

Dzierzbicka, Dorota

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Dorota Dzierzbicka

WINERIES AND THEIR ELEMENTS IN GRAECO-ROMAN EGYPT*

THE OBJECT OF THIS PAPER is a comparison and synthesis of archaeological and documentary evidence concerning wineries in Graeco-Roman Egypt, in order to obtain a comprehensive picture of what they looked like and what elements they were composed of. By the term ‘winery’ I mean a building or a part of a building which housed wine-making installations – above all a treading platform and a vat, but also other features involved in the production process.¹

Various structures that formed part of the winery have already been discussed in a number of publications.² However, none of these works

* I am deeply indebted to Dr Tomasz DERDA (Warsaw University) for his helpful comments and guidance when writing this article and to Prof. Roger BAGNALL (Columbia University) for his valuable suggestions. I would also like to thank Ms. Ewa JÓZEFOWICZ and Mr. Artur OBLUSKI, the authors of photographs reproduced as figs. 9 and 3–5 respectively. The other photographs were taken by the author.

¹ For the sake of clarity I tried to avoid using the term wine press, which is rather imprecise and can lead to misunderstandings – it has been used to denote a winery, a mechanical press, or a treading platform, depending on context.

² E.g. C. RICCI (*La coltura delle vite e la fabbricazione del vino nell'Egitto greco-romano*, Milano 1924) did not describe work in the winery at all and only mentioned grape treading as a part of the vintage; M. SCHNEBEL (*Die Landwirtschaft im hellenistischen Ägypten*,

aimed to present the entire wine-making complex as a whole, as a system of components that worked together in the process of wine production. Parts of the winery did not function as separate units, but were elements of a system, and this is how they are meant to be presented in this article.

Limiting the chronological framework of this paper to the Graeco-Roman period is justified by a fundamental change in wine's usage: although wine had been produced in Egypt for centuries before the coming of the Greeks, it was confined to temples and to the tables of royalty and aristocracy. The Greeks brought with them the culture of wine-drinking and their own production techniques. With their arrival, the increased demand for wine in Egypt triggered the emergence of a local alternative to imported wine. Throughout the Roman rule wineries were owned by both small-time producers and proprietors of large estates. The coming of the Arabs did not mean the end for Egyptian wine production. Wineries kept functioning in monasteries, where wine was made for liturgical purposes. However, in time it once again ceased to be a popular drink.

This chronological framework poses some problems because of disproportions in the available material. Sources are rather scant for the Ptolemaic period. The situation improves with Roman and Byzantine times: there are plenty of texts and archaeological evidence for wineries in this period, though few installations have a certain and precise dating. The uneven chronological scatter of material and the scarcity of Ptolemaic sources impair the description of the changes that took place in the winery during this long period. However, I chose to discuss the entire Graeco-Roman period as a whole because the wine-making industry was rather conservative and it seems that no revolutionary changes occurred in it from the start of the Ptolemaic period to the coming of the Romans.

München 1925, pp. 283, 286–287) discussed all of the elements of wineries, but this part of his work is an analysis of various words related to wine in papyri, without focusing specifically on the technical aspects of the structure itself; N. KRUIT ('The Meaning and Function of Various Words Related to Wine,' *ZPE* 90 [1992], pp. 268–269) only discusses *lénos*; K. RUFFING (*Weinbau im römischen Ägypten* [= *Pharos. Studien zur griechisch-römischen Antike*, vol. XIII], St. Katharinen 1999, pp. 112–119) included all of the relevant features of the winery in his work, but devoted only a few pages to the technical aspect of wine production; Ph. MAYERSON ('The Meaning and Function of *ληνός* and Related Features in the Production of Wine,' *ZPE* 131 [2000], pp. 161–165) focuses on the terms *lénos* and *pitbos*.

I. ARCHAEOLOGICAL EVIDENCE

The Egyptian wineries can be described thanks to archaeological evidence. As these structures will be referred to later on, a brief presentation of all the recorded wineries seems useful.³ The excavated wine-making installations are predominantly Roman and Byzantine units uncovered in the vicinity of Lake Mareotis and Abu Mina, in the Bahariya Oasis, and in the Fayum. All of these wineries have similar features, which makes their identification rather easy. Although their layouts differ, the elements of these structures are essentially the same regardless of the location.⁴

The wineries in the vicinity of Lake Mareotis are located on the strip of land between the lake and the Mediterranean Sea, and along the southern shore of the lake. To the north of the lake, at Abu Talaat, an Egyptian archaeological mission⁵ uncovered a winery with two connected treading platforms and one collecting vat. The wine-making unit was entirely hewn in bedrock except for one wall, which was built of stone blocks. Another winery was uncovered near Abu Qir Bay east of Alexandria.⁶ The winery was part of a sizeable, square structure built of limestone blocks.⁷ A large treading platform (3.25 x 5.80 m) covered with

³ There are also remains of wineries that have not survived *in situ* – lion head spouts kept at the Graeco-Roman Museum in Alexandria, a stone spout from Karnak, as well as fragments of wooden mechanical presses in the Graeco-Roman Museum and the Egyptian Museum, discussed further in the text.

⁴ M. RODZIEWICZ, 'Classification of wineries from Mareotis,' *BCH* suppl. 33 (1998), pp. 27–36; although the classification accomplished by Rodziewicz included only the wineries in the vicinity of Lake Mareotis, the structures uncovered elsewhere are similar.

⁵ Unpublished; the winery was described by RODZIEWICZ, 'Classification of wineries' (cit. n. 4), pp. 29, 31, and 36.

⁶ The unit was uncovered by Daninos Pasha in 1917. It was published as a private bath in: E. BRECCIA, *Le rovine e i monumenti di Canopo, Teadelfia e il tempio di Pniferôs*, Bergamo 1926, pp. 47–49, pl. XVI–XVII, and mentioned by RODZIEWICZ, 'Classification of wineries' (cit. n. 4), p. 27. No plans were published. The Ptolemaic dating established by BRECCIA on the basis of the quality of plaster used in the structure seems rather uncertain.

⁷ The layout of rooms in the structure is only partly preserved. It has not been determined where the entrance to the winery was located and whether there were passages leading to the adjacent rooms. It cannot, therefore, be said that the wine-making complex



Fig. 1. Winery at Burg el-Arab, view from the south-east. The winery occupies a corner of a larger building and was probably a part of an industrial complex together with a nearby pottery kiln and other facilities. The walls of the structure were built of limestone blocks. The lower part of the winery, occupied by a large, deep vat (centre) covered with waterproof plaster, is separated by a low wall from the raised treading platform (right).

waterproof plaster was raised 30 cm above the floor level of the building. Two channels led through a wall separating the platform from a collection vat, measuring 1.60 m in depth, 4.20 m long and 2.20 m wide. Twin flights of steps connected the two parts of the winery.

A sizeable winery near Burg el-Arab⁸ (N 30° 55.37' E 029° 31.485')⁹ was in this structure was limited to only one unit, consisting of a treading platform and vat. The other rooms also had an industrial function, perhaps related to wine and oil production (see BRECCIA, *Le rovine* [cit. n. 6], pp. 47–49).

⁸ Published by F. EL-ASHMAWI, 'Pottery kiln and wine-factory at Burg el-Arab,' *BCH* suppl. 33 (1998), pp. 62–64, mentioned in: RODZIEWICZ, 'Classification of wineries' (cit. n. 4), p. 34.

⁹ GPS coordinates of the wineries, as well as some additional information – dimensions, architectural details – were collected during my study tour of the Mareotis wineries



Fig. 2. Winery at Burg el-Arab, a close-up of the south-east corner of the treading platform, where the mechanical press (*stemphylourgikon organon*, see section IV.2, p. 52) was located. The round, raised base marks the spot where the fruit pulp was placed. The screw was mounted over the base and passed through a wooden beam, the ends of which were fixed in walls of the corner. A low, thin wall separates the press area from the treading floor.

located in the NE corner of a large villa (figs. 1–2). A mechanical press was built on the treading platform and closed off from the surrounding area with a thin wall. The must from the mechanical press enclosure and from the treading floor flowed to the adjacent collection vat through two separate channels. The winery at Taher el-Masry¹⁰ (N 30° 56.594', E 029° 34.582')

in November 2005 during my scholarship in Egypt. The study tour included the wineries near Burg el-Arab (also called Abu Sir), at Taher el-Masry and Marea, two of the installations at Abu Mina, and the wineries at Karm el-Shewelhy and Karm el-Baraasi. I am thankful to Mr. Adli RUSHDY from the West Delta Inspectorate and to Mr. Saber SELIM from the Islamic Inspectorate of the Supreme Council of Antiquities for allowing me to see the sites.

¹⁰ Explored by Mr. Mustafa Rushdy of the Egyptian Antiquities Organisation in 1998/1999 (as it was communicated to me by Mr. Maged AHMED, Inspector of the SCA),



Fig. 3. A small winery at Taher el-Masry near lake Mareotis. Both the treading platform (*lênos* – see section IV.1, p. 43) and the vat (*pithos* see section IV.3, p. 61) are visible. The destroyed section of the low wall separating the two parts marks the place where a stone, lion-head spout was once located. The structure is built of small cobbles bound with lime mortar and lined with waterproof plaster. There are traces of unexcavated structures surrounding the winery, suggesting that it might have functioned in a broader context.

was built of stone blocks and stone rubble embedded in cement (fig. 3). The uncovered press unit consisted of a square treading platform (3.75 m x 3.75 m) and a vat (2.37 m x 2.00 m), 1.40 m deep. Outlines of structures surrounding the unit suggest that the winery may have been part of some kind of a larger complex. A restored wine-making unit near Marea¹¹ (N 30° 58.491'

unpublished. The survey I conducted in 2005 yielded the GPS coordinates of the site, as well as some preliminary observations based on the remains visible on the surface.

¹¹ Published by F. EL-FAKHARANI, 'Recent Excavations at Marea, Egypt', *Aegyptiaca Trevirensia* 2 (1983), pp. 175–186. L. H. LESKO, ('Egyptian Wine Production During the New Kingdom,' [in:] P. E. MCGOVERN, S. J. FLEMING, S. H. KATZ [eds.], *The Origins and Ancient History of Wine*, *The University of Pennsylvania Museum of Archaeology and Anthropology* [1996], pp. 215–229) argued that this installation is not a wine-press, but the analogies with other such installations leave no doubt as to its identification.



Fig. 4. Winery at Marea, view from the north-east. In the front – the *pithos*, lined with waterproof plaster. Two flights of steps lead to the other side of a low wall, behind which the *lénos* is located (visible in the background). The must from the treading floor flowed out into the *pithos* through a channel ending with a damaged, lion-head spout (centre of wall). To the right of the lion head is the opening of a channel leading from the mechanical press area.

E O29° 40.129') consisted of a large treading platform, a smaller room with a base for a mechanical press, and a collection vat (figs. 4–7). Two separate channels led from the two rooms to the vat. The rooms where the pressing took place were raised higher than the room of the vat and two flights of steps connected the two levels. An unexplored winery in southern Huwariya,¹² built of irregular stone blocks, clay and waterproof plaster, consisted of one press unit – a treading platform and vat connected by two flights of steps. The round base of a mechanical press was set in a niche in the wall of the treading platform. A channel in the floor of the

¹² Unpublished, mentioned by RODZIEWICZ, 'Classification of wineries' (cit. n. 4), pp. 27–36, esp. p. 34.



Fig. 5. Winery at Marea, a close-up of the *pithos*, view from the south. Three steps descend to the bottom of the collection basin. Visible at the bottom is a concavity in the floor of the basin. On the northern edge of the vat there are two round indentations with funnels leading back to the basin.

platform led from the press directly to the vat. The installation 3 km south-east of Huwariya¹³ consisted of a treading platform, a vat and a mechanical press separated from the treading floor by a low, thin wall. A channel under the floor led from the mechanical press to the vat. The walls of the structure were built of irregular stone blocks bonded with mortar and covered with plaster reinforced with potsherds. The winery at Kom Truga¹⁴ south of Alexandria was built of stone blocks. It consisted of a treading platform and a vat. Of the coastal wineries, the one located farthest to the west is the structure excavated by an Egyptian team in

¹³ Unexplored. Unpublished, mentioned by RODZIEWICZ, 'Classification of wineries' (cit. n. 4), pp. 29 and 35.

¹⁴ Unpublished; identified by FAKHARANI, 'Recent Excavations at Marea' (cit. n. 11), p. 184, and mentioned by RODZIEWICZ, 'Classification of wineries' (cit. n. 4), p. 31.



Fig. 6. Winery at Marea, view of the *lênos* from the south-west. The floor is covered with waterproof plaster and gently slopes towards the opening of a channel, which leads under the low wall (left) and to the vat. The walls of the winery are built of small cobbles bound with lime mortar.

Hassan Bey. It consists of two complexes of two treading floors feeding into one vat.¹⁵

A number of wineries were found in the vicinity of Abu Mina, which suggests that the region was a thriving grape-growing and wine-making centre. There are three wineries within the town area. A large winery east of the double bath¹⁶ located behind the portico of the colonnaded street (N 30° 50.529', E 029° 39.761') was expanded in five phases until it became

¹⁵ The excavation was directed by Mr. Ezzad EL-HAMAHMY and Mr. Hussein NUR ED-DIN. I am very thankful to Prof. Roger BAGNALL for bringing this winery to my attention.

¹⁶ Uncovered by C.M. Kauffmann in 1907, excavated by P. Grossmann in 1983 and 1995. Published in: P. GROSSMANN & *al.*, 'Abu Mina. Elfter Vorläufiger Bericht. Kampagnen 1982–1983,' *MDAIK* 40 (1984), p. 148; P. GROSSMANN, F. ARNOLD & J. KOŚCIUK, 'Excavations at Abu Mina 1995,' *BSAC* 36 (1997), pp. 87–90.



Fig. 7. Winery at Marea, view of the northern face of the wall which separates the treading floor (*lénos*) in the upper part of the winery from the vat (*pitbos*) located in the lower part. In the centre one can see the damaged lion-head spout of the main channel leading from the *lénos*. To the right is an opening of the channel from the mechanical press area. In the foreground there is the southern wall of the collection basin. The ledges on the eastern and western walls most probably served for mounting a cover on the basin.

a complex of five treading floors with four mechanical presses. It was built of mud brick and stone blocks covered with waterproof plaster. Another winery was found behind the apse of the basilica¹⁷ (N 30° 50.458' E 029° 39.823'). It consisted of two rooms, the first housing one large treading platform flanked by two mechanical presses, a collection vat, and one smaller, raised platform. In the second room there was another treading floor and vat. The third winery¹⁸ within the area of Abu Mina was

¹⁷ Uncovered by Peter Grossmann in 1998, see P. GROSSMANN, 'Report on the excavations at Abu Mina in spring 1998,' *BSAC* 38 (1999), pp. 75–84, esp. pp. 82–83 and pl. IX.

¹⁸ The winery was uncovered in 1966 and published by W. MÜLLER-WIENER & P. GROSSMANN, 'Abu Mina. 6. Vorläufiger Bericht,' *Archäologischer Anzeiger* 82.4 (1967), pp. 468–473.



Fig. 8. Winery at Karm el-Baraasi near Abu Mina, close-up of the southern edge of the *pithos* (backfilled, left) with four notches, probably used for mounting a wooden lid.

uncovered in the so-called 'Kumring A', in three rooms of building 17, entered from a courtyard. Two of these rooms contained a set of one large and one small treading platform and vat. The third room on the opposite side of the courtyard was used for storage.

Four wineries have been uncovered hitherto in the vicinity of Abu Mina. The winery at Izbet Mohamed Farid,¹⁹ 1 km north of Abu Mina, had two phases of use. In the first phase (beginning or first half of the 5th cent. AD) it was a simple pressing unit consisting of a treading platform and vat, with walls built of baked brick and covered with waterproof plaster. When it was no longer in use, another winery was built (later part of

¹⁹ Excavated by Mr. ABD EL-AZIZ SHINAWY in 1989, re-excavated in 1998 by the German mission, published in an annex to a report by P. GROSSMANN, 'Report on the excavations at Abu Mina in spring 2001,' *BSAC* 41 (2002), pp. 25–31. Dating according to GROSSMANN, therein, p. 31.



Fig. 9. One of the press units of Karm el-Baraasi, located west of the published unit. A semicircular treading platform and a vat, now filled with water. Rising ground water is a serious threat to the wineries around Abu Mina. The mud brick walls are dissolving and only crumbling layers of waterproof plaster remain.

6th cent. AD) partly on top of the old one. This new structure comprised a treading platform, a vat, and two mechanical presses. In both phases of use, the winery stood next to a multi-story country house. The winery at Karm Gadoura²⁰ consisted of two treading platforms, two vats, one mechanical press, and storage rooms. The structure was built of mud brick and re-used stone blocks. The winery at Karm el-Shewelhy (N 30° 49.377' E 029° 38.650') consisted of a treading platform and vat, two storage rooms, and a courtyard. The wine-making unit was hewn in rock except for the eastern wall, which was built of limestone blocks. The

²⁰ Karm Gadoura, Karm el-Shewelhy, and Karm el-Baraasi wineries were explored in 1986 by the Egyptian Antiquities Organisation and published by M. ABD EL-AZIZ NEGM, 'Recent excavations around Abou Mina,' *BCH* suppl. 33 (1998), pp. 65–73. Karm Gadoura was inaccessible at the time of conducting the survey in the area due to flooding.

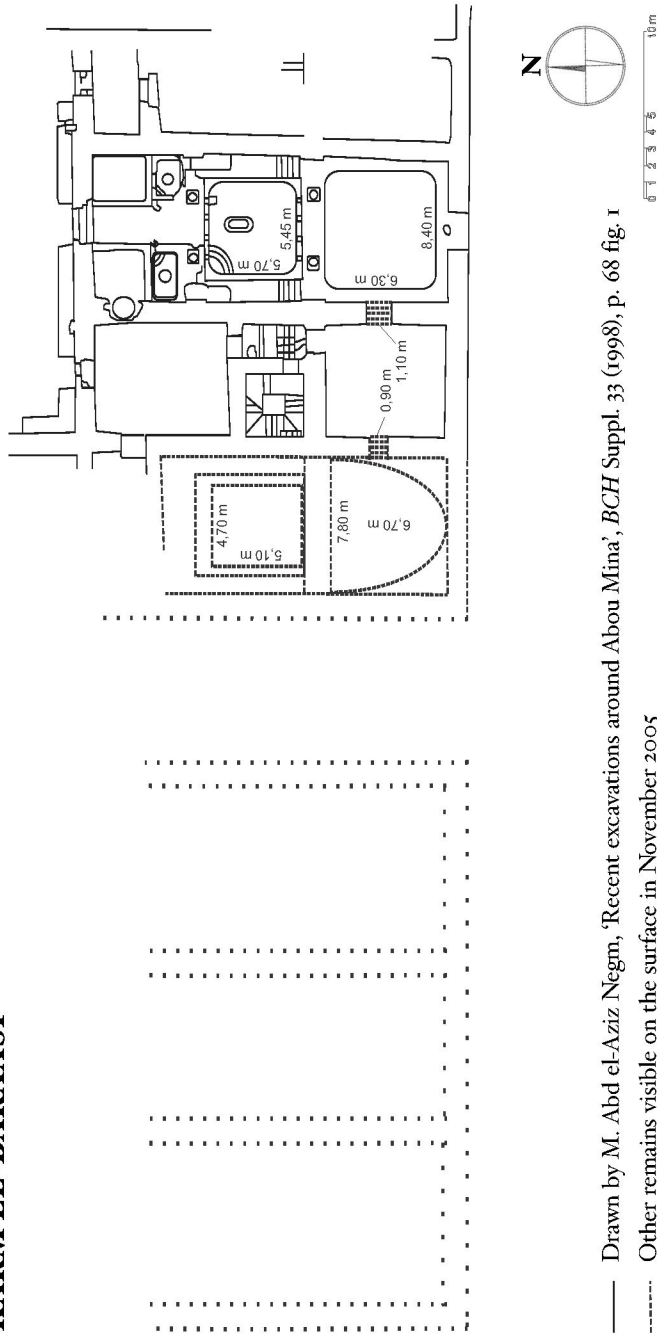


Fig. 10. The published, eastern press unit in Karm el-Baraasi. In the foreground the outline of a large, backfilled basin is visible. Further to the left is a rectangular treading platform laid with waterproof plaster. The western wall of this structure still stands, although the mud bricks are badly damaged by water.

floor of the treading platform and the walls of the vat were covered with waterproof plaster. Another sizeable winery at Karm el-Baraasi (N 30° 50.414' E 029° 40.495') consisted of several large treading platforms with vats and mechanical presses (figs. 8–10 and sketch in fig. 11).²¹ The complex was built of mud brick with corners reinforced with limestone blocks. The entrance to the unit uncovered by the excavators led from a

²¹ The excavations published by ABD EL-AZIZ NEGM (see above, n. 20) brought to light a large treading platform and vat. In the same room as the vat there were two small enclosures (4 m² each) for mechanical presses, each equipped with a small vat of its own. The survey carried out at the site in November 2005 revealed another treading platform, semi-circular in shape, with an adjacent vat. This unit was located further to the west and separated from the first platform by a room. The floor level of this room was lower than the two treading platforms and connected to them by two short flights of steps. Further to the west traces of three more treading platforms are visible (not yet excavated).

KARM EL-BARAASI



— Drawn by M. Abd el-Aziz Negrn, 'Recent excavations around Abou Mina', *BCH* Suppl. 33 (1998), p. 68 fig. 1

----- Other remains visible on the surface in November 2005

. . . Outlines of structures yet to be unearthed

Drawing: Dorota Dzierzbicka

Fig. 11. The above is a field sketch showing structures that were visible on the site of Karm el-Baraasi in November 2005 and their relation to the previously published area. Adjacent to the wine-making complex excavated and published by Abd el-Aziz Negrn (right) there were remains of another uncovered treading platform, semicircular in shape, connected to a large collection basin. Further to the west there may be other similar structures still to be unearthed (left), as it appears from remains visible on the surface.

courtyard. The winery was part of a larger complex – across the courtyard from it there was a house, and the courtyard itself was surrounded by rooms. Around 300 m to the north-west of this complex (N 30° 50.507', E 029° 40.402') there are probably more installations yet to be uncovered, as one can tell from the outlines of basins covered with waterproof plaster that are discernible on the surface.

In the oases of the Western Desert and in the Fayum few wineries were encountered hitherto. One winery was reported at Medinet Madi, ancient Narmouthis.²² At the site of Magdola a number of Roman wine-making facilities were identified.²³ Another installation, found in Theadelphia, is a winery located in room M of what Lefebvre believed to be the temple of Pnepheros, re-used as a farm house in the Roman period.²⁴ The winery, built of mud brick and covered with waterproof plaster, is dated to before AD 343. The treading platform was a rectangular basin measuring 20 m² in area and 0.5 m in depth. Its walls were stained with wine residue. Adjacent to the treading facility there was a round vat, 2.30 m in diameter and 1.85 m deep. The two elements were connected by flights of steps and ramps. The channel leading from the platform to the vat ended with a spout in the form of a lion's head. According to Lefebvre's report, other rooms in the villa were also part of the winery. In room L another platform was uncovered, but the vat was not preserved. In colonnade hall A mats of palm fibre covered with grape pulp were found, and fragments of amphorae were scattered throughout the building. More wine-making installations were identified by Paola Davoli in the southern part of the *kom* in Theadelphia²⁵ – they were remains of four plastered, circular basins within quadrangular structures built of baked brick.

²² A reference to this winery is provided in R. BAGNALL & D. RATHBONE, *Egypt from Alexander to the Copts. An archaeological and historical guide*, London 2004, p. 143.

²³ BAGNALL & RATHBONE, *Egypt from Alexander to the Copts* (cit. n. 22), p. 147; see photographs in: D. ARNOLD, 'Bericht über Fahrten in das el-Garaq Becken (Fajum)', *MDAIK* 21 (1966), p. 109 and pl. 32a; P. DAVOLI, *L'archeologia urbana nel Fayyum di età ellenistica e romana. Missione congiunta delle Università di Bologna e di Lecce in Egitto*, Napoli 1998, p. 216, il. 98.

²⁴ Uncovered by G. Lefebvre in 1908 and examined by Davoli during a survey in 1989, the results of these studies are published in G. LEFEBVRE, 'Égypte Graeco-Romaine,' *ASAE* 10 (1910), pp. 155–172, esp. pp. 168–170; DAVOLI, *L'archeologia urbana* (cit. n. 23), p. 283.

²⁵ DAVOLI, *L'archeologia urbana* (cit. n. 23), p. 280.

The winery in el-Haiz, Bahariya Oasis, is not fully excavated.²⁶ However, it certainly comprised at least one treading platform and one vat. The walls of the structure were built of mud brick on sandstone foundations and covered with waterproof plaster.

II. DOCUMENTARY EVIDENCE

Documentary texts are the most precious source of information on wineries and wine production in Graeco-Roman Egypt. Their chronological and territorial dispersion is as uneven as that of archaeological evidence and it corresponds to the chronological distribution and provenance of papyri in general. However, of the total of preserved texts only certain types of documents give us useful information, and these are not distributed uniformly with the rest of the papyri.

There are few Ptolemaic texts. Nearly half of them are from Philadelphia, from the Zenon archive. The largest group, about a third of all the texts, is dated to the 3rd century AD. There are also numerous documents from the 5th to 8th centuries. Certainly the chronological distribution of the documentation also reflects the increase of the role of wine in the Egyptian diet and the emergence of a better environment for capital-intensive development of private land. The majority of documents come from the Fayum, the Oxyrhynchite and the Hermopolite nomes. There is practically no information on the production of wine in Upper Egypt.

Wineries and wine production appear in certain types of documents. These are primarily texts concerning immovable property that included a winery – documents of sale, cession, and lease of vineyards, and texts concerning inherited property. Furthermore, there are contracts for work in a vineyard, from which we learn about the people who made the wine and about their activities. Another very important group of texts is constituted by letters, especially formal correspondence between employees in estates – instructions and reports on the progress of works or arising problems. Still another important group of documents is associated with

²⁶ The winery was excavated in 1988 by an SCA archaeological team headed by Dr. Zahi HAWASS. A general description and photographs of the structure were published in Z. HAWASS, *The Valley of the Golden Mummies*, Cairo 2000, pp. 164–166.

marketing the wine – sales of wine for future delivery and orders to issue wine. The latter also appear among the formal letters of estates in connection with payments in kind. Some interesting information is also supplied by accounts and registers of income and expenses.

Important data is provided by archives documenting the activity of estates.²⁷ In the analysed material the archives of Zenon and Heroninos are well represented. Also the much-referred-to *P. Mich.* XI 620 concerns wine production on an estate. The text contains copies of a series of reports concerning financial operations of a large estate, which belonged to Valerius Titanianus. The estate comprised land plots in the Fayum, in the vicinity of Dionysias, Alexandrou Nesos and Theadelphia in the *meris* of Themistos, as well as land near Philadelphia and Ptolemais Euergetis. Its main product seems to have been wine. Furthermore, several orders to issue wine and grain in *P. Oxy.* XLIX 3513–3521 concern wine produced at some estate. Although vineyards and sales of wine are attested in the documents of the Apion estate, unfortunately there is not much information available on actual wine production – it is mentioned in only three documents from the archive.²⁸

The texts suggest that the importance of major landowners among wine producers was considerable. On the one hand, this is understandable. First of all, the production of wine was a profitable business, but at the same time it was relatively risky because of the easy spoiling of the merchandise. Second, owning a winery and a vineyard was a long-term investment project, more easily undertaken by a wealthy landowner than a small-time producer. On the other hand, however, the reality conveyed by documentary evidence can be somewhat misleading. While the official correspondence necessary for the functioning of an estate has often been preserved in papyri and today it is a source of knowledge on wine pro-

²⁷ Large estates profited from wine production. See D. COMPARETTI, *P. Flor.* II, pp. 41–66; D. RATHBONE, *Economic Rationalism and Rural Society in Third-Century AD Egypt. The Heroninos Archive and the Appianus Estate*, Cambridge 1991; D. P. KEHOE, *Management and Investment on Estates in Roman Egypt during the Early Empire* (= *PTA* 40), Bonn 1992; A. ŚWIDEREK, *La propriété foncière privée dans l'Égypte de Vespasien et sa technique agricole d'après P. Lond.* 131 *recto*, Wrocław 1960; J. C. SHELTON, commentary to *P. Mich.* XI 620, S. A. STEPHENS, 'Nine Orders to Pay from Oxyrhynchus,' *ZPE* 31 (1978), pp. 145–160.

²⁸ *P. Oxy.* XVI 2044, ll. 9–10; *P. Oxy.* LVIII 3960, l. 4; *P. Oxy.* XVI 1911.

duction in Egyptian antiquity, the minor producers had no need for such bureaucratic means and therefore no trace of them remains.

The limitation of our sources on wine production in Graeco-Roman Egypt is not only their uneven chronological and territorial distribution but also the fact that archaeological sources are rarely complemented by texts in a direct fashion. In the Delta, wineries have been excavated, but there are no preserved papyri. The situation is opposite in Hermopolis and Oxyrhynchos – no wineries have been unearthed, but papyri testify to the existence of developed wine-producing centres in these localities and their surroundings. Complementary archaeological and written sources are available only for 3rd-century Theadelphia – documents from the Heroninos archive supply an abundance of information illustrated by archaeological evidence.

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The main body of this article is divided into two parts. Part I concerns the winery in general, part II its elements. The first part talks about what the winery looked like and how it functioned as a whole. There is a great deal of information about this in documents. Their interpretation is based on archaeological finds, and additional data is supplied by literary sources, especially the *Geoponika*.²⁹ The arrangement of sections in the second part follows the order of the production process that took place in the winery.

²⁹ *Geoponika* are a compilation of eclogues on agriculture in 20 books. It is the latest Greek text concerning wine production. The compiler of the work was Kassianos Bassos, who owned land in Bithynia. The text was ordered upon the request of Constantine Porphyrogenetos in the 10th cent. AD. Kassianos Bassos extracted fragments from over 30 works of Greek and Roman agronomists. Nearly 20% of the compilation is devoted to wine, especially books VI–VIII. The production process itself was described in book VI, while books VII and VIII give advice on how to protect the wine from spoiling and talk about flavoured wines. For more on *Geoponika* see: G. SCHROT, 'Geoponica,' in: *Der Kleine Pauly*, K. ZIEGLER, W. SONTHEIMER & H. GÄRTNER (eds.), München 1975, vol. 2, coll. 756–757; A. P. KAZHDAN, 'Geoponika', [in:] A. P. KAZHDAN (ed.), *The Oxford Dictionary of Byzantium*, vol. II, Oxford 1991, p. 834; M.-C. AMOURETTI, 'La viticulture antique méditerranéenne et ses rapports avec la vinification', [in:] *El vi a l'antiguitat. Economia, producció i comerç al Mediterrani occidental. II colloqui internacional d'Arqueologia Romana, Actes Badalona 6/9 de Maig de 1998, Monografies Badalonines*, núm. 14, pp. 15–28.

The first step was crushing the fruit on a treading floor (section IV.1). The pulp obtained was then put under a mechanical press (section IV.2) in order to squeeze out any remaining liquid. The must flowed down to a vat (section IV.3) – or vats, if the structure was equipped with separate basins for trodden and mechanically pressed must. The must remained in the vat through the first phase of fermentation. Then the new wine was poured into vessels and stored for maturing (section IV.4–5).

III. THE WINERY

As was first stated by Schnebel, the Greek words for winery are *ληνών* and *ληνός*.³⁰ He differentiated between the two terms, concluding that *lênôn* denoted a winery complex, while *lênos*, although it could also assume the same meaning, essentially stood for a vat. The meaning of *lênôn* evokes no controversy,³¹ but the term *lênos* has been interpreted in various ways by scholars and editors and indeed seems to have more than one meaning. Its etymology³² is unknown and it is probably a loanword. The term has survived in Greek until today, but in the Demotic dialect it is often replaced with the word *πατητήρι*. According to *LSJ* (s. v. [2]), *ληνός* is ‘anything shaped like a tub or trough, winevat in which the grapes are pressed,’ ‘a storage vessel for wine’ (*LSJ Supp.* s. v.) Preisigke also defines the term as ‘Bottich, Trog, Weinkufe, Weinfäß.’ (*WB*, s. v.). The dictionary definitions of this word, therefore, provide two different, basic meanings – a vat or container and a treading platform.

The approach of scholars and editors to the dictionary definitions is ambivalent. Editors usually accept the part of the definition that in their view best suits the given text. This sometimes leads to misunderstandings arising from the general character of the definitions. In turn, a number of

³⁰ SCHNEBEL, *Landwirtschaft* (cit. n. 2), pp. 283, 286–287.

³¹ *LSJ*, s. v. *ληνών* and *ληνέων*, reads: ‘the place of the *ληνός*’ in its first meaning (see below), and refers to *Geoponika* VI 1.3 and *P. Lond.* II 401 (p. 12), l. 13.

³² *Ληνός*, [in:] P. CHANTRAINE, *Dictionnaire étymologique de la langue grecque. Histoire des mots*, Paris 1984, p. 637.

scholars³³ presented their own ideas and comments on the meaning of the word, and these more or less differ from the definitions provided by dictionaries.

As we shall see on the basis of examples cited below in this section, the most adequate definition of *lénos* seems to be ‘winery’ in general,

³³ Two now-classic works were written on the subject early in the 20th century, based solely on literary sources: RICCI, *La coltura delle vite* (cit. n. 2) and SCHNEBEL, *Landwirtschaft* (cit. n. 2); RICCI concluded (p. 49) that the *lénos* was a shallow tub in which grapes were trodden, and remarked that this term is not synonymous to *pithos* and it was not used to denote a collecting vat; SCHNEBEL differentiated (pp. 283, 286–287) between the related words *lênôn* and *lénos*. He concluded that the term *lênôn* denoted a winery complex, while *lénos*, which could also assume the same meaning, essentially stood for a vat. In some texts, according to this scholar, the *lénos* was an immovable facility – a large masonry tub in which the grapes were crushed. In other documents SCHNEBEL interpreted the *lénos* as a wine vat, a synonym of both *pithos* and *κοῦφον*. After the publication of these two works, for many years new suggestions appeared only on the margin of other studies and in commentaries to editions of texts, until an article appeared by KRUIT, ‘The Meaning and Function...’ [cit. n. 2], pp. 268–269). According to KRUIT, *lénos* can be translated in two ways, as ‘wine-press,’ meaning ‘treading platform,’ or as ‘fermentation vat’. *Lénos* takes the meaning ‘treading platform’ in leases and sales of vineyards containing descriptions of the equipment sold or leased along with the plot. In the meaning ‘fermentation vat’ *lénos* is, according to KRUIT, synonymous to *pithos*. KRUIT prefers this last meaning in Ptolemaic loans of wine (*P. Amb.* II 48 and *P. Grenf.* II 24), in sales of wine for future delivery (mainly from the Oxyrhynchites) and in orders to issue payment in wine. In the same year as KRUIT’s article, there appeared a work by RATHBONE, *Economic Rationalism and Rural Society* (cit. n. 27); RATHBONE (p. 254) concluded that the *lénos* was above all a shallow tub in which the grapes were trodden and pressed but, like the Latin word *vas*, it could also denote the winery as a whole and the wine that came from it as well. The scholar argues that in this context *lénos* should not be interpreted as a storage vessel for wine. The most recent systematic study on the production of wine in Egypt is the work of RUFFING, (*Weinbau* [cit. n. 2]); Both in this detailed work and in his article on wine production written one year before (*Herstellung, Sorten, Qualitäts-beseichnungen von Wein im Römischen Ägypten* [1.–3. Jh. n. Chr.], *MBAH* 17 [1998], pp. 11–31) the scholar explains several terms appearing in papyri, citing an abundance of sources. Like SCHNEBEL, to whom the scholar often refers, RUFFING sees *lénos* as a winery, a treading platform or a fermentation vat and does not try to verify the established definitions. The most recent – and the only – study devoted exclusively to the meaning of the word *lénos* was written by MAYERSON (*The Meaning and Function of ληνός*’ [cit. n. 2], pp. 161–165). According to this scholar the basic meaning of the word *lénos* is ‘treading platform’ and by synecdoche it also denotes the entire wine-making complex, but the term should not be translated as ‘vat’ or ‘vessel’. This view seems to be correct. In contracts of sale of a vineyard where this term appears its most suitable meaning is ‘treading platform’.

as well as, specifically, 'treading platform', while the meaning 'vat' should be avoided.

The meaning 'winery' is attested beyond all doubt in a number of documents. *P. Mich.* XI 620 col. I, l. 94 (*SB* VIII 9898), an account of revenues of an estate dating from after AD 240 (Arsinoite nome), informs us that there was a weaver's workshop set up in a *lénos*. It must have been a building or room, therefore, rather than a treading platform or a fermentation vat.

In a 1st-century AD document concerning a land tax (Arsinoite nome), there is mention of a winery the area of which is measured in arourai.³⁴ Line 30 reads as follows: *ληνώ(νος) καὶ χρηστηρίω(ν) (ἄρουραι) δ*. Four arourai is quite a large area for a wine-making complex, considering the available archaeological evidence. Although for the majority of the excavated wineries the total area has not been determined, in some cases estimates can be made. For instance, if the winery complex behind the portico at Abu Mina was limited in size to what has survived until today,³⁵ its total area was about 420 m². If one assumes that the wineries at Abu Qir³⁶ and Theadelphia³⁷ occupied the entire space in the buildings they were located in (which is, however, not very likely, especially in the case of Abu Qir), their size would be 575 m² and ca. 500 m², respectively. The largest known winery may be the one at Karm el-Baraasi, given that the visible remains of the surrounding structures were all part of the same complex (see above, n. 20). If that were the case, the total area would be over 2000 m².³⁸ Therefore, the size of even the biggest excavated winery, if it occupied the largest possible area, does not even reach one aroura. It is hard to avoid the following conclusion: that either there is an error in the

³⁴ *P. Lond.* II 195 (pp. 127–128) = *P. Ryl.* II, edited on pp. 254–257. The editor does not comment on this baffling figure.

³⁵ GROSSMANN, ARNOLD & KOŚCIUK, 'Excavations at Abu Mina' (cit. n. 16), plan.

³⁶ Estimate based on the data and photographs in BRECCIA, *Le rovine* (cit. n. 6), pp. 47–49, pl. XVI–XVII, given that the entire complex 25 x 27 m, excavated by Daninos Pasha, was associated in function with the winery.

³⁷ DAVOLI, *L'archeologia urbana* (cit. n. 23), plan.

³⁸ Calculation based on observations and measurements on site.

document cited above³⁹ or the area occupied by the wineries and their appurtenances is larger than it may appear – perhaps some structures, hitherto not taken into consideration, also functioned as part of the complex (see below, section IV.6).

Wineries were built both in rural areas and in cities. Contracts of sale and lease of vineyards mention wine-making installations found within their area.⁴⁰ In turn, excavations in both Theadelphia and Abu Mina revealed wineries that were surrounded by houses. The villa in which the winery in Theadelphia was installed was in the centre of the city.⁴¹ Two of the wineries found in Abu Mina were located in the urban area – one behind the apse of the basilica, the other behind the portico of the main street. In this case it seems, however, that the wineries were built only after the Persian invasion which destroyed the city in 619.⁴² There are also several documents that mention city *lênnoi*. A contract of sale of a house and a courtyard (*P. Mich.* v 304, AD 42, Tebtynis) defined the location of the house by mentioning a winery (l. 6), which stood to the west of it. It can be inferred from the text that the winery was located in the centre of town, not on the outskirts, since the house stood next to the royal road that ran to the east of it.

Wineries could be large, complex structures, or small and simple installations consisting only of a treading platform and a collection basin.⁴³

³⁹ For instance, $\frac{1}{4}$ of an aroura (d') can easily change into 4 (δ) arourai. A re-examination of the papyrus might prove enlightening in this case.

⁴⁰ The words *lênos* and *lênopitbos* are found in the following sales and leases of vineyards: *P. Col.* x 280, l. 14; *P. Hamb.* I 23, l. 18; *P. Oxy.* IV 729, l. 19, *P. Oxy.* XXXIV 2723, l. 9; *P. Oxy.* LI 3638, l. 8; *P. Oxy.* XLVII 3365, ll. 46, 54, 55, 66; *P. Ryl.* IV 583, ll. 7, 10, 12, 50, 54; *P. Soter.* I, l. 17; *P. Soter.* 2, l. 14; *P. Vind. Tand.* 28, l. 10; *PSI* VII 918, ll. 2, 4; *SB* XX 14291, ll. 6, 7; *SPP* XX 218, l. 15.

⁴¹ DAVOLI, *L'archeologia urbana* (cit. n. 23), pp. 279–286.

⁴² According to GROSSMANN, ('Report 2001' [cit. n. 19] p. 31, n. 39), the winery behind the portico dates from the 6th cent. AD and later, meaning it was built before the period of decline of the city centre. However, KOŚCIUK, in the chronology of the Mediaeval settlement at Abu Mina (J. KOŚCIUK, 'The Latest Phase of Abu Mina – The Mediaeval Settlement,' *BSAC* 42 [2003], pp. 43–54, esp. p. 46) dates these installations to after 641/642 and before mid-9th cent. AD.

⁴³ See the classification of wineries in the Mareotis area (RODZIEWICZ, 'Classification of wineries' [cit. n. 4], pp. 27–36); the types distinguished by RODZIEWICZ range from simple

As we know from papyri, some wineries were owned by large estates, while others belonged to groups consisting of several independent producers who made wine on a small enough scale that it did not pay for them to build their own wineries. The former appear in documents from the Zenon, Heroninos, and Apion archives (*P. Oxy.* XVI 1911, col. II, l. 42, AD 557, Oxyrhynchos), in *P. Mich.* XI 620 (Arsinoites, after AD 240) from the estate of Valerius Titianus, as well as in five texts – *P. Oxy.* XLIX 3513–3521, concerning the production of wine in some other estate. In turn, the minor producers appear in sales and leases of parts of wineries. Such documents are: *P. dem.* Gieben 2, an important text for more on which see below, the sale of a fourth part of a winery, *P. Flor.* I 50 – a division of property, and *P. Vind. Sal.* 12 – a lease of 1/6 of a ἡλιαστῆριον (see below, p. 43). It seems that in such cases sharing a winery is above all the result of dividing inherited property, and of the fact that it was an investment that exceeded the financial possibilities of a single, minor producer.

Wineries were built of irregular or dressed stone blocks, clay, mud brick, lime mortar and waterproof plaster.⁴⁴ Rodziewicz observed⁴⁵ that those built of stone are predominantly located in the vicinity of Lake Mareotis, while mud brick was instead used in the desert areas, away from the humid coastal climate. However, as he suggested, the reason behind the use of mud brick may have also been the lack of local stone and the high price of transport from the quarries. The stone blocks as well as the decorated spouts were often reused architectural elements of older structures. Finally, he concluded that difference in material was not associated with any difference in function.

platform + vat units (type 1) to complex structures comprising a system of several treading platforms, vats, and mechanical presses (type 8).

⁴⁴ The winery near Burg el-Arab was built of stone blocks and covered with plaster, while the installations at Karm el-Baraasi were built of mud brick, and only the corners were reinforced with limestone blocks. At Karm el-Shewelhy, in turn, the press is hewn in rock except for the eastern wall built of limestone blocks. Also in Abu Talaat the basin was cut in the bedrock. In the wineries at Huwariya and Burg el-Arab potsherds were used to strengthen the walls. Burg el-Arab: ASHMAWI, 'Pottery kiln and wine-factory' (cit. n. 8), pp. 60–64. Karm el-Shewelhy and Karm el-Baraasi: ABD EL-AZIZ NEGEM, 'Recent excavations around Abou Mina' (cit. n. 20), pp. 65–73. Descriptions of wineries at Abu Talaat and Huwariya: RODZIEWICZ, 'Classification of wineries' (cit. n. 4), pp. 31–35.

⁴⁵ RODZIEWICZ, 'Classification of wineries' (cit. n. 4), pp. 29–30.

Several documents mention building a winery. One of them is a letter from the Zenon archive (*P.Lond.* VII 2054). A mason offers to supply stone blocks for a *lénos*. The blocks are to be cut from the same quarry and in the same dimensions as earlier, at the price of four tetradrachmai for 400 blocks.

P.Mil. Vogl. VII 304 (Tebtynis, AD 166) registers wages for workers who were to build a *lénos*. They were: a stoneworker, two masons and two assistants. Donkey drivers were hired – the animals carried stone, water and straw for the production of bricks. The performed activities were similar to those taking place when building a house of mud brick.⁴⁶ The editor suggested in the commentary that it was a whole winery that was being constructed, not just a treading platform. In addition, *CPR* VIII 22, l. 68 (AD 314, Hermopolite nome) mentions the door of a *lênôn*, leaving no doubt that a building is meant.

One of the most characteristic features of the excavated wineries is the extensive use of waterproof plaster. The plastered areas included the vat, the treading platform – its floor and walls to an indeterminable height, the mechanical press area, the channels, the low wall separating the raised treading floor from the vat, and, in some cases,⁴⁷ also the flights of steps connecting the two levels. Plastering the wine presses was practiced also outside Egypt. *Geoponika* (VI 1.3) recommend covering the entire platform (*ὁ ληνεών*), and the channels (*αἱ ἀναφοραὶ*) with fine plaster so that dirt and creatures (*οἱ ζωογονουμένοι*) do not fall into the must and contaminate it.⁴⁸

The plaster covering the treading platform and the vat was repaired rather often, and it was cleaned before and after each vintage. At Karm el-Baraasi near Abu Mina the surface of the platform was laid with three layers, and the vat – with seven layers. In the installation at Karm el-Shewelhy there were nine layers.⁴⁹ According to Peter Grossmann, some

⁴⁶ On building mud brick houses: M. NOWICKA, *La maison privée dans l'Égypte ptolémaïque* (*Bibliotheca Antiqua* IX.), Wrocław 1969, p. 28.

⁴⁷ As observed in wineries at Karm el-Shewelhy, at Abu Mina behind the apse of the basilica, and at Marea (reconstruction).

⁴⁸ See below, p. 13, esp. n. 54.

⁴⁹ ABD EL-AZIZ NEGM, 'Recent excavations around Abou Mina' (cit. n. 20), pp. 72–73.

wineries in the vicinity of Abu Mina had more than 20 layers of plaster, which suggests either great care for the condition of the presses or extensive use of the installations.⁵⁰

The state of the plastered surfaces was monitored. A private letter of unknown origin, dated to the 3rd cent. AD (*P.Köln* III 163) seems to concern an inspection of wineries to see if they are in need of repair (ll. 2–5):

πρὶν μοι γράψῃς περὶ τῶν ..ε..ων καὶ τῶν ληνῶν, ἠρξάμην ἀπὸ α' Ἐπειφ π...[.]αι τοῦς ληνοὺς μέχρι ιβ καὶ οὐδεὶ[s] αὐτῶν χρῆζει ἐπισκευῆς.

Already before you wrote me back about the... and the *lênnoi*, I began from the 1. Epeiph to ... the *lênnoi* up to 12., and none of them is in need of repair.⁵¹

Applying a layer of plaster may also be the subject of *BGU* VII 1549. It is a memorandum on an ostrakon from Philadelphieia, dated 210–209 BC.⁵² The meaning is not entirely clear, so the relevant passage is worth quoting:

(ἔτους) ιγ ἐξ Ἡφαιστιάδος ἀποζέσασαν τεταρταίαν τὴν πρώτην [[πεμπτ]] ληνὸν κατήλειψα τῇ τετάρτῃ ἡμέρῃ, τῶν δ' ἐκ Φιλαδελφείας ἢ γ λην(ν)ος πεμπταία ἀπέζεσεν καὶ κατηλείφθη. ἢ τοῦ κλίματος τοῦ πρὸς τῇ ληνῶι ἐνδεκαταία κατηλείφθη.

Following the suggestions of Viereck and Zucker, the text can be translated as follows:⁵³

In the 13. year the first *lênos* in Hephaistias, which was boiled for four days, I plastered it on the fourth day, and among those in Philadelphieia the third *lênos* was boiled for five days and plastered. The *lênos* near the hillside was plastered on the eleventh day.

The editors refer to the passage in *Geoponika* (VI 1) and interpret the verb ἀπόζειν as ‘to clean with boiling water’, and καταλείφειν, in their

⁵⁰ GROSSMANN, ‘Report 1998’ (cit. n. 17), p. 83.

⁵¹ R. HÜBNER suggested to restore the second lacuna with the word ‘füllen,’ thus proposing the translation: ‘I began to fill the *lênnoi* from 1st Epeiph’. This suggestion is, in my opinion, incorrect.

⁵² Dating as in *BL* III, p. 21 and *BL* XI, p. 28.

⁵³ Viereck and Zucker, the editors of this text, did not provide a translation, but suggested (comm.) to read the last sentence as follows: ἢ ληνός ἢ πρὸς τῷ κλίματι ἐνδεκαταία κατηλείφθη and explained that the winery must have been situated on a hillside or a cliff (κλίμα).

view, refers to the fine plaster (λειοτάτοις κονιάμασιν), with which the interior of the winery was covered.

It was of outmost importance to keep the winery clean and to prepare it for the vintage. Columella suggests (*De re rustica* XII 18 3) using sea water, if it is nearby, and if not, sweet water, to wash the basins used for storing wine, the vats by the wine press, and all the vessels. They should be cleaned and dried thoroughly and the storage room should be fumigated with pleasant aromas so that it does not give off a foul and sour odour.

In *P. Cairo Zen.* III 59300, ll. 15–17 (=PSI IV 434), a letter from the Zenon archive dating from 23 June 250 BC, the author complains that no one is putting the old *lênoi* in order or building new ones, though the vintage is drawing near, and nobody is getting ready to catch the mice. An interesting parallel to this text is a passage from *Geoponika* (VI 1.3): to keep mice from falling in and drowning in the wine, thus making it unfit for use, it is advised to place a wooden lid on the vat.⁵⁴ There is indeed reason to believe, based on archaeological evidence, that wooden covers were mounted on collection basins. For more on this point see below, section IV.3.

The majority of documents in which the word *lênos* appears do not provide us with any information on the appearance of the winery or its surroundings. They do, however, deserve a closer look, as they give insight into the production process, the work that went on in the winery, and its place in the life of a wine-producing estate.

In the Ptolemaic period the work in a winery was subject to regulations promulgated by the king and preserved as a part of the so-called

⁵⁴ According to the edition: *Geoponika sive Cassiani Bassi Scholastici De re rustica eclogae*, H. BECKH (ed.), Editio stereotypa editionis primae (MXCCCXCV), Stuttgart – Leipzig 1994. The above is the interpretation of this text by MAYERSON ('The Meaning and Function of *ληνός*' [cit. n. 2], p. 162). It is noteworthy that the translation provided by T. OWEN (*Geoponika: Agricultural Pursuits*, London 1805–1806, p. 94), supplies a different interpretation: instead of the channels, it is the ceiling that is to be plastered, and the wooden board does not serve as a cover, but is placed in the vat in such a way that the mice could get out. Despite the fact that LSJ defines *ἀναφορά* as the ceiling of the winery, like OWEN did, with reference to this place in *Geoponika* (see LSJ, s. v. [3]), I chose to accept MAYERSON's translation, as the more logical and corresponding to archaeological evidence.

Revenue Laws, coll. 23–36.⁵⁵ Serving as confirmation of state control over wine production on Crown and temple land is *P. Tebt.* III.2 1058 from the beginning of the 2nd cent. BC, a report concerning vine-growers in Tebty-nis. It contains entries from consecutive days of the month according to the following formula: ‘so-and-so, (whose vineyard is) in Crown land or temple land, (brings his produce) to the *lênos* of so-and-so.’ According to the editors (A. S. Hunt, J. G. Smyly, C. C. Edgar), the wine from wineries located on the abovementioned categories of land was produced under the supervision of officials. During the harvest, fruit was carried down to selected wineries where the production took place. After the deduction of taxes the product was probably divided – the lessees could keep a share and the rest was handed over to the Crown or the temple that owned the vineyard.

Aside from its industrial function, the winery was the place where wine was issued to buyers, lessees, borrowers, and receivers of payment in kind. There is a group of documents – sales of wine for future delivery,⁵⁶ loans of wine, leases of vineyards and contracts for work in a vineyard – which specify that wine is to be issued at the winery – *παρὰ ληνόν*,⁵⁷ soon

⁵⁵ J. BINGEN, *Papyrus Revenue Laws. Nouvelle édition du texte. (Sammelbuch Griechischer Urkunden aus Ägypten, Beiheft 1)*, Göttingen 1952. English translation in: *The Hellenistic Period. Historical Sources in Translation*, R. BAGNALL & P. DEROW (eds.), s.l. 2004 (2), pp. 181–195. A part of Revenue Laws concerns the collection of *apomoira*, a tax of 1/6 or 1/10 of the vineyard and orchard produce. The regulations concern the supervision of the harvest and pressing, the calculation of the tax, the procedure in case the tax collectors are absent, the transport and storage of the wine collected as *apomoira* and the vessels, further action concerning the remittances in wine, and the classification of various wineries and orchards by the *basilikos grammateus*.

⁵⁶ More on the sales of wine for future delivery as a genre of texts in: N. KRUIT, ‘Local Customs in the Formulas of Sales of Wine for Future Delivery,’ *ZPE* 94 (1992), pp. 167–184; N. KRUIT, ‘Three Byzantine Sales for Future Delivery,’ *Tyche* 9 (1994), pp. 67–92; É. JAKAB, ‘Guarantee and Jars in Sales of Wine on Delivery,’ *JJP* 29 (1999) pp. 33–44; B. FRIER, ‘Roman Law and the Wine Trade: the Problem of “Vinegar Sold As Wine”,’ *ZSSRA* 100 (1983), pp. 257–295.

⁵⁷ *P. Amb.* II 48 (106 BC, Pathyris); *SB* VI 9569 (AD 91, s. l.); *P. Oxy.* IV 729 (AD 138, Oxyrhynchos); *P. Rein.* II 101 (AD 198–209, Oxyrhynchite nome); *P. Mich.* XI 615, l. 5 (AD 259, Oxyrhynchite nome); *P. Col.* X 280 (AD 269/270, Oxyrhynchos); *P. Oxy.* XIV 1631 (AD 280, Oxyrhynchos); *P. Oxy.* XLIX 3512 (AD 492, Oxyrhynchos); *SB* V 8264 (AD 524, Oxyrhynchos); *P. Heid.* V 358 (AD 524/5, Oxyrhynchite nome); *P. Flor.* I 65 (AD 570/1?, Oxyrhynchos); *P. Rein.* II 102 (6th

after the vintage.⁵⁸ The texts containing this formula come predominantly from the Oxyrhynchite nome⁵⁹ and are dated to a period from the end of the 1st cent. to the 7th cent. AD (an exception is a loan of wine – *P. Amb.* II 48 – from Pathyris, dating from 106 BC). According to Mayerson,⁶⁰ in sales of wine belonging to this group *lênos* may denote the wine-making complex – the winery and its appurtenances.

cent. AD, Oxyrhynchite nome); *P. Mich.* XI 608 (6th cent. AD, Oxyrhynchite nome); *SB* XXII 15725 (6th cent. AD, Oxyrhynchite nome); *P. Heid.* V 359 (6th–7th cent. AD, Oxyrhynchite nome).

⁵⁸ According to KRUIT, ('The Meaning and Function...' [cit. n. 2], p. 269), the distribution of wine began as soon as the must filled the vats. The vintage took place in the months Epeiph, Mesore and Thoth. As it can be seen from a table presented by RUFFING, *Weinbau* (cit. n. 2), pp. 165–167, the vintage occurred in July and August, and sometimes lasted up to September. As a rule in the Arsinoite nome the vintage was in the month of Mesore and sporadically earlier, in Epeiph. There is scant information available on Panopolis (*SB* X 10270) and Abu Mina (*SB* XII 10990). The group of 107 ostraca from Abu Mina, dated to 5th–6th cent. AD, published by D. WORTMANN ('Griechische Ostraka aus Abu Mena,' *ZPE* 8 [1971], pp. 41–69) concern the wages of workers employed at the vintage. The dates in these documents range from the second half of Mesore to the end of Thoth. In turn, the seven ostraca (B. BOYAVAL, 'Les ostraca d'Edfa,' *BIFAO* 63 [1965], pp. 50–70) from Edfa near Panopolis (the 220s) concerning the issue of payment in kind for vintage works, indicate that the harvest was in Mesore. The documentary evidence is confirmed by Columella (*De re rustica* XI 60), who writes that in the coastal areas of Italy and in Africa the vintage ends with the last days of August, that is the last days of Mesore, during *epagomenai* and in the first days of Thoth.

⁵⁹ A great majority of known sales of wine for future delivery comes from Oxyrhynchos and Hermopolis. The documents from these two localities differ in formula. Among others, the texts from Hermopolis lack the phrase *παρὰ ληνόν*, in other words it is not specified that the wine will be issued in the winery. In turn, in the Oxyrhynchite contracts it is not mentioned what measure the wine will be issued by, which in the Hermopolite texts is expressed with the phrase *μέτρῳ τοῦ πίθου* (see p. 70). However, as KRUIT remarks, the fact that the Hermopolite contracts note that the wine is to be issued by the measure of the *πίθος* in which it remains makes it understandable that the issue of the wine was to take place at the winery. The only Oxyrhynchite document mentioning a measure is *P. Oxy.* XLIX 3512 (AD 492, Oxyrhynchos): *τεμὴν πλήρησ οἴν[ο]υ σηκωμάτων τῷ γεουχικῷ σηκῶ[ματ]ι ἐξήκοντα τρία*, translated by R. HÜBNER (ed., 'Four Oxyrhynchos Papyri,' *ZPE* 30 [1978], pp. 195–207) as: 'sixty-three sekomata of wine measured by the estate-sekoma'. More on such documents from Hermopolis in: KRUIT, 'Local Customs in the Formulas' (cit. n. 56), pp. 167–184.

⁶⁰ MAYERSON, 'The Meaning and Function of *ληνός*' (cit. n. 2), p. 164: *παρὰ ληνόν* may have designated the treading floor, 'adjacent spaces if not the entire wine-making establishment'.

An example of such a document is a sale in advance of wine, grain, and vegetable seed, *P. Mich.* XI 608, ll. 8–18 (6th cent. AD, Oxyrhynchite nome):

[ὄ]νπερ οἶνον παρὰ ληνὸν ἀπὸ γλεύκουσ ἀδόλο[υ] (σοῦ) παρέχοντος τὰ κοῦφ(α) ἐπάναγκεσ ἀποδώσ(ω) ἐν τῇ τρυ[γ]ῆ τοῦ Μεσ[ο]ρῆ μηνὸσ οἴνου ῥύσεωσ τῆσ α ἰνδ(ικτίονοσ) καρπῶν β ἐπινεμήσεωσ ἀνυπερ(θέτωσ): ἀναδέχομαι δὲ τὴν τοῦ οἴνου καλ(λ)ογήν καὶ παραμονήν μέχρι ὄλου τοῦ Τῦβι μηνὸσ καὶ εἴγε εὐρεθείη ἐν αὐτῷ ὄ(ξ)η ἤγουν φαῦλα ἐμέ ταῦτα ἀλλάξ[αι] καὶ τὰ (ῥ)σα σοι παρασχ(εῖν) ἐν πρωτείῳ οἴνω κινδ(ύνω) τῶν ἐμοὶ ὑπαρ(χόντων) ὑποκ(ειμένων) εἰσ τοῦτο.

This wine, for which you shall supply the vessels, I will necessarily deliver at the *lênos*, in the form of unadulterated must, in the vintage of the month of Mesore, from the wine vintage of the first indiction, the crops of the second indiction, without delay; and I guarantee the goodness and durability of the wine up to and including the whole month of Tybi, and if there be found in it any sour or inferior wines I will replace them and supply you with the same amount in wine of the best quality, at the risk of my property,⁶¹ which is mortgaged (to you) for this. (tr. J. C. Shelton)

Also in the contracts of lease of a vineyard the wine was to be issued to the owner παρὰ ληνόν and jars were to be brought to the winery by the buyer. N. Kruit and K. A. Worp⁶² translate the relevant passage of one such lease (*P. Col.* X 280, ll. 13–14) from Oxyrhynchos (AD 269–277) as follows:

(The lessees) ἀποδότωσαν τῷ μεμισθωκότι τὸν μὲν [οἶνον ἀπὸ γλεύκουσ νέου ἀδόλου παρ]ὰ ληνὸν εἰσ ὃν [π]αρέξει ὁ μεμισθωκὼσ κενώματα μέτρῳ οἰνικῷ κοτυλῶν δεκαεννέα.

They shall return (or: deliver⁶³) the wine from new and unadulterated must at

⁶¹ Receipts confirming payment in advance often contained guarantee clauses. The producer declared that if he does not provide the purchased wine, the buyer has the right of execution on his property, and if the wine turns sour or spoils before a certain date it will be replaced.

⁶² N. KRUIT & K. A. WORP, 'Metrological notes on measures and containers of liquids in Graeco-Roman and Byzantine Egypt,' *APF* 45 (1999) pp. 96–127 esp. 101, l. 13–14. The document was interpreted in various ways – B. E. Nielsen in the original edition suggested that the maximum volume of the wine jars was specified, KRUIT and WOPR believe that the volume of 19 *kotylai* referred to the measure with which the wine was decanted, and according to Ph. MAYERSON ('A Note on *P. Col.* X 280.14: μεμισθωκὼσ κενώματα μέτρῳ οἰνικῷ κοτυλῶν δεκαεννέα', *ZPE* 132 [2000], pp. 255–256) 19 *kotylai* was the minimal volume of the supplied jars.

⁶³ According to the suggestion of MAYERSON, 'A Note on *P. Col.* X 280.14' (cit. n. 62), p. 255.

the vat for which the lessor will furnish empty wine jars, (measuring the wine to be returned [or: delivered]) by the wine measure of nineteen *kotylai*.

Documents from outside the Oxyrhynchite nome also specified that wine was to be issued at the winery, only a different formula was used. This practice was, therefore, not limited to the vicinity of Oxyrhynchos. For instance, both the lessee and the landowner were to provide jars for their share of the wine εἰς τὴν ληνόν in a lease of a vineyard from Philadelpheia, *P. Ryl.* IV 583, l. 54 (170 BC). The same applies for a sale of wine for future delivery from Herakleopolis (*P. Coll. Youtie* II 93, 6th cent. AD). The difference in the formula of this document and analogous texts from Oxyrhynchos comes down to the use of the phrase ἐπὶ ληνοῦ instead of παρὰ ληνόν. Also in *P. Athen.* 23, ll. 18–19 (AD 82, Theadelphia) wine is to be issued ἐπὶ ληνῶν ἄνευ πάσης ὑπερθέσεως καὶ εὐρησιολογίας.

In all the abovementioned documents the general idea of the phrases in question is that one had to come to the winery to receive the wine. The very common way of translating the phrase παρὰ ληνόν as ‘at the vat’ does not seem accurate. First of all, the translation of *lênos* as vat can be avoided altogether, since the well-attested meaning ‘winery’ is just as appropriate and this way ambiguity of reference can be avoided. Second, as it will be demonstrated below (see pp. 73–75) the purchased wine was not necessarily *in* a vat anymore when it was being picked up by the buyer. The term ‘vat’, therefore, may not be correct at all.

III.1. *Lênoi* specified by number – vats or wineries?

The group of documents that feature numbered *lênoi*⁶⁴ consists predominantly of 3rd-century orders for payment of wine originating from the

⁶⁴ *P. Cairo Zen.* IV 5966I (3rd cent. BC, Philadelpheia); *BGU* VII 155I (210–204 BC?, Philadelpheia); *BGU* VII 1544 (210–204 BC, Philadelpheia); *O. Bodl.* I 346 (2nd–1st cent. BC?, Thebes); *P. Oxy.* XIV 1672 (AD 37–40 Oxyrhynchos); *P. Flor.* III 388 = *SB* XXIV 15920 (1st–2nd cent. AD, Hermopolis); *P. Mert.* II 79 (2nd cent. AD, s. l.); *P. Oxy.* XIV 1673 (2nd cent. AD, Oxyrhynchos); *P. Laur.* IV 183 (2nd cent. AD, s. l.); *SB* XIV 12107 (3rd cent. AD, Oxyrhynchos); *P. Mich.* X 588 (3rd cent. AD, s. l.); *P. Köln* IV 198 (3rd cent. AD, s. l.); *P. Köln* III 163 (3rd cent. AD, s. l.); *P. Flor.* II 253, l. 6 (AD 257, Theadelphia); *SB* XX 1498I = *P. Flor.* II 246 (AD 258, Theadelphia); *P. Flor.* II 256*, l. 9 (AD 258, Theadelphia); *P. Lips. inv.* 12 (AD 258?, Theadelphia?); *P. Flor.* II 197, l. 8 (AD 258, Theadelphia); *P. Flor.* II 139, ll. 2, 8 (AD 264, Theadelphia); *P. Oxy.*

Fayum and the vicinity of Oxyrhynchos. Numbered *lênnoi* are also found in texts concerning vineyards – property sales, vintage accounts and reports on the state of the *lênnoi* before the harvest.

Up until recently, the majority of scholars agreed that a *lênos* with a number should be interpreted as a vat or vessel.⁶⁵ In my view, this interpretation and the belief that it was synonymous to *pithos* should be rejected. If the numbered *lênnoi* are interpreted as *pithoi*, their capacity would be quite limited. Meanwhile, according to *P. Oxy.* VII 1055 (Oxyrhynchos, AD 267), as many as 203 *keramia* were to be issued from the fourth *lênos*, and 100 *keramia* from the fifth *lênos*. Of interest in this context is also a set of documents written on 30 Pachon (25 May), AD 260 or 282, in Oxyrhynchos. They were found together and are the correspondence of an estate in which the main activity appears to have been wine-making. All the texts are instructions from Nemesianos to Severus (Seoueros) to give out wine, usually to various employees of the estate.⁶⁶ The wine, one- or two years old, was to be issued from the second *lênos* in the *ktêma* of Kollouthos and from the third and fourth *lênos* in the Western *ktêma*. In total, on that day Nemesianos ordered the issue of the following quantities of

VII 1055 (AD 267, Oxyrhynchos); *P. Oxy.* XLIX 3513, 3515, 3516, 3519, 3520, 3521 (AD 260 or 282, Oxyrhynchos); *SB* XIV 11295 (3rd–4th cent. AD, s. l.); *P. Col.* VIII 239 (4th cent. AD, Phna, Oxyrhynchites); *P. Iand.* IV 61 (4th cent. AD, s. l.); *SPP* X 255 (4th–8th cent. AD, Arsinoites).

⁶⁵ SCHNEBEL (*Landwirtschaft* [cit. n. 2], pp. 287–288), who had interpreted documents based on Roman sources, believed that such *lênnoi* were storage jars in which wine was kept, comparable to Roman *dolia*. He agreed with COMPARETTI, who translated *lênos* as ‘tinello,’ and criticised REINACH for interpreting the *lênos* in *P. Rein.* I 54, l. 15 as ‘pressoir,’ explaining that in his opinion on the 9th day of Phamenoth wine was no longer at the press but was fermenting in a storage jar. According to SCHNEBEL, pouring the wine into smaller vessels took place only if wine was to be placed at the ἡλιαστήριον, and the rest remained in the *lênos* (i. e. *dolium*-type basin) until it was removed for sale or consumption. KRUIT concluded that ‘fermentation vat has to be the translation of ληνός (ληνός usually being specified by a number) in the orders for payment of wine, since wine can only be delivered if it is fully fermented’ (KRUIT, ‘The Meaning and Function...’ [cit. n. 2], p. 269). Also RUFFING translates *lênos* as synonymous to *pithos* in contracts of sale and orders for payment in kind (RUFFING, *Weinbau* [cit. n. 2], pp. 116–118).

⁶⁶ STEPHENS, ‘Nine Orders’ (cit. n. 27), pp. 145–160: *P. Oxy.* XLIX 3513–3521 – in the commentary to *P. Oxy.* XLIX 3513, l. 4 the editor interprets *lênos* as a vat, following SCHNEBEL’s suggestion.

wine from the specified *lênoi*: 137 *keramia* of one-year-old wine from the second *lênos* in the *ktêma* of Kollouthos, 47 *keramia* of one-year-old wine from the third *lênos* in the Western *ktêma*, and 113 *keramia* from the fourth *lênos* in the same *ktêma*.

The above texts have one shortcoming from our point of view: they inform us only how much wine was given out from a particular *lênos* but say nothing about the total amount of wine that was kept there. However, some total values are to be found in a 4th-century vintage account from Phna in the Oxyrhynchites (*P. Col.* VIII 239). The first *lênos* contained 243 *keramia*, and the second – 167. These capacities are comparable to the ones found in the texts referred to before.

The above quantities require some calculation and a comparison with archaeological evidence. One *keramion* had the same capacity as one *dichôron*. One *dichôron* was equal to 2 *monochôra*.⁶⁷ Van Lith⁶⁸ estimates that one *monochôron* amounted to ca. 8.73 L. Therefore, one *keramion* was equal to 17.46 L. The largest calculable capacity of one *lênos* based on the above data, amounts to 4242.78 L in the first *lênos* after the vintage in the locality of Phna (243 ker. = 486 *monochôra*, 486 x 8.73 = 4242.78 L). In the Graeco-Roman world the largest *pithoi* understood as earthenware storage jars had a capacity of up to 65 amphorae, that is ca. 1520 L.⁶⁹ It is clear that in this case the wine could not have been stored in a *pithos*. The *lênos* had a significantly greater capacity than a *pithos*; therefore, the two terms cannot be treated as synonymous and the *lênos* should not be interpreted as a vessel.

It also needs to be added that, as Ruffing had correctly noted,⁷⁰ a *lênos* cannot be synonymous to *pithos* in the third century texts from Oxyrhynchos, since at that time there appear contracts of sale of a vineyard in

⁶⁷ R. M. FLEISCHER, *Measures and containers in Greek and Roman Egypt*. (M. A. Diss. NY 1956), p. 22; see also KEHOE, *Management and Investment* (cit. n. 27), p. 109, n. 116. The above figures correspond only to the situation in the Oxyrhynchos area – the *keramion* was not a fully standardised measure, for instance at Kellis, Dakhleh Oasis, a *keramion* equalled 18 *sextarii*, so 9.72 litres.

⁶⁸ S. VAN LITH, 'Aufstellung über den Ertrag einer Weinernte,' *Talanta* 8–9 (1977), p. 67.

⁶⁹ K. D. WHITE, *Farm Equipment in the Roman World*, Cambridge 1975, pp. 145–146.

⁷⁰ RUFFING, *Weinbau* (cit. n. 2), pp. 116–118.

which both terms appear side by side, and with *pithos* most probably denoting the collection vat (see below, section IV.3).

What remains to be dealt with is the interpretation of *lênos* as vat, meaning the plastered collection basin found next to the treading platforms. Indeed, a quantity that could not fit in a *pithos* could easily have fit into such a vat. The largest collection basin uncovered hitherto (in a winery near Abu Mina) had a capacity of 35 m³.⁷¹ Given that 1 m³ is equal to a thousand litres, this vat could contain up to 35,000 L of must. Naturally, there were other, much smaller vats, and the standard size of the uncovered basins is ca. 8 m³, giving a maximum of 8,000 L of wine per vat.⁷² It appears theoretically possible, at first, that it was this kind of vat that was mentioned in the papyri as a numbered *lênos* from which the wine was issued. In that case, as Grossmann suggested,⁷³ the wine would be closed off tightly with a wooden lid. However, it would then be difficult to imagine the situation in Oxyrhynchos, where the wine issued from the fourth *lênos* in the Western *ktêma* was two years old. The vat called the fourth *lênos* would then have to be taken out of service for one vintage, since it was already filled with wine. This does not seem plausible. Moreover, as Rathbone has noted, at the time of the vintage the estate managers brought in thousands of jars, both used and newly ordered from the potter (*P. Fay.* 133; *P. Flor.* II 175, ll. 26–32). Also *SB* XIV 12054 leaves no doubt that after treading and pressing the must was poured into vessels of various sizes. Based on a wide variety of sources, Brun⁷⁴ came to the logical conclusion that first phase of fermentation took place in the collecting vat, and then the new wine was poured into smaller jars. In short, when the wine was distributed, it was no longer in the vat, so the term *lênos* cannot be interpreted as such in documents talking about the issuance of wine from a numbered *lênos*.

⁷¹ GROSSMANN, ARNOLD & KOŚCIUK, 'Excavations at Abu Mina' (cit. n. 16), p. 87 n. 9.

⁷² Collection basins in wineries at Theadelphia, Karm el-Shewelhy, Abu Mena behind the portico and in 'Kumring A,' Taher el-Masry, and Marea.

⁷³ GROSSMANN, 'Report 2001' (cit. n. 19), p. 27.

⁷⁴ J.-P. BRUN, *Le vin et l'huile dans la Méditerranée antique. Viticulture, oléiculture et procédés de transformation*, Paris 2003, p. 69.

It was only in the year 2000 that another interpretation was proposed by Mayerson,⁷⁵ according to whom the numbered *lênnoi* are not vats or *pitboi* of fermenting must, but whole wine-making units, distinguished by number from other wineries belonging to the same estate.

Indeed, as Mayerson correctly noted, all documents in which *lênnoi* are identified by number come from large estates. As can be seen from the documents cited above, it is often specified in which of the estate *ktêmata* the particular *lênos* is found. Within the Appianos estate there were at least ten numbered *lênnoi* in no less than 14 *ktêmata* (*P. Flor.* II 139, ll. 2, 8). In the Apollonios estate there were at least nine (*P. Cairo Zen.* IV 59661). *P. Köln* III 163 mentions 12 *lênnoi*, which are said to have been inspected in the month of Epeiph.

What further seems to confirm Mayerson's theory is that even though the wine was no longer in the vat at the time of distribution, it did not have to leave the wine-making complex once poured into jars. Some of the excavated wineries were equipped with additional rooms located in the vicinity of the wine-pressing installations. They could have been storage rooms in which the wine matured before it was sold or given out to workers. Such rooms could have been perceived as an integral part of the winery and they easily fit under the broad meaning of the term *lênos*. That wine was kept in storerooms is also confirmed by *SB* VI 9406 (= *P. Prag Vårdl* II 9), ll. 206–218,⁷⁶ a fragment of a document from the Heroninos archive (Theadelphia, February 247), which records the results of an inspection carried out by an estate administrator in a storage room containing 50 *monochôra* of wine. Another text, for more on which see below, is *P. Oxy.* XIV 1673, which mentions various activities performed in the storage facilities of a winery (see below, p. 76).

It is therefore possible that, as in the documents concerning the construction of a *lênos*, the numbered *lênnoi* also should be interpreted as whole wineries, buildings containing, among other components, a treading platform, a vat, and storage rooms. In addition, the numbered *lênnoi* should be understood as separate press units in different *ktêmata* of an estate.

⁷⁵ MAYERSON, 'The Meaning and Function of *ληνός*' (cit. n. 2), p. 165.

⁷⁶ For a thorough discussion see RATHBONE, *Economic Rationalism* (cit. n. 27), pp. 258–259.

IV. ELEMENTS OF A WINERY

IV.1. *Treading platform*

One of the meanings supplied by dictionaries for the term *lénos* is ‘treading platform’ (*LSJ s. v.*; see p. 27). Aside from the Greek term, the Demotic word for this structure is also known thanks to P. dem. Gieben 2 (Sebennytos, 107–30 BC). Since this is a relevant text which I refer to several times, it is worth a closer look. It contains a contract in Demotic, listing the elements of the winery, and an official note in Greek, recording the object of the contract. Philotera, daughter of Eirene (or Helene) and Diodoros, sells a fourth part of a winery with appurtenances. The structures listed as immovable property belonging to the vineyard were as follows: *h3ly3stryn*, *pr-hd.w*, *wrh.w*, *ym(.w)* and *qd.w r hm*. Owing to the fact that the contract has a formula similar to the Greek texts of the same genre, the editors, Katelijn Vandorpe and Willy Clarysse, were able to assign Greek equivalents to the Demotic terms:⁷⁷

h3ly3stryn = ἡλιαστήριον (see below, section IV.5);

pr-hd.w (storage rooms) = θησαυροί (see below, sections IV.4 & IV.6);

wrh.w (building plots) = οἰκόπεδα;

ym(.w) (basins) = πίθοι (see below, section IV.3);

qd.w r hm (?) (constructions for treading) = ληνοί.

The Demotic term which corresponds to the Greek *lénoi* in this text is, therefore, *qd.w r hm*, which was literally translated by the editors as ‘constructions for treading’. But another Demotic text, a gardening agreement on an ostrakon from Medinet Habu⁷⁸ (col. D, l. 15) mentions a different word which appears to be a parallel of the Greek *ληνός* – *hrwʃ*, attested there for the first time in Demotic, but well attested in Coptic as *ϣρωτ*.⁷⁹

⁷⁷ K. VANDORPE & W. CLARYSSE, ‘A Greek Winery for Sale in a Fayum Demotic Papyrus,’ [in:] A. M. F. W. VERHOOGT & S. P. VLEEMING (eds.), *Two Faces of Graeco-Roman Egypt. Greek and Demotic and Greek-Demotic Texts and Studies Presented to P. W. Pestman*, Leiden – Boston – Köln 1998, pp. 127–139.

⁷⁸ R. A. PARKER, ‘A Late Demotic Gardening Agreement: Medinet Habu Ostrakon 4038,’ *JEA* 26 (1940), comm. p. 108.

⁷⁹ CRUM, *Dict.* 704, *s. v.*, defines the term as ‘wine-press, vat,’ which corresponds to the dictionary definitions of *lénos*.

Information on the treading platform and the process of crushing grapes is provided by abundant and varied sources. The platform itself is well known predominantly thanks to archaeological finds (see above, figs. 6 and 9–10), iconography, and supplementary data in the form of depictions from the Pharaonic period. The activities performed on the treading platform may, in turn, be learned from documentary evidence, which also provides information on the workers employed at the vintage. As a result, a very clear and detailed picture of the work of treading can be obtained.

During the vintage, baskets of grapes were transported, usually by donkeys and camels, to the winery from one or more vineyards.⁸⁰ The extant walls of several known wineries have openings through which the fruit was tossed directly onto the treading platform, where the crushing took place. The winery at Karm el-Baraasi⁸¹ has such an opening in the southern wall. In Abu Mina the winery behind the portico⁸² also had a large window in the southern wall, with a ramp to facilitate access from the outside.

Treading platforms varied in size. Their dimensions ranged from 4 m² (Abu Mina, 'Kumring A') to nearly 53 m² (Karm el-Baraasi, the rectangular platform).⁸³ The surface of the platform was covered with several lay-

⁸⁰ *SB* XIV 12054, ll. 30, 53, 80, 107, an account of a part of a vintage which took place in Theadelphia on 4 to 11 August AD 253, and *SB* XVI 12380 ll. 47–49, 53 (Theadelphia, AD 249–268), a fragment of a similar document, perhaps concerning the same vintage. At the same time empty jars (*κοῦφα*) were brought into the winery.

⁸¹ ABD EL-AZIZ NEGM, 'Recent excavations around Abou Mina' (cit. n. 20), p. 66.

⁸² GROSSMANN, ARNOLD & KOŚCIUK, 'Excavations at Abu Mina' (cit. n. 16), p. 87.

⁸³ The size of the platforms in Abu Mina, 'Kumring A' based on the plan (MÜLLER-WIENER & GROSSMANN, 'Abu Mina 6' [cit. n. 18], pp. 468–473) Measurements in Karm el-Baraasi taken from extant remains in the field. Other treading platforms: Karm el-Shewelhy (own measurements): 7 m², Taher el-Masry (own measurements): 14 m², Marea (based on plan, FAKHARANI, 'Recent Excavations at Marea' [cit. n. 11], p. 183 and fig. 4): 16 m², Abu Qir (BRECCIA, *Le rovine* [cit. n. 6], pp. 48–49): 18.85 m², Theadelphia (LEFEBVRE, 'Égypte Graeco-Romaine' [cit. n. 24], pp. 168–170): 20 m², winery near Burg el-Arab (own measurements): ca. 25 m². In Isbet Mohamed Farid (GROSSMANN, 'Report 2001' [cit. n. 19], p. 25 fig. 5) the older platform measured nearly 14 m² and the newer one – 25 m². In Abu Mina by the portico the two largest platforms, built in phase I and III, measured 36 m² and 27.5 m², respectively (based on plan in GROSSMANN, ARNOLD & KOŚCIUK, 'Excavations at Abu Mina' [cit. n. 16], p. 88).

ers of waterproof plaster. The floor sloped gently so that the juice could flow down to a channel leading to the vat. At Karm Gadoura⁸⁴ there were two separate platforms, each with its own vat, permitting the production of two different types of wine. The treading platform near Burg el-Arab⁸⁵ was surrounded by benches on which the treaders could rest. At Abu Talaat⁸⁶ there were two interconnected platforms, a main one and a side one. The sloping floor of the side vat directed the flow of the must towards the channel connecting it to the main platform, and from there all the must flowed directly into the collection vat. Several platforms had closed off spaces where the mechanical press was installed (see above, fig. 2 and below, p. 52).

According to archaeological and iconographic evidence, similar structures were built in Egypt already in Pharaonic times. In the Old Kingdom the treading vat was depicted as an ankle-deep tub,⁸⁷ while during the New Kingdom it was a raised platform, sometimes accessible by a flight of steps.⁸⁸ Next to it was an earthenware jar or rock-cut vat in which the juice was collected. One might expect to find installations that would correspond to the iconography. Indeed, Manfred Bietak uncovered a stone basin with a channel in the south-western corner of the *temenos* of the temple of Seth built by Horemheb in Tell el-Dabaa.⁸⁹ Bietak main-

⁸⁴ ABD EL-AZIZ NEGM, 'Recent excavations around Abou Mina' (cit. n. 20), p. 70.

⁸⁵ ASHMAWI, 'Pottery kiln and wine-factory' (cit. n. 8), p. 62.

⁸⁶ RODZIEWICZ, 'Classification of wineries' (cit. n. 4), p. 31.

⁸⁷ The tomb of Ptahhetep (5th dyn., Saqqara): N. DE GARIS DAVIES, *The Mastaba of Ptahhetep and Akbethetep at Sakkara*, London 1900, pl. XXI; the tomb of Mereruka (6th dyn., Saqqara): P. DUELL, *The Mastaba of Mereruka*, vol. 2, Chicago 1938, pl. CXIV and CXVI; the tomb of Nefer (5th dyn., Saqqara): A. M. MOUSSA & H. ALTENMÜLLER, *The Tomb of Nefer and Ka-Hay*, Mainz am Rhein 1971, p. 24, pl. 8, 9, 12.

⁸⁸ The tomb of Antef (18th dyn., Thebes): T. SÄVE-SODERBERGH, *Four eighteenth Dynasty Tombs. Private Tombs at Thebes*, vol. 1, Oxford 1957, p. 11–21; the tomb of Nakht (18th dyn., Thebes): N. DE GARIS DAVIES, *The tomb of Nakht at Thebes*, New York 1917, pl. XXII–XXVI; The tomb of Paheri (18th dyn., el-Kab): J. J. TYLOR & F. L. GRIFFITH, *The tomb of Paheri at el-Kab*, London 1894, p. 17, pl. IV.

⁸⁹ Tell el-Dabaa: M. BIETAK, 'Ein altägyptischer Weingarten in einem Tempelbezirk (Tell el-Dabaa 1. März bis 10. Jun 1985),' *Anzeiger der philosophisch-historischen Klasse der Österreichischen Akademie der Wissenschaften*, 122, pp. 267–278; Commentary: LESKO, 'Egyptian Wine Production' (cit. n. 11), pp. 215–229, esp. p. 228.

tains that the temple court was planted with grapevines and the tub in the corner of the *temenos* wall was a treading platform. It is rather shallow and small, slightly over 1 m in length and 0.5 m in width, equipped with a channel with two spouts, so that two vessels could be filled at a time.

Much can be said about the treading of grapes that took place on the platform. Throughout antiquity, regardless of the period and region, treading ripe grapes was the fundamental way of obtaining must. Egypt was no exception. Treading with bare feet is the best method of pressing grapes. The human foot, as opposed to mechanical presses, does not crush stems and seeds, which contain unwanted substances, such as tannins and pigments.⁹⁰ According to *Geoponika* (VI 11), the fruit should be crushed as soon as it is brought into the winery. Next, the obtained pulp should be drained, so that the juice could flow off the platform, and then the pulp should be trodden again. The only depiction of grape treading from the Graeco-Roman period – not less important for its uniqueness – is a relief representation in the *pronaos* of the tomb of Petosiris in Tuna el-Gebel, Middle Egypt.⁹¹ On the one hand, it is a very interesting source, as the information on wine production in the Ptolemaic period is scant, but on the other hand one should be cautious when comparing this illustration with the Roman and Byzantine presses brought to light. The decoration of the tomb, despite evident Hellenistic influence, preserves conventional traits known from depictions dated to the New Kingdom. The wall of the tomb is decorated with vintage scenes. First, there are men in Hellenic clothing, some bearded, harvesting grapes. Next, the grapes are transported in baskets to a raised treading platform, accessed by a flight of five steps, similar to those depicted during the New Kingdom. The massive superstructure of the platform consists of two (or rather four) pillars supporting one (or two) horizontal bars. Four nude treaders hold on to the bars above their heads. Similar depictions of men treading grapes are found on walls of tombs dating back to the Pharaonic period

⁹⁰ A. LUCAS, *Ancient Egyptian Materials and Industries*, London 1962 (4), p. 17. For more on mechanical presses see below, section IV.2.

⁹¹ G. LEFEBVRE, *Le tombeau de Petosiris*, Le Caire 1924, pp. 59–63. The dating of this depiction, and of the whole tomb, is quite early, the very beginning of the Ptolemaic period, as Petosiris was appointed the priest of Thoth at the time of Alexander's conquest of Egypt.

(see above, notes 87–88). The treaders were depicted crushing the grapes with their bare feet in a shallow tub and holding on to a line, horizontal bar, or ropes attached above their heads on a wooden frame. The workers were also shown forming a queue, holding one another by the hips, the first and the last of the line leaning on a pole stuck into the ground outside the platform. The treaders walked round to the rhythm of music and clapping.

Geoponika (VI 11) supply important instructions concerning rules of personal hygiene that were to be followed while treading grapes. The treaders should thoroughly wash their feet before starting work. They should be dressed, as they sweat heavily while treading. They should not eat or drink, nor should they leave the platform. If it was necessary to do so, they were not to walk barefoot outside the platform.

More detailed information concerning the treading platform and workers employed for treading grapes can be found in Ptolemaic and Roman papyri – vintage accounts, contracts and reports. One document mentions the building of a treading platform. *P. Gron.* 13 is a memorandum from the 5th–6th cent. AD (provenance unknown), regarding building material for a *ληνός*, a *κρήνη*, and a *μηχανή*. To build a new *lênos* 1150 bricks and three stone slabs were needed. This is a very small amount of material for construction of a whole building, so the narrow definition of *lênos* should be understood in this case.

In documents the workers hired in the winery are called *πατηταί* or *ληνοβάται*. Usually they are mentioned in connection with their wages, paid in cash or in kind. *SB* XIV 12054 is an account of a vintage that took place in AD 253 in 14 out of 20 *ktêmata* of the Appianos estate. This document, which is part of the Heroninos archive, registers the pressing of over 1600 *monochôra* of wine (ca. 112 hL) from the 4th to 11th of August, AD 253 in Theadelphia.⁹² This document contains information about the issuing of wages in kind for work at the vineyard during the vintage. For instance, one of the noteworthy fragments (ll. 101–102) reads as follows: *πατηταῖς ἐπὶ ληνῶν μο(νό)χωρον) α καὶ ὑπ(έρ) μισθοῦ μο(νό)χω(ρα) δ.*

⁹² This is not a register of the whole vintage of that year; the total production of the mentioned vineyards was probably not recorded, but this has no influence on the data of interest to us at this point.

Mentioned in the text are payments to *πατηται ἐπὶ ληνῶν* (ll. 26, 50, 64, 101) and *ὑπὲρ μισθοῦ* (ll. 10, 27, 51, 65, 102). The payment *ἐπὶ ληνῶν* always amounts to one *monochôron*, whilst paid *ὑπὲρ μισθοῦ* were two or four *monochôra*.

According to Rathbone,⁹³ *patêtai* were given *ἐπὶ ληνῶν*, that is at the winery, one *monochôron* of must for immediate consumption, while *ὑπὲρ μισθοῦ*, as payment, they received two or four *monochôra*. Therefore, contrary to the advice of *Geoponika* (VI 11) for the *patêtai* not to eat and drink at work, they received a bonus during the vintage, in the form of a jar of fresh must, which they could drink on the spot or keep for fermentation. Another document from the Heroninos archive is of a similar nature and confirms Rathbone's explanation of the abovementioned phrase *πατηται ἐπὶ ληνῶν*. In *SB XVI 12380*, l. 7 (3rd cent. AD, Theadelphia), *patêtai* receive six *monochôra* as payment and one *monochôron* to drink at the winery:⁹⁴ *πατηταις 5 πόσιμον ἐπὶ ληνῶν* α [[S]].

Two leases of vineyards mention the cost of wine drunk during treading, *P. Soter*. 1, l. 17 (AD 69) and *P. Soter*. 2, l. 14 (AD 71), both from Theadelphia. The key fragment of *P. Soter*. 2 (ll. 9–15) reads:

ἢ μ[ίσ]θωσις [ἡ]δε εἰς ἔτη τρία ἀπὸ τοῦ εἰσιόντος τετάρτου ἔτο[υ]ς ἐπὶ τρίτῳ μέρει τῶι μεμισθωμένῳ τῶν ἐκ τοῦ ἀμπελῶν(ος) ἐγβησομένων κατ' ἔτος καρπῶν καὶ γενημάτων καθαρῶι ἀπὸ δημοσίων καὶ παντὸς εἶδους ἀνταναιρουμένης ἐκ κοινῶν τῆς τε οἰνικῆς δαπάνης πάσης καὶ τοῦ ποθησομένου ἐπὶ ληνῶν οἴνου.

...this lease for three years from the current fourth year, for a third part of the fruit produced in the vineyard each year and vintage, free from expenditures and all dues deductible from the common wine and all the expenditures in wine and whatever was drunk at the winery.

The costs of wine consumed by workers at the winery (*ἐπὶ ληνῶν*) and other expenses were to be covered jointly by the owner and the lessee before the division of profits.⁹⁵

⁹³ RATHBONE, *Economic Rationalism* (cit. n. 27), p. 253.

⁹⁴ Translation in P. J. SIJPESTEIJN, 'Neue Heroneinospapyri. Mit Bemerkungen zum Archiv,' *CĒ 55* (1980), p. 180 – l. 7: 'an die Kelterer 6 Monochora, 1 trinkbares Monochoron bei den Bottichen'.

⁹⁵ MAYERSON, 'The Meaning and Function of *ληνός*' (cit. n. 2), p. 164.

Not only *patêtai* were hired at the winery during the vintage. Another document, *P. Ryl.* IV 583 (170 BC, Philadelphia, *patêtai* referred to in ll. 7 and 50) mentions ἀφαιρεθείσης τῆς καθη(κ)ούσης ἀπομοίρας εἰς τὸ βασιλικὸν καὶ πατηταῖς καὶ μισθοῦ ληνο[ῦ]: ‘deductions made for the apomoira due to the Treasury, wages for the treaders, hire of winepressers...’ (tr. R. Bagnall, P. Derow)⁹⁶

According to the interpretation of Roberts and Turner, who published the text, *patêtai* and the workers Bagnall and Derow called winepressers are two different groups.

It is evident from *SB* XIV 12107 (P. Mich. inv. 347 verso) that payments in kind for the workers were sometimes a heavy burden for the vineyard owner. It is a 3rd-century letter containing a report on the vintage. In lines 19–26 the supervisor of the vintage gives the total quantity of wine produced from two *lênoi*. He explains that the wages are so high because the harvest came at the same time everywhere and it is difficult to find workers.

The payment was to be issued in cash, according to other documents mentioning the wages of *patêtai* during the vintage – *BGU* IV 1039, l. 4 (AD 323–642, *s.l.*), *P. Lond.* II 163 (p. 182, Karanis, AD 88, the issue of pay for treading – πάτησις), *SB* XVI 12732 (2nd–3rd cent. AD) and *P. Iand.* VIII 149 (2nd cent. AD), as well as *SB* XIV 11960 (Oxyrhynchites, 2nd cent. AD) and *P. Oxy.* XIV 1340 (therefrom, 1st cent. AD). Also *lênobatai* in *P. Mil. Vogl.* III 152, l. 50 (AD 166/167, Tebtynis) were to receive cash.

Another text mentioning *lênobatai* supplies an interesting detail. This contract (*CPR* XVIIA 19, ll. 8–21), dating from AD 321, reads as follows:

ὁμολο[γ]ῶ [σ]υντεθεισ[θαι κ]αὶ συμπεπεισθαι πρὸς σέ τὸν γεούχον ὥστε με ἀπαντήσειν πρ[ὸς] κῶμηνριν καὶ τρύγας τῶν ὄντων [ἐκεῖ ἀμπελ]ικῶν χωριῶν μ[ε]τὰ τῶν συν[τ]ετα[γμ]ένων ληνοβατῶν καὶ ἀμέμπτως ὑπηρ[ετή]σασθαι τοῖς ληνοβάταις καὶ τοῖς ἄλλοις ἐν τῇ ἀλλήσει καὶ μὴ ἀπολειφθῆναι τῶν ληνοβατῶν μέχρι λήξεως αὐτῆς τῆς τρύγης (...)

I acknowledge that I have contracted and agreed with you the landlord to present myself at the village of ... at the vintage of the vineyards which are there along with the appointed grape-treaders and without fault assist the grape-

⁹⁶ *The Hellenistic Period* (cit. n. 55), pp. 179–180.

treaders and the other workers by my flute-playing and not leave the grape-treaders until the completion of the vintage...⁹⁷

The above text is well illustrated by a relief from the Pharaonic period. On the wall of the tomb of Mereruka depicted are two musicians sitting in a circle and playing for the workers on instruments made of three pieces of wood.⁹⁸

In the Appianos estate the work of drivers and treaders was supervised by *karponai*, overseers in charge of particular wineries, who organised the work power for the vintage and activity at the winery. *SB* XIV 12054, mentioned above, gives the amount of grapes collected and the quantity of wine produced in each *ktêma* and payments in kind for the workers. Kehoe concludes from this text⁹⁹ that *karponai* who organised the vintage work received a third part of the must as payment for their services.

IV.1.1. The colour of the wine

Treading of grapes was the phase of wine production during which the colour of the wine was determined. Grape juice itself is always colourless, regardless of the colour of skins, but the colour of the wine depends on whether during fermentation the skins are left in the must or not. It is the alcohol, the product of fermentation, that releases pigment from the skins, and at high Egyptian temperatures this process must have started immediately after the grapes were crushed. It seems rather improbable that the skins were separated before this process began. Therefore, wine obtained from dark-coloured grapes must have been pinkish or red as well. The only white wine that can be fermented without separating the skins is the one made from naturally green or yellowish grapes, the skins of which completely lack pigment.¹⁰⁰ Our sources provide evidence for the cultivation of both red and white varieties, and for the existence of red as well as white wine in the Greek and Roman periods.

⁹⁷ Translated by A. S. HUNT and C. C. EDGAR in *Sel. Pap.* 1 22 (pp. 64–66).

⁹⁸ DUELL, *Mereruka* (cit. n. 87), pl. CXIV and CXVI.

⁹⁹ KEHOE, *Management and Investment* (cit. n. 27), pp. 113–117.

¹⁰⁰ BRUN, *Le vin* (cit. n. 74), pp. 51–52.

Red wine is attested already in the Pharaonic period. On the tomb paintings from this time both the wine and the juice flowing from the bag press are dark-coloured. Darby, however, points out that the use of colours was often influenced by convention and the availability of pigments, so the depictions need not be realistic.¹⁰¹ The Egyptian term *irp dšr*, or red wine, appears in texts, but *dšr* also had other meanings.¹⁰² Notably, there seem to be no attestations of white grapes or white wine in this period.

Red wine is also present in iconographic sources from the Graeco-Roman period. Two Fayum portraits depict men holding glasses filled with a reddish liquid.¹⁰³ There are no such representations of white wine (perhaps unpopular in iconography, as it would be more difficult to identify the drink portrayed as wine if it were not painted red), but its existence is attested in literary sources. The first evidence for white Egyptian wine is found in Athenaeus' *Deipnosophistai* (VII 33 D-E). This author reports that wine from the Mareotis area is white, and the wine from the Taenia has a greenish tint. Tchernia concludes on the basis of literary evidence that the best Italian wines were white and white grapes were preferred for cultivation.¹⁰⁴ According to Rathbone,¹⁰⁵ the documentary evidence from the Heroninos archive suggests that Appianos wished to produce a local alternative to the imported white wine. The Appianos estate produced white wine in Theadelphia, as can be inferred from *P.Flor.* II 148 recto. The document mentions the cultivation of white grapes. Rathbone concludes

¹⁰¹ W. J. DARBY, P. GHALIOUNGUI & L. GRIVETTI, *Food: The Gift of Osiris* II, London – New York – San Francisco 1977, pp. 556–557.

¹⁰² A. ERMAN & H. GRAPOW, *Wörterbuch der ägyptischen Sprache*, vol. V, Berlin 1971, pp. 487–489.

¹⁰³ A portrait of a man from the 2nd quarter of the 3rd cent. AD, provenance unknown, the J. Paul Getty Museum Inv. 79 AP 142; a portrait of a certain Ammonios, ca. AD 193–235, Antinoopolis, Louvre, Département des antiquités égyptiennes E 12581 (P 215), E. DOXIADIS, *The Mysterious Fayum Portraits. Faces from Ancient Egypt*, London 1995, pp. 214, 221 and figs. 7, 89.

¹⁰⁴ A. TCHERNIA, 'La vinification des Romains,' [in:] *Le vin des historiens. Actes du 1^{er} Symposium Vin et Histoire, 19, 20 et 21 mai 1989, sous la Direction Scientifique de Gilbert Garrier*, Suze-la-Rousse 1990, p. 65.

¹⁰⁵ RATHBONE, *Economic Rationalism* (cit. n. 27), p. 255.

from this text that there was a variety of vines in the estate, but the aim was to limit the new plantings to the Theban and white types. He adds that the instruction of Alypius in *P. Fay.* 133 to delay the vintage to make the wine better is characteristic for white grape growing.

IV.2. Mechanical presses

IV.2.1. Bag presses

There were several types of mechanical presses used in the ancient world.¹⁰⁶ The use of such devices in Egypt is attested since at least the third millennium BC. The method originally employed in the Nile valley constituted wringing out a bag filled with grape pulp. This type of press was typical for Egypt and it remained in use throughout antiquity, including the Graeco-Roman period.¹⁰⁷ The majority of sources for this press date from the Pharaonic period, but they are of some use for the Graeco-Roman period as well. The same method, with minor innovations, was used from the 1st dynasty to the Ramessides, and textile bags used for squeezing out must were observed in Egypt in the 19th century by scholars travelling with Napoleon.¹⁰⁸ One might expect, therefore, that some form of bag press was also in use during the Graeco-Roman period.

¹⁰⁶ WHITE, *Farm Equipment* (cit. n. 69), pp. 229–233; IDEM, *Greek and Roman Technology*, London 1984, pp. 67–71; A. G. DRACHMANN, *Ancient Oil Mills and Presses*, Copenhagen 1932, *passim*. The wedge press is known only from wall paintings in Pompeii and Herculaneum. The beam press is much better attested and it was more widely used. The oldest depiction is found on a skyphos, 6th cent. BC, now in the Boston Museum of Fine Arts, see photograph in: A. TCHERNIA & J.-P. BRUN, *Le vin romain antique*, Grenoble 1996, p. 71, fig. 84. The beam press was mentioned by Hero of Alexandria (*Mech.* III 2.13–15), Cato (*De agric.* 18 and 19), Vitruvius (*De archit.* VI 6.3), and Pliny the Elder (*NH* XVIII 317). This type of press was used in Egypt in the 18th and 19th century (Niebuhr recalls seeing one in 1772: C. NIEBUHR, *Reisebeschreibung nach Arabien und andern umliegenden Laendern*, vol. I, Copenhagen 1774, p. 151, tab. XVII, and a drawing of a beam press is found in *Description de l'Égypte*, p. 686 [vol. II, pl. XI fig. 1], a collection of drawings published in Köln in 1994), but there are no attestations of it in Egyptian antiquity.

¹⁰⁷ GROSSMANN, ARNOLD & KOŚCIUK, 'Excavations at Abu Mina' (cit. n. 16), pp. 88–89, see BRUN, *Le vin* (cit. n. 74), p. 59.

¹⁰⁸ M. P. S. GIRARD, 'Memoire sur l'agriculture, l'industrie et le commerce de l'Égypte,' [in:] *Description de l'Égypte, État Moderne* II, Paris 1813, p. 608.

The hieroglyphic sign in the form of a bag press, used as a determinative of the word 'wine', serves as evidence for the existence of this device of as early as the 1st dynasty (3050/2960–2860/2780 BC).¹⁰⁹ In the Old Kingdom it was used in the name of *Šsm.w*, the god of wine, oil presses and wine cellars.¹¹⁰ However, our main sources of information on the bag press in the Pharaonic period are vintage scenes depicted in tombs.

Crushed fruit was placed in a long sack. Poles were attached to both ends of the sack and turned in opposite directions, wringing out the contents. Depictions from the Old Kingdom¹¹¹ show five men operating the press – two were needed for turning each pole and one was in charge of pushing the poles away from each other, so that the sack was properly stretched. The Middle Kingdom brought innovation¹¹² – the sack was fixed to a wooden frame at one end and only the pole at the other end needed to be turned. This greatly facilitated the use of the press and decreased the number of workers needed to operate it. Another variation of the bag press is depicted in the temple of Seti I in Abydos.¹¹³ Not one, but two bags were fixed to the frame crosswise, so that when poles on both ends were turned, the sacks wound around one another.

Lutz noticed¹¹⁴ that there are no depictions of mechanical presses in vintage scenes in Theban tombs and in those found further south. The grapes are crushed only by treading.

The bag press was not mentioned by any of the classical authors. The only interesting passage is found in *Mechanika*, the work of Hero of Alexandria,¹¹⁵ who supplies detailed descriptions of a beam press and

¹⁰⁹ Dating according to J. VON BECKERATH, 'Chronologie,' *LA* I, coll. 967–971.

¹¹⁰ ERMAN & GRAPOW, *Wörterbuch* (cit. n. 102), vol. IV, p. 537.

¹¹¹ Mereruka (Saqqara, 6th dyn.): DUELL, *Mereruka* (cit. n. 87), and Nefer (Saqqara): MOUSSA & ALTENMÜLLER, *Nefer and Ka-Hay* (cit. n. 87).

¹¹² Baqt III (Beni Hassan no. 15, 11th dyn.): T. G. H. JAMES, 'The Earliest History of Wine in Ancient Egypt,' [in:] P. E. MCGOVERN, S. J. FLEMING & S. H. KATZ (eds.), *The Origins and Ancient History of Wine, The University of Pennsylvania Museum of Archaeology and Anthropology* 1996, p. 212; Antef (Thebes, 18th dyn.): SÄVE-SODERBERGH, *Four Eighteenth Dynasty Tombs* (cit. n. 88), pl. 15.

¹¹³ R. BILLIARD, *La vigne dans l'antiquité*, Lyon 1997 (2), p. 444.

¹¹⁴ H. F. LUTZ, *Viticulture and Brewing in the Ancient Orient*, Leipzig 1922, p. 56.

¹¹⁵ The third book of Hero's *Mechanika* is preserved only in an 11th-cent. Arabic trans-

a screw press (see below). Hero remarks (*Mech.* II 20) that there are also other types of presses, but they are not worth describing, as they are commonly used and the way they are built is widely known. However, Hero adds, they are less efficient than those he describes. Perhaps what Hero had in mind were bag presses, devices widely used in Egypt, but rather primitively built. These are mere speculations, however.

According to Brun,¹¹⁶ the bag press survived until the Graeco-Roman period only among small-time producers, but Grossmann maintains that there are remains of a bag press in the winery behind the portico at Abu Mina.¹¹⁷ According to Grossmann, the bag hung vertically and it was fixed to the floor and to the ceiling. The must flowed down to a channel and farther to two vats. However, it is difficult to understand on what basis Grossmann concluded that the extant remains belonged to a bag press, especially that on the known depictions the bag is never fixed vertically.

There is no documentary evidence for a bag press. There is only one intriguing text – *P. Oxy.* XLVII 3354. It is an agricultural agreement presumably from an Oxyrhynchite estate, dating from AD 257. The workers declare (ll. 15–16): *καὶ ποιησόμεθα τῆς ληνοῦ καὶ θυείου τὰ ἐνχρήζοντα χαλάτρια* ('...and we will make the necessary matting for the winery and the oil press.')

According to Shelton, the editor of the document, *χαλάτρια* were mats used in the bag press. He adds, however, that they are not attested in any other document. Naturally, mats could have had many purposes in a winery and one ought to be cautious in order to avoid misinterpretation. However, the editor's suggestion is interesting and it should be taken into consideration, especially because remains of mats covered with grape pulp were found in the winery in Theadelphia.¹¹⁸

lation. First edition based on one manuscript: *Heron d'Alexandrie, Les Mécaniques ou l'éleveur des corps lourds. Texte arabe de Qusta Ibn Luqa*, B. CARRA DE VAUX (tr.), Paris 1988 (Reprint from *Journal Asiatique* 9, 1893), pp. 199–214. Second edition, based on three manuscripts, was published as part of the Teubner series: L. NIX, W. SCHMIDT, *Heronis Alexandrini opera quae supersunt omnia*, vol. II: *Mechanica et Catoptrica*, Lipsiae 1900, Commentary: A. G. DRACHMANN, *The Mechanical Technology of Greek and Roman Antiquity*, Copenhagen 1963.

¹¹⁶ BRUN, *Le vin* (cit. n. 74), p. 59.

¹¹⁷ GROSSMANN, ARNOLD & KOŚCIUK, 'Excavations at Abu Mina' (cit. n. 16), pp. 88–89.

¹¹⁸ LEFEBVRE, 'Égypte Graeco-Romaine' (cit. n. 24), pp. 168–170.

IV.2.2. Screw presses

The invention of the screw press, a device which exerted direct pressure on the fruit pulp, was a significant innovation in wine-making. The screw press is well known thanks to literary sources. Its emergence is mentioned in a passage by Pliny the Elder (*NH* XVIII 317) which indicates that it came into use in the mid-1st century AD.¹¹⁹ Hero of Alexandria gives detailed descriptions of two kinds of this press – a double-screw press and a single-screw press.¹²⁰

¹¹⁹ BRUN, *Le vin* (cit. n. 74), p. 59; This chronology is supported by DRACHMANN, *Ancient Oil Mills and Presses* (cit. n. 106), p. 77, who believes that even though the screw itself appeared in the time of Archimedes, the nut of the screw, an indispensable element of the screw press, did not appear until ca. AD 50, when a tool was invented for cutting out the grooves in which the screw-thread turned. However, WHITE (*Technology* [cit. n. 106], pp. 32 and 70) believes that DRACHMANN is wrong and the nut could be made earlier. He admits that the tool in question was necessary for building small screw presses, but he argues that the nuts of the large ones could be made without special instruments.

¹²⁰ Hero mentions (*Mech.* II 18 and 19) that the structure of these presses is simple, they can be transported and installed anywhere. They also have other assets: they do not require a long beam of hard wood, nor a heavy stone, nor strong ropes, but they press with great strength and to the last drop. Hero provides a detailed description of the double-screw press: The base of the press was a plank of wood six *spithamai* in length (1.3872 m), no less than two feet in width (61.6 cm) and no less than one foot thick (30.8 cm). The wood should be neither dry nor wet, but it must be hard. Two round holes were drilled in the plank, one on each end. Two long wooden rods were cut into screws, with the spirals reaching the end only on one side. On the other side a ring was fixed with four sticks attached to it. The ends of the rods were fixed in the holes in the base plank in such a way that they could turn, but not fall out. Next, in a board of the same length and thickness as the base, but a quarter of its width two holes were drilled, matching the placement and diameter of the screws mounted on the base. The holes had spiral grooves inside, corresponding to the grooves of the screws. The board was put on the screws, and when they were turned, the board moved up and down. The entire device was fixed to a rectangular platform, somewhat wider than the base of the press. A bottomless box made of thin wooden sticks was put between the screws. The box was filled with grape pulp and covered with a lid. A kind of a superstructure was placed on the lid. As the screws were turned, the upper board descended and exerted pressure on this superstructure, which, in turn, pressed the lid into the box and squeezed the grape pulp, releasing the must. There was also a single-screw press (*Mech.* II 20). The base upheld a frame of two vertical poles supporting a horizontal beam. The screw passed through an opening drilled through the centre of the beam. The screw was turned by the means of a ring with attached sticks, fixed to its upper end. The bottom end of the screw pressed on the lid of a box, which descended, crushing the contents.

The use of a screw press in Egypt is attested from archaeological finds. Two limestone bases with adjacent collection vessels were discovered in Karanis.¹²¹ They were large, dressed blocks with two square openings cut in the upper surface for mounting wooden pillars of the press. Between the openings there was a shallow, rectangular depression. A narrow channel ran around its perimeter.¹²²

A complete, wooden double-screw press was found in the Fayum at the end of the 19th century. It is now kept in the storage rooms of the Graeco-Roman Museum in Alexandria.¹²³ A single screw from Tebtynis is on exhibition at the Egyptian Museum,¹²⁴ but the assumption that it was part of a wine or oil press is somewhat premature.¹²⁵ This identification should be approached with caution due to the lack of context and no other remains of the device.

Although the presence of mechanical presses is attested in a number of wineries,¹²⁶ no wooden elements were uncovered hitherto in the

¹²¹ One press was in the courtyard of house B75 B in area G. The second press was in the southern part of the *kom*, by the stone foundations of granaries in Cb86. The base was 3 m long, 1 m wide and ca. 0.5 m high. Uncovered in 1926/7 and published by A. E. R. BOAK & E. E. PETERSON, *Karanis. Topographical and Architectural Report of Excavations during the seasons 1924–28*, Ann Arbor 1931, p. 37, figs. 56 and 57, and E. M. HUSSELMAN, *Karanis Excavations of the University of Michigan in Egypt 1928–1935. Topography and Architecture. A summary of the reports of the Director, Enoch E. Peterson*, Ann Arbor 1979, p. 54, fig. 93 a.

¹²² It is very difficult to determine whether the given mechanical press was used for oil or grapes. However, mechanical devices used for oil and wine production were essentially the same and the knowledge gained on one kind also applies for the other. Therefore, in the section devoted to mechanical presses I decided to leave aside the issue of whether or not a given mechanical press was indeed used for wine production and I chose focus on the features of the known artifacts.

¹²³ Dr Mervat Seif el-Din, Director of the Graeco-Roman Museum in Alexandria, who informed me that the press was found in Theadelphia, also told me that the museum houses not one, but two such presses.

¹²⁴ Inv. no. 55959, room 34, case C. Photograph in: TCHERNIA & BRUN, *Le vin romain antique* (cit. n. 106), p. 54, fig. 58

¹²⁵ BRUN, *Le vin* (cit. n. 74), p. 61.

¹²⁶ The winery near Burg el-Arab (ASHMAWI, 'Pottery kiln and wine-factory' [cit. n. 8], pp. 61–62), Marea (FAKHARANI, 'Recent Excavations at Marea' [cit. n. 11], p. 183), 3 km south-east of Huwariya and Huwariya south (RODZIEWICZ, 'Classification of wineries' [cit. n. 4], pp. 31–35), Abu Mina behind the portico (GROSSMANN, ARNOLD & KOŚCIUK, 'Excava-

Mareotis area, where the largest number of wineries was found. There is, however, other evidence for the use of this device. The omnipresent, characteristic remains of mechanical presses are round, raised bases built into the floor and covered with waterproof plaster.¹²⁷ Often the base was located in a niche in the wall. Above the base, openings in walls for mounting the wooden beam were found.¹²⁸ As far as can be judged from the size and shape of the openings, the beams had a square section and were 20 cm thick.¹²⁹ If the press stood directly on the treading platform, the space around it was separated from the rest of the floor by a low wall.¹³⁰ In some wineries there was a separate room for the mechanical press. The must from under the press flowed to a channel, which ran under the floor or on the surface to the main vat.¹³¹ At times the mechanical press even had its own vat, permitting the separation of the must obtained by treading from the mechanically pressed liquid. The must from the treading floor was of better quality and, if quickly separated from the skins, stems and seeds, remained light-coloured and sweet. The must pressed from the pulp took the colour of the skins and acquired an undesirable bitterness.¹³² The mechanical press survived in Egypt until

tions at Abu Mina' [cit. n. 16], pp. 87–90) and by the basilica (GROSSMANN, 'Report 1998' [cit. n. 17], pp. 82–83), Karm el-Baraasi and Karm Gadoura (ABD EL-AZIZ NEGM, 'Recent excavations around Abou Mina' [cit. n. 20], pp. 65–73).

¹²⁷ At the winery near Burg el-Arab this base has a diameter of 1.20 m and is elevated 10 cm above the level of the floor, see above, fig. 2 (ASHMAWI, 'Pottery kiln and wine-factory' [cit. n. 8], pp. 61–62).

¹²⁸ In the winery near Burg el-Arab, in two wineries near Huwariya, and in Abu Mina – in the winery behind the portico, behind the apse of the basilica, and at Karm el-Baraasi (see above, n. 126)

¹²⁹ RODZIEWICZ, 'Classification of wineries' (cit. n. 4), p. 30.

¹³⁰ The press at the winery near Burg el-Arab stood in the corner of the treading floor and it was separated from it by a wall 20 cm thick and 0.5 m high (see above, n. 127).

¹³¹ At Marea, Abu Mina behind the basilica and at Karm Gadoura (see above, n. 126) the press stood in a separate room, a channel connected it with the main vat.

¹³² At the winery at Karm el-Baraasi two small enclosures (ca. 4 m²) flank the entrance. The western enclosure, measuring 2.30 x 2 m, has a niche in the wall, which holds a round base of a press, 1 m in diameter. In the wall there are places for mounting a horizontal beam. Both enclosures had small, separate vats adjoining them from the south. ABD EL-AZIZ NEGM ('Recent excavations around Abou Mina' [cit. n. 20], pp. 65–73) believes that these enclosures served as small treading platforms, but I think both of them were used

the 19th century – in *Description de l'Égypte* there is a drawing of a single-screw press used by a vinegar-maker.¹³³

In contrast to archaeological evidence, the papyri do not provide us with much information on this installation. There are altogether eight texts that mention such devices and even those are rather vague (see below, tab. I, p. 61). In Greek texts the mechanical press is usually called *στεμφυλουργικὸν ὄργανον* or *στεμφυλούργιον*.¹³⁴

One text seems to concern the maintenance of a screw press. *P. Oslo* III 145, a short letter dating from the turn of the 2nd to 3rd century from Oxyrhynchos, carries the following instructions:

Δὸς Ἄρποκρατίωνι φροντιστῆ Σεντῶ εἰς χρίαν στεμφυλουργικοῦ ὄργανου
γλοιοῦ κεράμιον ἕν.

Give Harpokration, the phrontistes of Sento, for use at the mechanical press
one keramion of machine oil.

The lubricant may have been used for oiling the parts of a screw press, as in the case of the bag press it would have been rather useless. However, the word *γλοιός* is not well attested and its meaning is unclear. Preisigke provides a definition ('Schmieröl', *WB*, s. v.) based on two instances (the second document where the word is used – besides the one cited above – is *P. Oxy.* IX 1220, l. 16, where the context is similar: *γλοιοῦ κεράμιον α εἰς τὰ ἐργαλία τῶν μηχανῶν*),¹³⁵ and *LSJ* supplies a different, broader definition – 'any glutinous substance, gum.' However, the context in these two documents makes the use quite clear, and it is difficult to think of a more suitable translation.

The editor of *P. Oslo* III 145 rightly differentiates between *stemphy-lourgikon organon* and *stemphyourgion*, explaining that the former term des-

for mechanical pressing. There was considerably little space for the treaders, compared to the vast treading platforms close at hand and the presence of separate vats indicates that the must extracted in these enclosures needed to be separated from that obtained by treading and collected in the main vat.

¹³³ *Description de l'Égypte* (cit. n. 106), p. 696, fig. 1 (vol. II, pl. XI).

¹³⁴ *LSJ*, s. v. *στεμφυλούργιον*, translated as 'wine-press'.

¹³⁵ In the commentary the editor of *P. Oslo* III 145 gives the meaning 'machine oil,' while Hunt in *P. Oxy.* IX 1220 translates 'gum'.

ignated the press itself, while the latter is the place where it was located. He also states that the term *stempbylourgikon* used in this text is new. Related terms were found already in a fragment of a vintage account from the Zenon archive (*P. Cairo Zen.* IV 59737, l. 18), which mentions workers operating a press (τοῖς στεμφυλουργ[οῖς ἐδώκα]μεν χο(ίνικας)ς).¹³⁶ *BGU* II 531, col. II, ll. 11–12, (Arsinoites, ca. AD 75–85)¹³⁷ also mentions wages of people who did some work at the press *περὶ [τ]ῶν ἀπὸ τοῦ [στ]εμφ[υ]λουργί[ου] περ[ι]ειρομένων.*

An account (*P. Mich.* XI 620, l. 96) from an estate in the Arsinoite nome, dating from AD 240, contains a register of rooms and buildings of the estate, specifying who is using them and what profits they bring. The register mentions a *στεμφυλούργιον ὑπὸ Ἡραῖσκον καὶ τῶν σὺν αὐτῷ μισθωτῶν* (l. τοὺς σὺν αὐτῷ μισθωτάς)¹³⁸ – a press used by Heraiskos and fellow contractors, located in the vicinity of a grape-treading installation.

In the remaining texts, the press appears as one of the appurtenances of a winery (3rd-century sales of vineyards from Oxyrhynchos: *P. Oxy.* LI 3638, l. 9 and *P. Oxy.* XXXIV 2723, l. 9), or in an uninformative context (*P. Ross. Georg.* II 19, l. 35, a lease of a vineyard from Oxyrhynchos dating from AD 141).

However, the Greek terms discussed above are not the only words for a mechanical press in papyri. In some cases a more general term was used – *μηχανή*.¹³⁹ *SB* XIV 12054 mentions carpenters – *τέκτοσι ὑπὲρ μηχανῶν* (or *ὑπὲρ μηχανῆς*), who worked at the vineyard during the vintage (ll. 6, 31, 53, 76, 89, 103). Rathbone rightly concludes that in this case *mêchanai* must have been mechanical presses made wholly or mostly of wood.

The vineyard was equipped with two appliances that were called *mêchanê* – the waterwheel and the mechanical press. Since during the vin-

¹³⁶ Two documents from the Zenon archive confirm the use of another word deriving from the same root – *τὰ στεμφύλα* (*P. Cairo Zen.* 59527, *PSI* VI 554). *LSJ* translates it as ‘a mass of olives from which the oil has been pressed, olive-cake.’

¹³⁷ Dated as part of the Apollonios Archive, see R. SMOLDERS, ‘Two Archives from the Roman Arsinoites,’ *CE* 79 (2004), pp. 233–237.

¹³⁸ As corrected by SHELTON, ed.

¹³⁹ As pointed out by RATHBONE, *Economic Rationalism* (cit. n. 27), pp. 252–253. All the texts in which this term was most probably used to denote a mechanical press are part of the Heroninos archive.

tage the vineyard was not irrigated, it is safe to conclude that in this context the term *mêchanê* designates a press. The carpenters, therefore, made sure the press functioned properly and perhaps operated the machine as well.

Another document where the word *mêchanê* probably stands for a mechanical press is *P.Flor.* I 65, ll. 16–17 (AD 570/1, Oxyrhynchos). It is a sale of wine in which the seller agrees to issue the merchandise ἐκ τῆς μηχανῆς καλουμένης Τζηράς.

A letter from the Heroninos archive, *P.Flor.* II 233, talks about repairing a mechanical press as part of preparations for a vintage. The subject is the order of two pairs of ὄμοι (lit. *arms*) for a mechanical press. It is known from elsewhere that in Pake, one of the localities where the two ὄμοι were to be delivered, there were *mêchanai*. Four attestations from the Heroninos archive concern repairs of wine and oil presses and all of them mention the delivery of wooden ὄμοι. According to Rathbone, ὄμος was the horizontal plank of wood through which the screws passed, the part of the press that was exposed to the greatest pressures. In his view these elements were usually delivered in pairs to have one for immediate use and the other as a spare.¹⁴⁰ However, one might expect that ὄμοι were ordered in pairs because they were *used* in pairs. It may have been, for instance, a pair of screws, as is the case in the press from the Graeco-Roman Museum in Alexandria, or two long rods used to operate the bag press. In this case, however, it is difficult to go beyond speculation.

The pieces of the information puzzle which we obtain from documents regarding mechanical presses are the following: the mechanical press was part of the equipment of a vineyard. It could be subject to lease as an independent piece of property. In the course of preparations for the vintage the press was repaired, perhaps oiled, and spare parts (ὄμοι) were purchased. During harvest it was operated by workers hired for this purpose or by (or, perhaps, with the assistance of) carpenters, who presumably looked after the wooden elements of the press and took care of any repairs.

¹⁴⁰ Other attestations quoted after RATHBONE, *Economic Rationalism* (cit. n. 27), p. 253, n. 62, are as follows: *SB VI* 9406 (= *P. Prag. Varcl* II 1), l. 46 (2 ὄμοι for an oil press); *P. Ryl.* II 236, ll. 22–28 (2 ὄμοι elaiourgikoi); *P. Prag.* I 94 (1 *acanthus ὄμος* for an oil press, cost of 100 dr, probably from the Heroninos archive, translated as ‘sbarra di legno’).

Tab. 1. Papyri mentioning the mechanical press

Source: based on a table listing attestations of the terms *stemphylourgion/stemphylourgikon organon*, [in:] Ruffing, *Weinbau* (cit. n. 2), p. 114.

Document	Dating	Origin	Notes
<i>BGU</i> II 531 r II, l. 12	AD 75–85	Arsinoites	<i>stemphylourgeion</i> ; a letter from the Apollonios archive, Bakchias; order for payment to workers
<i>P. Ross. Georg.</i> II 19, l. 35	AD 141	Oxyrhynchites	lease of a vineyard; <i>ὄργάνου στυμφυλλου</i> pap.
<i>P. Oslo</i> III 145, l. 3	2nd–3rd cent. AD	Oxyrhynchites	<i>stemphylourgikon organon</i> ; order to issue machine oil
<i>P. Oxy.</i> LI 3638, l. 9	AD 220	Sinary, Oxyrhynchites	cession of a vineyard
<i>P. Mich.</i> XI 620, l. 96	AD 239/240	Arsinoites	<i>stemphylourgion</i> ; account; property of the estate
<i>SB</i> XIV 12054, ll. 6, 31, 53, 76, 89, 103	AD 253	Theadelphia	<i>mêchanê</i> ; account of a vintage, payment to carpenters, Heroninos archive
<i>P. Oxy.</i> XXXIV 2723, l. 9	3rd cent. AD	Souis, Oxyrhynchites	sale of a vineyard
<i>P. Flor.</i> I 65, l. 16	AD 570/571	Oxyrhynchos	<i>mêchanê</i> ; sale of wine

IV.3. *The vat*

The vats, in which the must was collected as it flowed from the treading platform and mechanical press, are well known thanks to archaeological research. All the excavated wineries were equipped with one or more rectangular basins lined with waterproof plaster.

The must obtained by treading and pressing grapes flowed down into a vat which in literary sources (*NT*, *Mk.* 12:1; *Geoponika* VI 1.4) is called *ὕπολῆμιον*. *LSJ*, *s. v.*, supplies the following definition of this term: ‘vessel placed under a press to receive the wine or oil, vat.’ Preisigke interprets it

similarly: 'Unterfaßtrog, Uffangtrog unter der Kelter.' According to *Geoponika* (VI 1.4), a *hypolênion* should have a wide mouth (be πλατύστομον). It ought to be kept clean by washing it with brine and wiping with a sponge. In order to keep mice from falling into the must, a lid should be placed on it (see above, n. 54).

Much valuable information is provided by archaeological finds (see figs. 1, 3–5, and 7–9). The excavated wineries are equipped with rectangular basins dug in the ground or hewn in bedrock.¹⁴¹ The must flowed from the treading platform and the mechanical press by channels that ended with decorative spouts.¹⁴² The walls of the dug-out basins were reinforced with stone blocks and covered with several layers of waterproof plaster, showing signs of frequent renovation.¹⁴³

The shape and size of the vat determined the successful outcome of the process of fermentation, especially its first phase. The heat produced as a result of turbulent fermentation had to be allowed to escape and the liquid needed access to fresh air.¹⁴⁴ A flight of steps which led to the bottom of the vat facilitated drawing the liquid and cleaning the basin.¹⁴⁵ The

¹⁴¹ Abu Talaat, RODZIEWICZ, 'Classification of wineries' (cit. n. 4), p. 29, n. 14.

¹⁴² Most of these took the form of lion heads. The lion-head spouts, a large number of which is found in the Graeco-Roman Museum in Alexandria, vary in size, style and material. Most of them are reused architectural detail – dressed blocks, even columns of limestone, granite, especially marble. The oldest have evidently Hellenistic features. A block decorated in relief datable to the 2nd–1st cent. BC depicts Dionysos reclining on a bed over the opening of a channel. The piece was found out of context in Karnak, and is on exposition at the Luxor Museum. It is especially valuable, being the only identified element of a Hellenistic winery and the only one found in Upper Egypt.

¹⁴³ In some cases potsherds were embedded in the plaster; Burg el-Arab: ASHMAWI, 'Pottery kiln and wine-factory' (cit. n. 8), p. 62; Marea: FAKHARANI, 'Recent Excavations at Marea' (cit. n. 11), p. 184. In a winery in Abu Mina the vats had a 3- to 4-mm layer of a bituminous substance on the walls under the top layer of plaster. See: MÜLLER-WIENER & GROSSMANN, 'Abu Mina 6' (cit. n. 18), p. 472.

¹⁴⁴ Thoroughly commented by BRUN, *Le vin* (cit. n. 74), p. 49.

¹⁴⁵ The north-west corner of the vat in the Burg el-Arab winery (ASHMAWI, 'Pottery kiln and wine-factory' [cit. n. 8], p. 62), three steps in the corners of the vats in Karm el-Baraasi and Karm Gadoura. In Karm el-Shewelhy there were originally five, and later three steps leading to the bottom. Karm el-Baraasi, Karm Gadoura and Karm el-Shewelhy: ABD EL-AZIZ NEGM, 'Recent excavations around Abou Mina' (cit. n. 20), pp. 65–73.

bottom of the vat was equipped with a small cavity.¹⁴⁶ All vats had a narrow ledge running across the inner walls below the rim, and some of them featured rectangular depressions,¹⁴⁷ presumably for fitting wooden beams supporting the lid.¹⁴⁸ Grossmann believes¹⁴⁹ that the wine remained in the *hypolênion* long after the process of fermentation had ended, and that it was sold off shortly before the next vintage when the vat was needed again. According to this scholar the depressions on the ledge inside the vat served to mount a hermetic lid on the basin after the first phase of fermentation had come to an end and the wine no longer required frequent care. Grossmann is certainly correct in his belief that the depressions were used for fixing a cover on the vat, but it would be extremely difficult to hermetically seal such a large basin with a wooden lid. Moreover, the fact that a lid was mounted does not have to suggest that the wine remained in the vat for more than a few days. The vat needed to be closed even if it were filled for only a short time, in order to protect the contents from contamination.

The vats were usually quite large.¹⁵⁰ The biggest one uncovered hitherto had a capacity of 35 m³.¹⁵¹ The enormous size of vats in wineries of Abu Mina¹⁵² and vicinity shows the scale of wine production in the area.

¹⁴⁶ The vats at Burg el-Arab, Karm el-Baraasi, Karm Gadoura (see above, n. 145) and Marea (FAKHARANI, 'Recent Excavations at Marea' [cit. n. 11], pp. 183–184).

¹⁴⁷ Karm el-Baraasi: four notches respectively on the N and S wall; Karm Gadoura, (see above, n. 145) Abu Mina in 'Kumring A' (MÜLLER-WIENER & GROSSMANN, 'Abu Mina 6' [cit. n. 18], p. 471). Isbet Mohamed Farid: GROSSMANN, 'Report 2001' (cit. n. 19), p. 27.

¹⁴⁸ According to ABD EL-AZIZ NEGM ('Recent excavations around Abou Mina' [cit. n. 20], p. 68) these beams supported a screen of cloth through which the must was strained as it flowed into the basin. Grossmann's theory (GROSSMANN, 'Report 2001' [cit. n. 19], p. 27) that the notches served for fitting the wooden lid mentioned in *Geoponika* is, however, more convincing, and it is tempting to see these elements as analogies to the passage in this source.

¹⁴⁹ GROSSMANN, ARNOLD & KOŚCIUK, 'Excavations at Abu Mina' (cit. n. 16), p. 87, n. 9; GROSSMANN, 'Report 2001' (cit. n. 19), p. 27.

¹⁵⁰ The vat at Burg el-Arab (1B) was 5.40 m long, 2.70 m wide and 1.90 m deep. ASHMAWI, 'Pottery kiln and wine-factory' (cit. n. 8), p. 62.

¹⁵¹ GROSSMANN, ARNOLD & KOŚCIUK, 'Excavations at Abu Mina' (cit. n. 16), p. 87 n. 9.

¹⁵² The large production complex by the portico in Abu Mina, made up of five press units, gives an idea about the scale of production. Notably, this was not the only winery

Undoubtedly vast vineyards and abundant vintages called for the construction of large vats for the must obtained.

Wine presses excavated in Egypt leave no doubt as to the appearance and function of wine vats, but reconciling the archaeology with the information provided by the papyri poses some problems. The first obstacle is determining what term is used in papyri for this part of the winery. As mentioned above, the word that appears in Greek literary sources is *hypolênion*. However, the only documentary papyrus where this term appears is a vintage account from Oxyrhynchos, from the 4th cent. AD – *P. Oxy.* XIV 1735, l. 5, and both the reading and interpretation are somewhat doubtful. Line 5 reads as follows: ὑπολήνια δι(πλο)κ(έραμον) α.

Philip Mayerson,¹⁵³ who accepts the *hapax* from *P. Oxy.* XIV 1735, explains that a *hypolênion* was an indispensable element of every winery, so it may have been perceived as an integral part of the *lênos* and therefore was not mentioned in contracts of sale. He adds that *P. Cairo Masp.* I 67097 (Aphrodito, AD 573/574), *P. Hamb.* I 23 (Antinoopolis, AD 569), *P. Vind. Tand.* 28 (Hermopolis, AD 576/7) and *SPP* XX 218 (Hermopolite nome, 7th cent. AD) concern the sale of a *lênopithos* (ληνόπιθος), which may denote the entire wine-making complex.¹⁵⁴

However, the term *lênopithos* appears only in documents from the 6th and early 7th cent. AD, while in earlier texts the phrase ληνὸς καὶ πίθος is used instead. The term *lênopithos*, a compound of the words *lênos* and *pithos* formed, according to Vandorpe and Clarysse,¹⁵⁵ as a result of the joint use of the two units, which, in a sense, functioned as a whole. This explana-

in Abu Mina – there were two other complexes within the city and three more in its proximity. One of these satellite units – the winery at Karm el-Baraasi – is indeed enormous with two uncovered units and probably at least three other ones still to be unearthed (see above, p. 21 and figs. 9–11).

¹⁵³ MAYERSON, 'The Meaning and Function of ληνός' (cit. n. 2), p. 162. MAYERSON argues that in documents *pithos* is a storage vessel in which must was kept for fermentation. He does not consider it to be a collection vat.

¹⁵⁴ The opinion of RUFFING is similar, *Weinbau* (cit. n. 2), pp. 117–119, but he identifies *lênopithos* with *pithos* and understands this term exclusively as the designation of a wine vat. See also comm. to *P. Herm.* 23, l. 18: P.M. MEYER translates *lênopithos* as 'Kelterfaß' and makes note of the phrase ληνὸς καὶ πίθος – the treading floor and adjacent vat.

¹⁵⁵ VANDORPE & CLARYSSE, 'A Greek Winery' (cit. n. 77), p. 130.

tion is logical but has serious consequences. One may ask what is the meaning of the term *pithos* in this context. Already Schnebel¹⁵⁶ suggested that both *lênos* and *pithos* are immovable property, fixed to the place in which they stand. Ruffing also believes that *pithos* was the Greek parallel for the Latin *dolium defossum*, a large, buried, earthenware vessel where fermentation took place.¹⁵⁷ Vanderpe and Clarysse,¹⁵⁸ however, suggested that the term *pithos* stands for the basin in which the must was collected.

This hypothesis may seem rather bold at first, considering the main definition of the word *pithos* (LSJ: 'large wine-jar') and the appearance of vats in the hitherto uncovered wineries. However, the line of reasoning based on the analysis of a previously mentioned Greek-Demotic text (P. dem. Gieben 2), presented by Vanderpe and Clarysse, is very convincing.

The word *ym* in this text deserves a closer look. The editors point out that the Semitic term *yamm*, and the Coptic ⲉⲓⲠⲠ (Crum, *Dict.*, s. v.) both denote a basin, which can refer to either a wine press or a lake. ⲉⲓⲠⲠ can also be translated into Greek as *πίθος* and *προλήνιον*.¹⁵⁹ In the contract from Sebennytyos the word *ym* takes a determinative of water, which would indicate a pond or a lake, but the editors rejected this meaning and concluded that if *ym* stands next to *hêliastêrion*, it must be either *lênos* or *pithos*. They also pointed to Demotic analogies from the Roman period. A temple inventory on a bronze plaquette from Medinet Habu mentions two *ym.w* (P. Cairo I 3069I, col. I, l. 33).¹⁶⁰ A Demotic gardening agreement on an ostrakon, dated to after AD 271, also from Medinet Habu,¹⁶¹ states that the grapes are to be gathered into a basket and carried to the *y'm*.¹⁶² In the Sebennytyos contract the treading platform (*lênos*) is called differ-

¹⁵⁶ SCHNEBEL, *Landwirtschaft* (cit. n. 2), p. 286.

¹⁵⁷ RUFFING, *Weinbau* (cit. n. 2), pp. 117–119.

¹⁵⁸ VANDORPE & CLARYSSE, 'A Greek Winery' (cit. n. 77), pp. 127–139.

¹⁵⁹ LSJ, s. v., 'vat in front of a wine-press'.

¹⁶⁰ *Service des Antiquités de l'Égypte, Catalogue Général des Antiquités égyptiennes du Musée du Caire. Die demotischen Denkmäler: 30601–31166* vol. 1, *Die Demotischen Inschriften*, W. SPIEGELBERG (ed.), Leipzig 1904, pp. 80–82, pl. xxvi.

¹⁶¹ PARKER, 'Gardening agreement' (cit. n. 78), p. 89, col. D, l. 14, comm. 108.

¹⁶² The same text (col. D, l. 15) contains another Demotic word for 'wine press' or 'vat': *ḥrwṯ*, see above, p. 41.

ently (see above, p. 43), so what remains is the *pithos*. However, the Demotic word for *pithos*, *ym*, is written with a determinative of a water basin, not of an earthenware vessel of any kind. This led the editors to a conclusion that in one of its meanings the *pithos* (*ym*) is synonymous to *prolênion* (προλήνιον) and *hypolênion*.

According to the conventional definition, *pithos* is a large, earthenware storage jar used for keeping wine, olive oil, grain, etc. *Pithoi* came in various dimensions. Their capacity ranged from 10 to around 65 amphorae (ca. 230 to 1520 L).¹⁶³ In papyri *pithos* usually appears in connection with wine. Its use for other purposes is attested as well, though.

There are 38 papyri mentioning the word *pithos*. The meaning appears to depend on both the place of origin and the dating of the texts. Two documents are Ptolemaic, three are from the 2nd cent. AD, nine from the 3rd cent., three from the 4th cent. and twenty from 5th–7th cent. AD.

Of the Ptolemaic documents, one concerns sending *pithoi*, meaning storage vessels of various sizes (Zenon archive, *P.Col.* IV 109, l. 2, Philadelphia, 3rd cent. BC), and the second one lacks context (*P.Tebt.* I 190 v, l. 5, an account from Tebtynis, 1st cent. BC). In one of the three texts from the 2nd century the word is without useful context (a letter, *O.Amst.* 30, l. 4, Contrapollonopolis or Thebes), while in the remaining two the *pithos* is mentioned as a large storage vessel with no relation to wine production (*P.Oxy.* XIV 1648, l. 63, Oxyrhynchos, and *P.Lond.* III. 1177 [pp. 180–190], l. 160, Arsinoiton Polis, AD 113). Therefore, up until the 3rd century the *pithos* does not appear in connection with wine.

The situation changes in the 3rd century, when *pithos* appears in lists of appurtenances of vineyards. Out of nine texts featuring this word, in seven it is mentioned as immovable property that formed part of the winery. Five of these texts are from Oxyrhynchos, two from Hermopolis. Only two 3rd-century texts attest other functions of the *pithos*. In an Oxyrhynchite sale of wine, *P.Rein.* II 101, l. 12 (AD 198–209), the buyer is to supply the *pithoi* into which his wine will be poured,¹⁶⁴ and, in a list of pro-

¹⁶³ For a thorough discussion see WHITE, *Farm Equipment* (cit. n. 69), pp. 145–146.

¹⁶⁴ This text is atypical, as in other documents of this type this place is occupied by the word κοῦφα, see KRUIT, 'Local Customs in the Formulas' (cit. n. 56), pp. 167–184, esp. pp. 169–170.

duce from Soknopaiou Nesos (*P.Louvre* I 48 v, l. 24, AD 212), vegetables are kept in a *pithos*.

Of the three documents from the 4th century, one mentions clothing stored in a *pithos* (*P.Bingen* 117), another concerns digging foundations for a *pithos* (*CPR* VIII 22), and the third one is the earliest sale of wine (*SB* XVI 12492), that features the phrase ‘μέτρῳ τοῦ πίθου’ (see below, p. 70). In the 5th, 6th and 7th century nineteen out of twenty attestations of the term are found in documents concerning wine. These will be discussed in greater detail below.

The geographic layout of the texts in which the word *pithos* appears is as follows: The largest number of texts originated in the Hermopolites. These twenty documents are dated to the 3rd–7th century and in all of them *pithos* appears as immovable property associated with the winery. There are ten documents from the Oxyrhynchite nome. One of them (*P.Rein.* II 101), mentioning *pithos* as a movable vessel, dates from the turn of the 2nd and 3rd cent. AD. The other, later texts treat it as a fixed element of the winery. There are six from the 3rd cent. AD, one from the 5th cent., and two from the 6th–7th cent. AD. Two texts come from Aphrodito (*P.Cairo Masp.* II 67143 v, *P.Vat. Aphrod.* 25). Both date from the 6th century. Isolated documents, in which the term *pithos* appears either out of context or with no connection to wine, come from the Arsinoite nome (Tebtynis, Arsinoe, Soknopaiou Nesos, Karanis, Philadelphiea) and from Herakleopolis.

As a wine vat *pithos* appears in a number of contexts. It is primarily listed as part of the equipment of a vineyard, along with *lénos*, *béliastêrion*, and *stemphylourgikon organon* in contracts of sale and division of property (see also table 3). Of these documents five date from the 3rd cent. AD and come from Oxyrhynchos, two, from the same period, are from Hermopolis, and one 4th-century text originated in Aphrodito. In this context *pithos* is treated as immovable property, a vat in a press unit.¹⁶⁵ The relevant fragments of the documents in question are the following:

PSI XIII 1328 = *SB* V 7817, ll. 43–44, (AD 200, Oxyrhynchos), a petition: ἐπο(ι)κίου, ἐν ᾧ ληνὸς καὶ πίθος καὶ ἡλιαστήριον;

¹⁶⁵ Cf. a review of Pintaudi's edition of *P. Vat. Aphrod.* by J. GASCOU, *Aegyptus* 61 (1981), p. 280, ad. 25. In such documents *pithos* is treated as immovable property.

P.Oxy. LI 3638, l. 8 (AD 220, Sinary, Oxyrhynchites), a cession of a share of a vineyard: λη[νοῦ καὶ πίθου] καὶ στεμφυλοργικοῦ ὄργάνου καὶ ἡλιαστηρίου;

P.Oxy. XLVII 3365 (AD 241, Oxyrhynchos), a copy of a request to confirm a sale: καὶ ληνῶ καὶ πίθω καὶ ἐποικίω καὶ ἑτέροις οἰκοδομήμασι καὶ χρηστηρίοις πᾶσι (l. 46); ληνῶ καὶ πίθω καὶ χρηστηρίοις πᾶσι (ll. 55–56, same in ll. 66–67);

SPP XX 58, l. 18 (AD 265/266, Hermopolis), a contract: ληνῶνι σὺν πίθω;

P.Flor. I 50, ll. 17, 98, 103 (AD 269, Hermopolis), a division of property: καὶ ληνῶνων καὶ πίθων καὶ ἡ[λ]ιαστηρίου;

P.Oxy. XXXIV 2723, l. 9 (3rd cent. AD, Oxyrhynchos), a sale of a vineyard: καὶ ληνὸν καὶ πίθον καὶ στεμφυλοργικὸν ὄργανον;

P. Rob. inv. 7; *SB* XX 14291, l. 6 (3rd cent. AD, Oxyrhynchos?), a lease of a vineyard: καὶ ληνοῦ καὶ πίθου;

P.Vat. Aphrod. 25, l. 20 (6th cent. AD, Aphrodito), an agreement between inheritors: καὶ ληνῶνος καὶ πίθου καὶ ἡλιαστήρι[ο]ν.

In an account found in a codex from Skar, Hermopolite nome (*CPR* v 26, second half of the 5th cent.) the *pitthoi* are numbered. It reads as follows, l. 811: α ἡμέρ(α) α πί(θου) οἴ(νου) κνί(δια) ρ λι() κνί(δια) ιη; l. 819: β πί(θου) Ἐρμολ(ένει) [ο]ἴ(νου) {κν} κνί(δια) ρ λι() κνί(δια) ιε; l. 826: γ πίθου οἴ(νου) κνί(δια) [ρ] λι() κνί(δια) ιδ.

Sijpesteijn translates the term *pitthos* as ‘Weinfaß’, and in the commentary he compares it to numbered *lénai* in *P.Oxy.* VII 1055 and *P.Mich.* x 588. Both of these texts concern sales of wine and are dated to the 3rd century.

In the original edition of *P.Bad.* IV 55, ll. 17–19, 33 (6th cent. AD, Hipponon, Oxyrhynchites) the word *pitthos* was interpreted as a movable vessel in which wine was sold. However, Kruit and Worp, who prepared a re-edition of this text and proposed significant changes to the reading, read lines 17–19 as follows: [.] α ξξ ἐπάνω τιμῆς οἴνου πρὸς [±4] τοῦ αὐτοῦ πίθου ἐπὶ τῆς πα[ρούσης τ]ε[σ]σαρεσκαιδεκάτης ἰ[νδικ(τίονος)], and thoroughly comment on the relevant passage.¹⁶⁶ They conclude that the phrase τοῦ αὐτοῦ πίθου should be understood as ἐμαυτοῦ πίθου (from my *pitthos*), since the term *pitthos* does not appear earlier in the text and the

¹⁶⁶ N. KRUIT & K. WORP, ‘*P.Bad.* IV 55: ein neuer Text,’ *ZPE* 137 (2001), p. 216.

debt was to be returned by the borrower in the form of wine ‘from his *pitbos*’. The lacuna preceded by προσ- is emended as προσ[ήκον(τος)] (‘belonging to’). The editors, therefore, interpret the fragment as: ‘for the price of wine that comes from my vat,’ noting that analogies are lacking and these are only hypotheses. However, such an interpretation seriously alters the meaning of the term *pitbos* in this particular text. According to Kruit and Worp’s explanation it is no longer a movable vessel, but a permanently installed vat forming part of a winery.

The phrase ἐκ/ἀπὸ τοῦ κοινοῦ πίθου – from the common *pitbos* – appears in ten documents. All of them are land leases from the Hermopolites, mostly from the second half of the 5th and from the 6th century:

BGU XVII 2682, ll. 18–20, AD 481, Sesiy: ἐπ[ὶ τ]ῷ σε τὸν γεοῦχον λαβεῖν ἀ[πὸ] τοῦ [κοι]νοῦ πίθου [λό]γ[ω] πρ[ω]τωλήνου ἑκατὸν;

P. Coll. Youtie II 89, l. 16, AD 485, Hermopolis: ἀπὸ τοῦ κοινοῦ πίθου οἴνου κνίδια ἑκα[τό]ν;

SB XIV 12050, l. 26, AD 498, Hermopolis: λαβεῖν ἀπὸ τοῦ κοινοῦ πίθου κατ’ ἔτος ὑπὲρ πρωτολήνου [οἴνου μέτρα] ἑκατόν;

P. Stras. V 486, l. 15, AD 504/505, Hermopolis: ἐκ [τ]οῦ κοινοῦ πίθου καὶ ὑπὲρ σμήματος ἐκ τοῦ λοιποῦ πίθου;

SB IV 7369, ll. 15–16, 23–24, AD 512, Hermopolis: λόγω πρωτολήνου ἀπὸ τοῦ κοινοῦ πίθου οἴνου κνίδια ὀγδοήκοντα (ll. 15–16); καὶ [λαβεῖν αὐ]τήν [ἀπὸ] τοῦ κ[ο]ινοῦ πίθου ἐπὶ μό[ν]η[s] [τῆς εἰσιού]σης ἐβδ[όμ]η[s] ἰνδ(ικ-τίονος) λ[ό]γ[ω] π[ρ]ω[τ]ολήν[ο]υ οἴ[ν]ου κνίδια (ll. 23–24);

P. Vind. Tand. 28, ll. 16–17, AD 576/577, Hermopolis: ἀπὸ τοῦ κοινοῦ πίθου τὰ πρωτόληνα;

BGU XII 2175, l. 2, 5th–6th cent. AD, Taurinos archive, Hermopolis: ἀπὸ τοῦ κοινοῦ πίθου οἴνου κνίδια ἑβδομήκοντα; the lessor is entitled to additional seventy *knidia* from the common *pitbos*;

SB XX 14416, l. 13, 6th cent. AD, Antinoopolis: ἐκ τοῦ κοινοῦ π[ί]θου π[ρὸ] [μ]ερισμ[οῦ]; wine to be divided from the common *pitbos*;

CPR IX 10, l. 1, 6th cent. AD, Hermopolites, Archive of Eulogios, Georgios and Kallinikos: κοιν]οῦ πίθου; lack of context; most probably the text concerns the division of wine from the *pitbos*;¹⁶⁷

¹⁶⁷ A. JÖRDENS, ‘Teilpachtverträge aus dem Arsinoites,’ *ZPE* 65 (1986), p. 111: a fragment of an agreement to divide the produce kept in the common *pitbos*.

SPP XX 218, ll. 25–27, 7th cent. AD?,¹⁶⁸ Hermopolites: ἐξαιρέτως πρὸ μερισμοῦ ἀπὸ τοῦ κοινοῦ πίθου λόγῳ πρωτολήνων οἴνου μέτρα ἑκατὸν; the same document mentions a *lênopithos*. Wine to be divided from the common *pithos*.

According to these texts the owner of the winery is to receive an annual share of the produce of a vineyard in the form of wine, and an agreed share of must of the first pressing (τὰ πρωτόληνα) from the common *pithos*.¹⁶⁹ *Pithos* in these documents is usually translated as ‘Faß/jarre’, whose contents, new wine, has not yet been divided and comes from the first pressing.¹⁷⁰

In the same context *P.Hamb.* I 23, l. 32 (Antinoopolis, AD 569) attests the phrase ἔκ τοῦ κοινοῦ γλεύκουσ. Therefore, it seems that it was fermenting must,¹⁷¹ not mature wine, that was issued ἀπὸ τοῦ κοινοῦ πίθου.

The phrase μέτρῳ τοῦ πίθου appears in five sales of wine for future delivery from the Hermopolite nome – one document from the end of the 4th century, and four from the 6th–7th cent. AD: *SB* XVI 12492 = *SPP* XX 144, l. 18 (AD 368), *SB* XVI 12490 = *P.Herm. Rees* 33, l. 4 (6th cent. AD), *SB* XXII 15595, l. 7 (6th–7th cent. AD, Tanemos), *SB* XVI 12491, l. 6 (6th–7th cent. AD), *BGU* XII 2209, l. 19 (AD 614). According to Rees,¹⁷² in *SPP* XX 144, l. 18, and *P.Herm. Rees* 33, l. 4, the μέτρον τοῦ πίθου should be perceived as a real vessel, a small measure kept at the *pithos* and used to draw the liquid from the vat. Also Maehler in the commentary to *BGU* XII 2209, l. 19, defines *pithos* as a large, earthenware jar buried in the ground, in which wine was stored and agrees with Rees that this μέτρον was a ‘Schöpfgefäß’, a bucket. This editor adds that such an interpretation does not explain why there was a mention of such a vessel in the description of the purchased wine and guesses that the term expressed a certain relationship

¹⁶⁸ Dating *BL* x, p. 272.

¹⁶⁹ See commentaries to *BGU* XVII 2682, *P. Coll. Youtie* 89, *P. Vind. Tand.* 28, and H. FRISK, ‘Vier Papyri aus der Berliner-sammlung,’ *Aegyptus* 9, 1928, p. 295 (concerning *SB* IV 7369).

¹⁷⁰ See *P. Coll. Youtie* 89 (‘Le propriétaire reçoit une certaine quantité de vin nouveau, prise avant que le partage soit effectué, comme une sorte de prémices’) and FRISK, *loc. cit.*

¹⁷¹ Ph. MAYERSON, ‘Transactions Involving γλεῦκος/μοῦστος: Must or Wine? Or Must Wine?’, *BASP* 36 (1999), pp. 123–128.

¹⁷² See commentaries.

between the liquid measure appearing in this document and the volume of the vessels supplied by the buyer. He offers no definite solution in this matter, however.¹⁷³ A similar approach is presented by Kruit regarding *SB* XXII 15595, l. 7.¹⁷⁴ Kruit translates this phrase as ‘measure of the vat’, thus interpreting *pithos* as a collection basin, and the μέτρον – as a quantity measure at the winery.

In two of the texts in which the phrase appears, however, the *pithos* is interpreted by the editors as a jar supplied by the buyer and used to measure the purchased wine, not as a collection basin of the winery, where the local measure is used to issue the wine to the client. The editions of these documents read as follows:

SB XVI 12491, l. 6: μέτρῳ τοῦ ὑμετέρο[υ πίθου];

BGU XII 2209, l. 19: μέτρῳ τοῦ [ὑμ]ῶν πίθου.

The editors translate the phrase μέτρῳ τοῦ ὑμῶν (οἱ ὑμετέρου) πίθου, ‘according to the measure of your (the buyer’s) *pithos*’. However, in one of these texts ὑμῶν is supplemented by the editor, and in the other one the word *pithos* is added. It is highly uncertain, therefore, that such a phrase indeed existed, as these are merely suggestions of editors. As for *BGU* XII 2209, l. 19, a more probable restoration, considering the examples cited above and the interpretation of the word *pithos*, would be ἡμῶν. In *SB* XVI 12491, l. 6 even if the buyer was to supply the measure of the wine, it could not have been called a *pithos*, as restored by the editor, but perhaps a different term designating vessels brought into the winery. In the majority of sales of wine for future delivery the jars supplied by the buyer are called κοῦφα or κεράμια.¹⁷⁵ In this context the word *pithos* is used to denote a portable vessel in only one document (*P.Rein.* II 101, l. 12, AD 198–209, Oxyrhynchite nome). In 23 texts *pithos* is a vat in a winery, from which the wine is issued, and not the vessel brought in by the buyer. It seems reasonable, therefore, to reject the restorations suggested by

¹⁷³ Harrauer agrees with Rees’ reasoning: H. HARRAUER, ‘Sechs Byzantinische Weinkaufverträge aus dem Hermopolites. Mit Bemerkungen zu einigen Formeln,’ [in:] Rosario Pintaudi (ed.), *Miscellanea Papyrologica = Papyrologica Florentina* VII, Firenze, 1980, p. 124.

¹⁷⁴ KRUIT, ‘Three Byzantine Sales’ (cit. n. 56), pp. 67–92, esp. p. 78.

¹⁷⁵ E. g.: *P. Athen. Xyla* I 6; *P. Amst.* I 48; *CPR* XIV 4; *P. Heid.* V 358.

Maehler in *BGU* XII 2209 and Harrauer in *SB* XVI 1249I¹⁷⁶ and to conclude that in documents of this type the term *pithos* is synonymous to *hypolênion* and does not denote a portable vessel.

Apparently *pithos* had the same meaning as *hypolênion* only in texts from Oxyrhynchos and Hermopolis, as only in these documents it appears exclusively in connection to wine. In several documents *pithos* is a storage jar for keeping other liquids or objects. These isolated texts come from outside the Oxyrhynchites and Hermopolites, mostly from Herakleopolis and the Fayum. In *P.Lond.* III 1177 (p. 180¹⁷⁷ (AD 113, Ptolemais Euergetis) oxen working at a *sagiyeh* were given water in it. *P.Louvre* I 48 v (AD 212, Soknopaiou Nesos) mentions a *pithos* that contained two artabae and two *metra* of vegetables, which amounted to a capacity of ca. 100 L.¹⁷⁸ This is, interestingly, much less than the standard size of a *pithos* according to K. D. White.¹⁷⁹ In *P.Bingen* I 117, l. 18 (AD 368, Karanis) a *pithos* served for storing clothes and small vessels. Also *P.Cairo Masp.* II 67143 v, l. 13 (AD 538–547, Aphrodito) mentions objects kept in a *pithos*.

There is yet another noteworthy document, *BGU* VII 1550, which features (l. 6) the word δόλιον. It is an ostrakon from Philadelphieia, dating from 208–207 BC. The most obvious parallel is the term *dolium*, a Latin word for *pithos*, and such was the interpretation of the editors, P. Viereck and F. Zucker. The word was not indexed, and therefore, being a *bapax*, it never entered the dictionaries. The editors do not specify on what grounds (except for the evident similarity to the Latin term) they translate the word as ‘Faß’. It might prove helpful to check the reading on the original (photograph not available). Tempting though it may seem, it is difficult to accept this word as yet another term synonymous to *pithos*/*hypolênion* based on only one attestation.

It can be concluded that the vat of a wine press was called a *pithos* since the beginning of the 3rd cent. AD in documents from the Her-

¹⁷⁶ HARRAUER, ‘Sechs byzantinische Weinkaufverträge’ (cit. n. 173), pp. 109–126, esp. p. 119.

¹⁷⁷ *WChr.* p. 193, l. 160.

¹⁷⁸ Commentary on both texts in: W. HABERMANN, *Zur Wasserversorgung einer Metropole im kaiserzeitlichen Ägypten*, München 2000, p. 188.

¹⁷⁹ White, *Farm Equipment* (cit. n. 69), pp. 145–146, see also p. 18.

mopolites, Oxyrhynchites, and Aphrodito. In these areas it was a term synonymous to the word *hypolênion*, which was used predominantly in literary texts. In the 6th century the phrase *ληνός και πίθος* evolved into one word – *ληνόπιθος*, attested in texts from the Hermopolite nome and from Aphrodito. It is possible that the use of the term *pitbos* for a fermentation basin is no more than a local peculiarity of vocabulary. However, there is no archaeological evidence as to what wineries looked like in the vicinity of Hermopolis, Oxyrhynchos and Aphrodito. They could have differed in some ways from the installations known from the Mareotis area, Abu Mina, and the Bahariya Oasis. It cannot be excluded that the word *pitbos* does actually tell something about the form of such basins in these particular areas and maybe the vat was sometimes replaced by an earthenware storage jar buried in the ground. Perhaps it was such a vessel that was being interred by workers in *CPR* VIII 22, l. 110. What is more, *P. Wash. Univ.* 105 indicates that wine could remain in the *pitbos* for the whole year and be removed from it just before the next vintage. Such a manner of storing the wine does not seem possible with wine vats identified during archaeological exploration, but it would be feasible with such interred vessels.

IV.3.1. Pouring the wine into jars

The must was poured into amphorae immediately after pressing, as it can be inferred¹⁸⁰ from a letter from the Heroninos archive (*P. Fay.* 133, 11 August AD 260):

π(αρά) Ἀλυπίου []. ἀπέστειλα τὸν οἰκ[ον]όμον [Ἡρα]κλείδην πρὸς σέ καθὰ ἡξίω[σας] ἵνα τὴν διαταγὴν τῆς τρύγης ποιήσῃται. [ὑ]περθεοῦ δὲ ἡμερῶν δ[ύο] καὶ τριῶν ἵνα καὶ τὰ κοῦφά σοι [σ]υνδράμῃ ἀλλὰ καὶ ὁ οἶνος [[ἔτοιμος]] καλὸς γένηται, οἶδας γάρ ὅτι ὁ καιρὸς νῦν ἐστὶν ὀψιμώτερος, καθὼς καὶ ἐν τοῖς ἄλλοις κτηματίοις ἐποίησα. καθ' αὐτὴν οὖν τὴν ὄψιν μὴ πισθεῖς οὖν τοῖς καρπῶναις τὴν τρύγην ποιήσαι καὶ οὕτως μοι ἐπίστειλον. (...) (ἔτους) ζ, Μεσορῆ ιη.

From Alypius. I have sent the administrator Herakleides to you as you requested, to make arrangements for the vintage. Wait for two or three days in order that your jars may come in and also the wine may become good, for you know that the season is now rather late, as I have done also in the other vineyards. As

¹⁸⁰ RATHBONE, *Economic Rationalism* (cit. n. 27), p. 253.

soon therefore as you see this, don't listen to the vintage overseers, but hold the vintage, and when you do, send me word. ... The 7th year, Mesore 18.

Alypius persuades Heroninos to ignore the agitation of the *karponai* and to delay the vintage, although it is already late, by two or three days, so that the vessels are collected and the wine is better. There would have been no need for Alypius to delay the vintage in order to collect the vessels if they were not needed immediately after the pressing.¹⁸¹ Also *SB* XIV 11960 mentions the salary paid both to *patêtai* and to the donkey drivers in charge of transporting the vessels. The same scenario can be observed on vintage scenes in Egyptian tombs – freshly pressed must is poured into jars straight from the vat and carried off to storage rooms.¹⁸²

On the other hand, the accounts by classical authors say otherwise. In the Greek and Roman world fermenting must was placed in *dolia*, large, interred storage jars. According to Cato (*De agric.* 26), once filled, the vessels should be closed after a month. Throughout this period wine was subject to various operations. The emission of gases during the turbulent phase of fermentation caused the surfacing of grape skins and other particles that escaped filtration. These were successively removed. Cato recommends removing the surface foam twice a day and using a brush for cleaning the walls of the vessel. The turbulent phase of fermentation took less than nine days according to Pliny, while Cato claimed it was definitely over after 30 days, depending on the temperature, the mixing of the must, the sugar level, etc. Before sealing the jars the wine could be decanted once more to get rid of the dregs.

¹⁸¹ Today, owing to archaeological research, it is clear that SCHNEBEL was wrong (*Landwirtschaft* [cit. n. 2], pp. 283–284) assuming that the *κοῦφα* appearing in this document were portable, shallow vats used for treading grapes. The scholar could not have known then what Egyptian treading platforms looked like and based his interpretation of texts on Greek and Roman iconography.

¹⁸² See above, n. 87, 88, and 91. Naturally, the depictions on the walls of Egyptian tombs may portray the process of wine-making in abbreviated form. It is possible that the wine remained in the vat for some time before being poured into jars, but the artistic conventions demanded that the artist show decanting as a process simultaneous to treading and pressing. However, the Egyptian trend to abbreviate does not rule out the possibility that the depicted actions were indeed performed immediately one after the other.

Brun believes¹⁸³ that must was poured into vessels when fermentation had already begun. According to this scholar, in Egypt fermentation did not take place in storage vessels permanently buried in the ground, as it was the case in Italy. After a short first phase of fermentation, which took place in a large vat, the wine was poured straight into the amphorae in which it was later stored and sold off. To prevent the vessels from exploding, they were not sealed until the fermentation ended completely.

This seems rational, considering that the turbulent phase of fermentation was very short in the hot Egyptian climate, so wine did not remain in the vat for long. During this time the fermenting must was covered to prevent insects and impurities from falling in and the vat was opened only to remove the lees that had risen to the surface. It bears repetition that *hypolènia* of excavated Egyptian wineries have ledges with notches on the inner walls, which probably were used to fix the wooden frame of the lid mounted during the turbulent fermentation phase. At the same time it is understandable that jars were brought into the winery at the time of the vintage. After they were gathered, a few more days were needed for testing the jars, or perhaps pitching and preparing them for the new wine. As hundreds of jars were being prepared for use (or re-use), the must underwent the first phase of fermentation in the vat.

Therefore, pouring the wine into jars took place twice. First, new wine left the *hypolènon* or *pithos*, where it had undergone the first phase of fermentation; it was poured in amphorae and either carried off to the storage rooms or *hèliastèrion* or was sold immediately. The wine that remained in the winery was decanted again when the buyer arrived with his own vessels.

IV.4. *Storage room*

Some of the uncovered wineries¹⁸⁴ had additional rooms with no obvious function, tentatively called storage rooms by the excavators. Several

¹⁸³ BRUN, *Le vin* (cit. n. 74), p. 63–64.

¹⁸⁴ Winery at Abu Mina behind the portico (GROSSMANN, ARNOLD & KOŚCIUK, 'Excavations at Abu Mina' [cit. n. 16], p. 89), installations in Karm el-Baraasi and Karm el-Shewelhy (ABD EL-AZIZ NEGM, 'Recent excavations around Abou Mina' [cit. n. 20], pp. 69 and 73), winery near Burg el-Arab (ASHMAWI, 'Pottery kiln and wine-factory' [cit. n. 8], p. 64).

texts¹⁸⁵ confirm that there were indeed storage facilities in the winery – a storehouse (θεσαυρός) and a cellar (οινοθήκη)¹⁸⁶ are mentioned. Another text of interest is a report of an inspection of a winery storage room, drawn up sometime during the 2nd century on 27 or 28 December in Oxyrhynchos (*P. Oxy.* XIV 1673, ll. 3–19). The document shows that wine was subject to control and selection. It reads:

τὰ τῆς πρώτης ληνοῦ οὐνάρι[α] ἐνέκλεισα μὴ χωρίσας τὰ εὐώδη, τ[ὰ] δὲ τῆς δευτέρας διεχώρισα πρότερ[ο]ν εὐρῶν εὐώδη τριάκοντα, τὰς δ' ἄλλας ληνοὺς οὐκ ἐνέκλεισα, τῶν ἐκδοχέων λεγόντων ἐκδέξεσθαι ἕως εἰς Τύβι μέχρι ἀν τὸ εὐώδες ἀ[π]οκατασταθῆι καὶ γνωσθῆι ἀκριβῶς. ἐκ δὲ τῶν ἐγκλεισθέντων εὐρον ἐκ [τ]ῆς α λη(νοῦ) ποτῆ(ν) α, [δ]ξ(ο)ς .. ο() ἐξ ὄλ(ου) α, κ[αί] τῆς β ποτᾶς ε, ὄξ(ο)ς ... , καὶ τῆς ... ω πωμαρίωι τῆς γ λη(νοῦ) ὁμοί(ως) ποτ(ᾶς) β, δ λη(νοῦ) α, ἅπερ εὐρον ἐν θήκαις ἐκτὸς μέρους τοῦ ..[ο]ν. ἵνα οὖν μὴ ἀπόληται, δηλωσόν μοι εἰ θέλεις παραθῆναι. οὐ γὰρ δύναται ἀνερχθῆναι, εἰ μὴ διαπραθῆι.

Grenfell and Hunt translate this text as follows:

...I stored the wine of the first vat without separating the fragrant, of the second I previously found and put aside 30 fragrant jars, and the other vats I did not store away, since the middlemen said that they would wait till Tybi 5 until the fragrant should be established and accurately known. Of what was stored I found of the first vat 1 drinkable, ... acid, 1 entirely ..., of the second 5 drinkable, ... acid, and of the third vat in the ... orchard likewise 2 drinkable; of the fourth vat 1; these I found in receptacles outside part of the... In order then that they may not be lost, tell me if you wish them to be sold; for they cannot be carried up without being sold off.

It is clear that the wine was tested to see that it did not turn sour or become unfit for use. It is, however, difficult to determine the precise meaning of the words ἐνέκλεισα and εὐώδη in this text. Notably, the wine stayed in the winery as late as the end of December and its quality was

¹⁸⁵ P. dem. Gieben 2 (107–30 BC, Sebennyto), *P. Flor.* III 385 (2nd–3rd cent. AD, Hermopolite nome), *P. Flor.* I 50 (AD 269, Hermopolis).

¹⁸⁶ The term *οινοθήκη* also appears in *Geoponika* (VI 12.4), meaning 'a storage room for wine'. Other structures the names of which include the element *-θήκη*, such as *ἀροθήκη*, *ἀχυροθήκη*, *χορποθήκη*, denote a place where the given product is stored. *LSJ* (s. v.) defines the term *οινοθήκη* as 'wine cellar' and 'wine cask'. G. HUSSON (*Oikia. Le vocabulaire de la maison privée en Égypte d'après les papyrus grecs*, Paris 1983, p. 215) concludes that it is a place for storing wine and adds that a different word with the same meaning, *οἰνών*, appears in two Ptolemaic documents from the Fayum: *PSI* IV 396 and *SB* V 7521.

controlled until that time. Perhaps the translation is incorrect and the wine jars were not stored away, but sealed off tightly, as they could not have been closed due to the emission of gas throughout the second phase of fermentation. In the month of Tybi the fermentation must have been already coming to an end and the wine could be safely closed up without risking the jar's cracking from the pressure of the gas. Until the fermentation ended completely, the wine could still be tended to and its quality could be controlled. It is therefore possible that *P. Oxy.* XIV 1673, ll. 3–19 concerns, in fact, putting mud stoppers on the wine jars, an activity well documented by archaeological evidence, but poorly attested in papyri. The same activity was perhaps performed in the *bêliastêrion*, on which see below.

IV.5. Ἡλιαστήριον

The *bêliastêrion* appears in documents concerning vineyards and wine making. It is listed among the appurtenances of wineries, usually as a place where maturing wine was stored. The definitions in use, however, do not reflect this as the structure's primary function. Preisigke¹⁸⁷ defines *bêliastêrion* as a 'Sonnenplatz, Trockenplatz (diente zum Trocknen von Früchten, zum Gären des Weines ufw),' and *LSJ*¹⁸⁸ calls it 'a place for sunning oneself, a place for drying fruit.' The supplement to *LSJ*¹⁸⁹ emends this definition to 'room open to the sky for drying fruit.'¹⁹⁰

Hêliastêrion is well attested in papyri, which provide information on the function of such structures and their place in a wine-making complex,

¹⁸⁷ PREISIGKE, *WB*, s.v. 'ἡλιαστήριον' and 'ἡλιστήριον'.

¹⁸⁸ *LSJ*, s.v. 'ἡλιαστήριον'.

¹⁸⁹ *LSJ Suppl.*, s.v. 'ἡλιαστήριον'.

¹⁹⁰ As it has been noted correctly by VANDORPE & CLARYSSE, ('A Greek Winery' [cit. n. 77], p. 127) this meaning is rather poorly attested. This function of the *bêliastêrion* appears in *SB* VI 9132, an uncertain document where the interpretation is based on the word *ἐξερευκότα*, which Zucker (ed.) derives from a doubtful *hapax* term *ξερεύω*, to dry. Vandorpe and Clarysse support a more adequate suggestion presented by Cockle, who defines it as: 'A sunning ground, i.e. an enclosure in the open air with no roof to store the new wine and mature it by the heat of the sun.', with a reference to W. E. H. COCKLE, *Euripides, Hypsipyle. Text and Annotation based on a re-examination of the Papyri* (= *Texts and Commentaries* 7 [1987]), p. 205 (= *SB* XX 14409) – *non vidi*.

and provoke suppositions as to their appearance and the activities that went on there. It was not mentioned in literary texts by classical authors who wrote about wine production,¹⁹¹ but the works of Cato, Pliny the Elder, Strabo, and the *Geoponika* do supply some relevant, additional information. Unfortunately, there are no archaeological finds or iconography that could be of help in reconstructing the appearance of this structure. Some of the uncovered wineries had courtyards,¹⁹² but so far there is no evidence that any of these open spaces had this particular function.

All the Greek texts that mention a *hēliastērion* date from the Roman period. Sales, cessions, and leases of vineyards mention the *hēliastērion* as part of wine-making complexes on estates. In *P. Oxy.* XLIX 349I (fr. 1, l. 16), a marriage contract from Oxyrhynchos dated to AD 157/158, the listed property features an

ἀμπελικὸν κτῆμα, ὅσων ἐὰν ᾦν (ἀρουρῶν), καὶ τὰ τοῦτου ὕδρε(ύματα) καὶ χρηστήρια καὶ ἐποίκ(ιον) καὶ ἡλιαστήριον.

A vineyard of however many arouras it may be, together with the water sources and appurtenances and farmstead and sunning-ground (tr. A. Bülow-Jacobsen, ed.).

A similar list of property is found in a petition from the same location, AD 201, *P.SI* XIII 1328.

Another Oxyrhynchite document dated to AD 220 (*P. Oxy.* LI 3638), contains an impressive line-up of appurtenances of a vineyard. This text (ll. 7–10) records a cession of a part of

ἀμπελικοῦ κτήματος καὶ τῶν φοινίκων καὶ φυτῶν καὶ ἀκροδρύων κα[ὶ τῆς προσούσης καλα]μείας καὶ ὕδρευμάτων καὶ τῆς ἐπικεμένης αὐτοῖς μηχανῆς καὶ ἐποίκιον καὶ λη[ροῦ καὶ πίθου] καὶ στεμφυλοργικῶ ὀργάνου καὶ ἡλιαστηρίου καὶ ἐτέρων χρηστηρί[ων καὶ συ]κυρόν[τ]ων πάντων.

A vineyard estate and the dates and plants and fruit-trees and the adjoining reed-bed and wells and the irrigation machine installed in them and farmstead

¹⁹¹ Strabo (*Geog.* VII 1.44) is the only classical author to use this term, but in his work it appears in a different context – as a place where crocodiles bask in the sun after coming out of the water.

¹⁹² The winery at Abu Mina in ‘Kumring A’ (MÜLLER-WIENER & GROSSMANN, ‘Abu Mina 6’ [cit. n. 18], p. 468), Marea (ASHMAWI, ‘Pottery kiln and wine-factory’ [cit. n. 8], p. 64), Karm el-Baraasi, Karm el-Shewelhy, Burg el-Arab (see above, n. 184).

and treading-trough and vat and pressing-machine and drying-ground and all other appurtenances (tr. J. R. Rea, ed.).

Hêliastêrion also appears in a later document, dated to the early 7th century (*SPP* xx 218, l. 16). It is a lease of a vineyard containing, among other things, a *ληνοπίθος* και ἡλιαστήριον και πύργος.

Despite a considerable number of documents which do not mention a *hêliastêrion* when describing a vineyard (see below, tab. 3), the above examples indicate that the *hêliastêrion* was part of a wine-making complex along with structures such as a treading platform, a vat, a mechanical press, and a farmstead.

The *hêliastêrion* was also subject to sales and leases, both as part of vineyard equipment and as an independent unit, and there are attestations of sharing it with co-owners or co-lessees. In a contract concerning division of property from Hermopolis, AD 269 (*P.Flor.* I 50), one *hêliastêrion* is listed as part of the share assigned to one of the brothers (l. 17), and another is mentioned as common property (ll. 98, 103, 109). In both cases the *hêliastêrion* is accompanied by the *lênos* and *pitbos*. Therefore, the divided property consisted of two wine-making units, each equipped with such a facility. One of the wineries with a *hêliastêrion* was given to one of the brothers, while the other one remained shared property.

The shared use of a *hêliastêrion* is also attested in *PSI* VIII 918, ll. 2–3,¹⁹³ a sale of a vineyard and appurtenances from AD 38/39, from Tebtynis. The owner sells, among others,

ὑπάρχον μ[ο]ι τρίτον μέρος λη[νοῦ και ἡλιαστηρίου και τῶν] συνκυρώντων πάντων ἐν τῇ αὐτῇ κώμη Θεογονίδι κοινῶν καὶ διαίρετων.

A third part of a winery and sunning-ground belonging to me and all the common and indivisible appurtenances in the same village of Theogonis.

There is also a lease of 1/6 of a *hêliastêrion* (*P.Vind. Sal.* 12, l. 9, AD 334/5), where it is not referred to as a part of a vineyard or winery. Notably, the structure was located within the city – in a quarter of Hermopolis called ‘East City’, Asklepios street (ll. 2–3: ἐν τῇ αὐτῇ Ἐρμουπόλει ἐπ’ ἀμφόδου Πόλεως ἀπηλιώτου ἐν ῥύμη δημοσία κα]λουμένη Ἀσκληπιου).

¹⁹³ The word *hêliastêrion* is supplemented in line 2, but this reconstruction is based on a certain reading in l. 4.

The *hêliastêrion* was not an Egyptian invention. P. dem. Gieben 2, a document already mentioned above, is the oldest and the only Demotic document that mentions a *hêliastêrion*. The Demotic word *h3ly3stry*n used in the text is an evident loanword from Greek.¹⁹⁴ It can be inferred, therefore, that it was a structure typical for the Greek, rather than Egyptian wine production process. One guesses that the *hêliastêrion* arrived in Egypt with the Greeks who settled in Egypt in the Ptolemaic period.

Indications as to the appearance of the *hêliastêrion* are provided in *P.Lond.* I 131 (p. 166),¹⁹⁵ a statement of income and expenses of an estate in the Hermopolites in AD 79. Of interest are the expenditures registered under the 17th day of the month Tybi (ll. 374, 375), and the first day of Pachon (l. 85).

On 17 Tybi three slaves weeded the *hêliastêrion*.¹⁹⁶ The very fact that weeds could grow there implies that it was an open-air, unpaved area. On the same day, two workers brought reeds to be kept at the *hêliastêrion*.¹⁹⁷ The reeds may have had various purposes; perhaps they were only stored there, but it cannot be excluded that they were used for making some sort of roofing or, for instance, amphora stands. On the first of Pachon a mason built a wall enclosing the *hêliastêrion*.¹⁹⁸ Solid walls encircling the area where the wine was kept were necessary, as the structure also served to protect the wine from thieves. The *hêliastêrion* which was the object of a lease in *P.Vind. Sal.* 12, l. 9, had a door or gate (*θύρα*) with a lock.

Storing wine in the open air was nothing out of the ordinary and it was practiced in Italy as well. Roman authors mention special types of wine that were made in such storage conditions. Pliny the Elder recalls (*NH* XIV 27) that in Campania the best wines are kept in the open air and explains that wine is better if it is exposed to the elements. Pliny and Cato supply traditional recipes according to which new, still fermenting

¹⁹⁴ VANDORPE & CLARYSSE, 'A Greek Winery' (cit. n. 77), pp. 127–139.

¹⁹⁵ ŚWIDEREK, *La propriété foncière privée* (cit. n. 27), pp. 21, 28, 46 and 54.

¹⁹⁶ Line 374: βoτaνίζ(ουσιv) ἐv τῷ χωρίῳ καὶ ἡλιαστη(ρίω) παιῖδ(εσ) γ τ(μῆ)ς (ὀβολῶν β) χα(λκοῦ) (δραχμῆ) α.

¹⁹⁷ Lines 375–377: μισθ(ὸς) ἐργ(ατῶν) β ἀράντω(ν) καλάμο(υς) Τώλμω(ς) εἰς τὸ Εὐρυμ(ε-δόντος) ἡλιαστη(ρίω) ὡς τῶν δεσμ(ῶν) μ (ὀβολοὶ δ) δεσμ(ᾶς) π (ὀβολοὶ δ).

¹⁹⁸ Line 574: Ἀμβρύω(ν) ἐστὶ περὶ τὸν οἰκοδ(όμον) οἰκοδ(ομῶν) τὸ τεῖχ(ος) τοῦ ἡλιαστη(ρίου).

wine should be left in the sun. Pliny, when writing about salty wines (*NH* XIV 10), mentions a Greek wine called *bion*, which was left to mature in the sun. Cato (*De agric.* 105) gives instructions on how to make 'Greek' wine: in the spring sealed jars of wine should be placed in the sun for two years and after this period they should be brought inside. His recipe for sweet wine (*De agric.* 113) advises the wine maker to pour the wine into the jars after 40 days, add boiled must, fill the vessels up to the level below the handles, and seal them. The following instruction follows: *amporas in sole ponito, ubi herba non siet* ('place the amphorae in the sun where there is no grass') for a period of no more than four years. In a chapter devoted to sweet wines Pliny also recommends (*NH* XIV 11) putting *protropum* (wine from the first must) in the sun after fermentation, but only for 40 days.

Wine makers searched for ways to obtain mature-tasting wine. The factor that increased the speed of maturation was heat, among other things, and therefore Greeks in Egypt exposed wine to the rays of the sun.¹⁹⁹ Besides speeding up the process of maturing, heat killed bacteria and preserved the wine. The process also served to accelerate the maturing of poorer wines, the taste of which was altered by adding wine of better quality, or even potsherds of old wine jars, in order to raise the price.

As Ruffing correctly concludes,²⁰⁰ it was the young, fermenting wine that was placed on the *bêliastêrion*, not freshly pressed must. According to this scholar, first the wine underwent the turbulent phase of fermentation in the vat, and then it was filtered, decanted into wine jars and carried off to the *bêliastêrion*.

Papyri supply information as to what was done with the wine at the *bêliastêrion*. A contract for labour in a vineyard dated to AD 280 (*P.Oxy.* XIV 1631, ll. 17–18) lists the tasks of the employees:

¹⁹⁹ BRUN, *Le vin* (cit. n. 74), p. 86. BRUN also mentions, citing passages from Galen from the 2nd cent. AD (*De antidotis* I,3), that in areas with cooler climate, such as eastern and northern Greece, Marseille or Judaea the filled amphorae were placed in heated rooms. Pliny calls these rooms *apothecae* (*NH* XXXIII 40) or *fumaria* (42) and writes that the smoke gave the wine a slightly bitter hint characteristic of old wine. Martialis criticized this method for being used in Marseille only by frauds. According to Pliny wine was very harmful after such treatment (40). See also R. J. FORBES, *Studies in Ancient Technology*, vol. 3, Leiden 1955, p. 156.

²⁰⁰ RUFFING, *Weinbau* (cit. n. 2), pp. 112–119.

...[σ]υνθήσομεν [sc. τὰ κούφα] ἐν τῷ ἡλιαστηρίῳ καὶ ἐπαλείφομεν καὶ κινήσομεν καὶ μεταδιεράσομεν καὶ παραφυλάξομεν ἐς ὅσον ἐν ἡλιαστηρίῳ ἀπόκ[ε]ιται...

Grenfell and Hunt provided the following translation of this fragment:

...we will carry them [sc. the jars] to the *bêliastêrion* and we will oil them, move them, filter and guard them for as long as they will remain at the *bêliastêrion*...

The same tasks were assigned to workers employed in another contract for labour in a vineyard, dated to AD 257, in the *epoikion* of Nomou in the Oxyrhynchites (*P. Oxy.* XLVII 3354, l. 19). In addition, they agreed for one of them to stay at hand as a night guard at the farmstead in order to keep the wine from being stolen: ἔτι δὲ καὶ κοιμηθήσεται ὁ (ἔ)τερος ἡμῶν Τερεῦς ἀδιαλείπτως ἐν τῷ ἐποικί[ω], translated by Shelton as: ‘And further, the one of us, Hiercus, will sleep in the farm building each night.’ We find a similar situation in a lease of a vineyard from Oxyrhynchos, AD 137 (*P. Oxy.* IV 729), according to which the lessee is obliged to ‘move and guard what is in the *bêliastêrion*.’²⁰¹

The issue of guarding the wine from thieves and watching over it needs no comment, but the mentions of oiling (ἐπαλείφω) and moving (κινέω) are quite intriguing. When translating the term ἐπαλείφω in *P. Oxy.* XIV 1631, cited above, the editors referred to a passage from *Geoponika*. This text contains an indication that the mouths and lids of vessels should be smeared with pitch, boiled must, or brine. According to this source, some producers mixed the boiled must with pitch and brine and smeared the mouths of jars with the substance obtained, while others only covered the lids with *amurca* (VI 9). Mayerson, in his article on the term ἐπαλείφω,²⁰² convincingly argues that the word meant both ‘to smear’ and ‘to seal’. According to this scholar the term denoted not oiling, but closing the wine jars. He adds that a parallel Latin term is the word *oblino*, which also had a double meaning and was used by Cato and Columella in connection with closing the jars. Mayerson’s interpretation seems correct. Archaeological research often yields the remains of mud

²⁰¹ The text emended as in *BL* I, p. 327.

²⁰² Ph. MAYERSON, ‘ἐπαλείφομεν in *P. Oxy.* XIV 1631.17 and XLVII 3354.18: “Oiling” or “Sealing”’, *BASP* 37 (2000), pp. 101–103.

stoppers from wine jars, made of vine leaves, mud, straw and clay,²⁰³ but mentions of them are nowhere to be found in documents. Perhaps the workers in the *bêliastêrion* were to close the jars at a given time and this task was specified in the contract with the verb ἐπαλείφω.

Another term the sense of which is not obvious is κινέω. It is usually translated as ‘to move’, but Ruffing believes²⁰⁴ that it may denote the decanting of wine from above the dregs (‘Abstich’). However, this explanation seems rather unsatisfactory, considering that in *P.Oxy.* XIV 1631 the word κινέω is accompanied by the term μεταδιεράω meaning ‘to filter’ (*LSJ*, s. v.). Hence, κινέω must stand for a different action, not associated with the process of filtering. Perhaps it has to do with the mixing of wine, although at this stage the access of fresh air to the wine could trigger the development of acid bacteria and cause the wine to turn. Possibly the action denoted by this term was simply moving the amphorae into the sun and back to the shade. There are no indications that the wine was to stand in the sun all the time. Moving the amphorae would mean that they could not have been embedded into the ground on the *bêliastêrion*, but they had to be placed on amphora stands or racks. Such stands, attested on wall paintings and reliefs from tombs (New Kingdom tombs of Parennefer²⁰⁵ and Nebamun,²⁰⁶ the early Hellenistic tomb of Petosiris at Tuna el-Gebel), may have been made from the reeds mentioned in *P.Lond.* I 131 (p. 166). However, these are pure speculations.

A somewhat similar text, although difficult to read and interpret, is *P.Oxy.* XIV 1692, an Oxyrhynchite vineyard labour contract from AD 188. Lines 21–22 read as follows: φυράσει τὸν Πηλουσι[ακὸν οἶνον] καὶ ἔτι φυλάξι ἐν ἀργῶ τὸ σύνη[θες] (‘you will mix the Pelousian wine and still

²⁰³ H. E. WINLOCK & W. E. CRUM, *The Monastery of Epiphanius at Thebes*, vol. 1, New York 1926, pp. 79–81, C. HOPE, ‘Jar Sealings and Amphorae of the 18th Dynasty: a Technological Study,’ [in:] *Excavations at Malkata and the Birket Habu 1971–1977* [= *Egyptology Today* 2, vol. 5, 1977]. For further bibliography see P. DAVOLI, *Oggetti in argilla dall’area templare di Bakchias (el-Fayyum – Egitto)*, (= *Biblioteca degli Studi di Egittologia e Papirologia* 3), Pisa 2005.

²⁰⁴ RUFFING, *Weinbau* (cit. n. 2), pp. 112–119.

²⁰⁵ N. DE GARIS DAVIES, *The Rock Tombs of el-Amarna*, vol. VI, pl. IV.

²⁰⁶ L. MANNICHE, *Lost Tombs. A Study of Certain Eighteenth Dynasty Monuments in the Theban Necropolis. Studies in Egyptology*, London 1988, p. 46, pl. 1.

guard in the field the filtered [?]....) Perhaps the wine was mixed after all, considering that *LSJ* clearly defines the verb *φυράω* as ‘to mix’.

Filtering the wine was within the job responsibilities of workers in charge of the *bêliastêrion*. This can be concluded from *P. Oxy.* XIV 1631, a labour contract that mentions filtering in line 17. This is quite understandable; it appears from other documents that this was done immediately before issuing the wine to the buyer. One expects, therefore, that wine was also filtered when being handed out from the *bêliastêrion*.

What remains to be discussed is how long the wine remained at the *bêliastêrion*. Schnebel did not discuss the matter, while Ruffing assumed, based on documentary evidence, that the storage period ranged from roughly half a year to a year, or even up to two years.²⁰⁷ Interesting data in this matter is supplied by a receipt of produce in wine dated to 13 October, AD 62 (*P. Oxy.* XLI 2970):

[Ισ]χυρίων Διονυσίου [] Δι[.]....[.]υ ἀμπελ..ωργῶι χ(αίρειν): [ἐπε]ὶ ξ[ν ἦ] τέθειμαί σοι μισθῶσει τῶι διετηλυθότι η (ἔτει) Νέρωνος Κλαυδίου Καίσαρος Σεβαστοῦ Γερμανικοῦ Αὐτοκράτορος ἔγραψα μὴ ἐλαττουμένον μου ἐν ᾧ εἶχον ἐν ἡλιαστηρίω οἰνικῶι γενήματι τοῦ ζ (ἔτους) διὰ σοῦ, ὁμολογῶ πᾶν τὸ αὐτὸ γένημα παρεληφέναι με τοῦ αὐτοῦ ζ (ἔτους) καὶ οὐδέν σοι ἐγκαλῶ περὶ τοῦ αὐτοῦ γενήματος, μὴ ἐλαττουμένων ὑμῶν ἀμφοτέρων ἐν τῇ δηλουμένῃ μισθῶσει. (ἔτους) θ Νέρωνος Κλαυδίου Καίσαρος Σεβαστοῦ Γερμανικοῦ Αὐτοκράτορος Φαῶ(φι) ις.

...Ischyriion, son of Dionysius to ..., vine-dresser, greetings. Whereas in the lease which I made to you in the past eighth year of Nero Claudius Caesar Augustus Germanicus Emperor I added a clause that I was to suffer no loss at your hands in the matter of the produce in wine of the seventh year, which I had in the open-air shed, I acknowledge that I have received all the said produce of the said seventh year, and I bring no charge against you concerning the said produce and both of you (sic) shall suffer no loss in the aforementioned lease. Year 9 of Nero Claudius Caesar Augustus Germanicus Emperor, Phaophi 16 (ed. & tr. by G. M. Browne).

When suggesting that wine sometimes matured for two years at the *bêliastêrion*, Ruffing refers to the above text. However, the letter suggests that wine remained there for a little over 13 months. The harvest was most probably in mid-August, shortly before the end of the seventh year

²⁰⁷ RUFFING, *Weinbau* (cit. n. 2), pp. 112–119.

(see above, p. 36 n. 58). In the eighth year, when Ischyriion drafted the lease, the wine had been there for only a few months. 13 October, the date of *P. Oxy.* XLI 2970, is shortly after the beginning of the ninth year, and the wine would have been maturing at the *hêliastêrion* for a year and two months at most. Moreover, at that time in the winery, and perhaps already at the *hêliastêrion*, there was wine from two vintages, that of the seventh year and a new wine, less than two months old.

R. P. Salomons²⁰⁸ also believes that wine remained at the *hêliastêrion* for two years and seeks confirmation of this in a lease of a *hêliastêrion* which remained valid for two years (*P. Vind. Sal.* 12). There is, however, no reason to think that throughout the entire time of lease wine from only a single vintage was stored at the *hêliastêrion*. The lessor might have put the wine there twice, each vintage for only one year.

An interesting document in this context is *BGU* I 33 (Arsinoites, 2nd–3rd century AD), which does not contain the word *hêliastêrion*, but lines 13–16 read: τὰ δὲ οἰνάρια σκιάσον, ἐὰν καιρὸς γένηται, μὴ εἰς τὸν θησαυρόν, ἀλλὰ εἰς ἄλλον τόπον ὅπου ἂν θέλῃς. This instruction may be translated as follows: ‘Place the wines in the shade [sc. remove it from the *hêliastêrion*] when they are ready, but not in the storage room,²⁰⁹ but wherever else you wish.’

The above elements form a clear picture. The *hêliastêrion* was an open-air storage area with walls, accessible through a door or gate, equipped with a lock for protection from thieves. New wine in amphorae was placed at the *hêliastêrion* after the first phase of fermentation had finished. It remained at the *hêliastêrion* for a little more than a year and during this time it was subject to filtering and further unspecified actions of moving and oiling or sealing. A *hêliastêrion* could be used collectively by several vintners at a time and a team of workers was hired to guard and take care of the wine. It was apparently a Greek invention – it appears in recipes for so-called ‘Greek’ wine and the Demotic term for it is a loanword.

²⁰⁸ The editor of *P. Vind. Sal.* 12, comm., p. 142.

²⁰⁹ See HUSSON, *Oikia* (cit. n. 186), *θησαυρός* – p. 93.

Tab. 2: Papyri mentioning a *bêliastêrion*

Document	Dating	Origin	Content
<i>PSI</i> VIII 918 , l. 2	AD 38/39	Theogonis (Arsinoites)	sale of a vineyard
<i>P. Oxy.</i> XLI 2970, ll. 6–7	AD 62	Oxyrhynchites	receipt of produce in wine
<i>P. Lond.</i> I 131 (r), ll. 85, 374, 375	AD 79	Hermopolites	account
<i>SB</i> XX 14409, VII l. 7; XV ll. 5, II	col. VII: AD 83/84 or AD 93/94; col. XV: AD 88/89	Oxyrhynchites	account
<i>P. Sarap.</i> 56, ll. 27, 35	AD 128	Hermopolites	accounts
<i>P. Oxy.</i> IV 729, l. 18	AD 138	Oxyrhynchos	lease of a vineyard
<i>P. Oslo</i> II 43, ll. 3, 4	AD 140/141	Prosopis	sale of wine for future delivery
<i>P. Oxy.</i> XLIX 3491, l. 16	AD 157/158	Oxyrhynchos	marriage agreement
<i>P. Ross. Georg.</i> II 28, l. 37	AD 163/164	Arsinoites	register of leased land
<i>SPP</i> XX 10, l. 1	AD 168	Arsinoites	sale of a house
<i>SB</i> XIV 11292, l. 14	2nd cent. AD	Oxyrhynchos	fragment of account
<i>P. Mert.</i> II 79, l. 16	2nd cent. AD	unknown	letter
<i>P. Bodl.</i> I 123, l. 2	2nd cent. AD	unknown	payroll
<i>P. Giss.</i> 31, l. 14	AD 116–120	Hermopolites	letter
<i>SB</i> XIV 11960, l. 58	2nd cent. AD	Oxyrhynchites	ἐν τῷ ἡλίῳ [] account
<i>PSI</i> XIII 1328, l. 44	AD 201	Senepsau, Oxyrhynchites	petition concerning property
<i>P. Oxy.</i> LI 3638, l. 9	AD 220	Sinary, Oxyrhynchites	cession of a part of a vineyard
<i>P. Flor.</i> I 77, l. 20	AD 241/242	Memphis	account

Document	Dating	Origin	Content
<i>SB</i> VI 9414, ll. 5, 31	AD 251–254	Theadelphia	issue of wine
<i>SB</i> VI 9075, ll. 3–4	AD 254–268	Theadelphia	letter; wood stored in h.
<i>P. Oxy.</i> XLVII 3354, l. 18	AD 257	Nomou, Oxyrhynchites	agricultural agreement
<i>SPP</i> V 101, fr. 2, l. 5	AD 266–268	Hermopolites	account
<i>P. Flor.</i> 1 50, l. 17	AD 269	Hermopolis	division of property
<i>P. Oxy.</i> XX 2269 (v), l. 7	ca. AD 269	unknown	account
<i>P. Col.</i> X 280, l. 13	AD 269/270	Oxyrhynchos	lease of a vineyard; the word reconstructed
<i>P. Oxy.</i> XIV 1631, l. 17	AD 280	Oxyrhynchos	contract for labour in a vineyard
<i>P. Laur.</i> 166, l. 5	AD 289/290	Oxyrhynchos	contract for labour in a vineyard
<i>P. Stras.</i> VI 539, l. 3	AD 290/291	Hermopolis	lease of arable land
<i>P. Bad.</i> II 26 inv. 214 (r), ll. 76, 78	AD 293	Hermopolites	account
<i>P. Ryl.</i> II 206, l. 48	3rd cent. AD	Hermopolites	account
<i>SB</i> VI 9132, ll. 12, 15	3rd–4th cent. AD	Hermopolites	account
<i>CPR</i> XVIIIa 5a, ll. 4, 7	AD 316	Hermopolis	loan
<i>P. Vind. Sal.</i> 12, l. 9	AD 334	Hermopolis	lease of a sixth of a <i>héliastêrion</i>
<i>P. Hamb.</i> I 68, l. 5	AD 549/550 (564/565)	Aphrodito	lease of arable land
<i>P. Vind. Tand.</i> 28, l. 10	AD 576/577	Hermopolites	lease of a vineyard
<i>P. Vat. Apbrod.</i> 25, l. 21	6th cent. AD	Aphrodito	agreement between inheritors
<i>P. Stras.</i> VII 696, l. 8	6th cent. AD	Hermopolis	sale of wine
<i>P. Ant.</i> III 190 (r), l. 6	6th–7th cent. AD	Antinoopolis	account
<i>SPP</i> XX 218, l. 16	early 7th cent. AD	Hermopolites	lease of a vineyard

IV.6. *Other appurtenances of a winery*

Interesting information on other installations forming part of a wine-making complex is provided in documents containing references to immovable property found in vineyards or to the appurtenances of a winery. The lists feature the elements already discussed: the ever-present treading platform (*lénos*) and collection basin (*hypolénion*, *pithos*), in a later period referred to by a common term – *lénopithos*, a mechanical press (*organon* or *mêchanê*), a *hêliastêrion*, a storehouse (*θεσσαυρός*), and a cellar (*οἰνοθήκη*).²¹⁰ According to some documents the complex was also equipped with some farm buildings (*ἐποίκιον*, *πύργος*, *ἔπαυλις*), store-rooms (*κέλλα*) and building plots (*οἰκόπεδον*).²¹¹ Large wineries where mass production took place had a potter's workshop on the premises (*κεραμικὸν ἐργαστήριον*).²¹² The table below provides a comparative chart of the facilities mentioned in the extant texts, showing how frequently they appear and in what combinations.²¹³

²¹⁰ The term *οἰνοθήκη* also appears in *Geoponika* (VI 12.4) where it denotes a store room for wine. Other words composed with the particle *-θήκη*, like *ἀρποθήκη*, *ἀχυροθήκη*, *χορποθήκη*, denote the place in which a given product is stored. *LSJ* (s.v.) defines *οἰνοθήκη* as a 'wine cellar' and 'wine cask'. HUSSON (*Oikia* [cit. n. 186], p. 215) believes it is a place for storing wine and adds that another term of the same meaning, *οἰνών*, appears in two Ptolemaic documents from the Fayum: *PSI* IV 396 and *SB* V 7521.

²¹¹ Most of these terms are discussed in: HUSSON, *Oikia* (cit. n. 186), *θεσσαυρός* – p. 93, *οἰνοθήκη* – pp. 215–216, *ἐποίκιον* – p. 83, *πύργος* – p. 248, *ἔπαυλις* – pp. 77–80, *κέλλα* – p. 142.

²¹² It is interesting to note that there was indeed a large pottery kiln in the vicinity of the winery near Burg el-Arab. See ASHMAWI, 'Pottery kiln and wine-factory' (cit. n. 8), pp. 55–60.

²¹³ The table contains only those installations that may have been associated with the process of wine production. Other objects mentioned in these contracts were used in irrigation of the vineyard. They were: *ὑδρευμα* (*P. Flor.* I 50, *P. Oxy.* XLIX 3491, *P. Oxy.* LI 3638, *PSI* XIII 1328), *βουστάσιον* (*P. Flor.* I 50, *SPP* XX 218), *κυκλευτήριον* (*SPP* XX 218), *φρέαρ* (*P. Vind. Sal.* 12), and *μηχανή/ὄργανον* meaning 'waterwheel'.

Tab. 3: Appurtenances of a winery

Document	Ληξιών, ληξιός	Ληγνόπιθλος	μηγαλαρή	όργανων	πιθλος	κεραμ. έργαστ.	ήλιαστίριον	οΐνοθήκη	θεσαυρός	έπαυλις	έποίκιον	κέλλα	πήργος	οικόπεδον
<i>P. Tebt.</i> III.I 814, sale, after 227 BC, Tebtynis	x													
<i>P. Lond.</i> II 401, petition, 115–110 BC, Thebaid	x										x			
<i>P. dem.</i> Gieben 2, sale, 107–30 BC, Sebennytos	x				x		x		x					x
<i>PSI</i> VIII 918, sale, AD 38/39, Tebtynis	x						x							
<i>P. Oxy.</i> XLIX 3491, marriage contract, AD 157/158, Oxyrhynchos							x				x			
<i>P. Ross. Georg.</i> II 28, lease, after AD 163/164, Arsinoites							x					x		
<i>P. Flor.</i> III 385, 2nd–3rd cent. AD, Hermopolites								x	x					
<i>PSI</i> XIII 1328, petition, AD 201, Oxyrhynchos	x		x		x		x				x			
<i>P. Oxy.</i> LI 3638, cession, AD 220, Sinary, Oxyrhynchites	x			x	x		x				x			
<i>P. Flor.</i> I 50, division of property, AD 269, Hermopolis	x				x	x	x		x			x		x
<i>P. Oxy.</i> XXXIV 2723, sale, 3rd cent. AD, Oxyrhynchos	x			x	x									x
<i>SPP</i> XX 58 (7), col. II, 3rd cent. AD, Hermopolis	x			x	x									
<i>SB</i> XX 1429I, lease, 3rd cent. AD, Oxyrhynchos	x				x									
<i>P. Vind. Sal.</i> 12, lease, AD 334/335, Hermopolis							x			x		x		
<i>P. Cairo Masp.</i> I 67097 (1), contract, AD 571/572 (?), Aphrodito		x												x
<i>P. Vind. Tand.</i> 28, lease, AD 576/577; Hermopolis							x							x
<i>P. Vat. Aphrod.</i> 25 fr. A, division of property, 6th cent., Aphrodito	x				x		x							
<i>SPP</i> XX 218, lease, early 7th cent. AD, Hermopolites		x		x			x							x

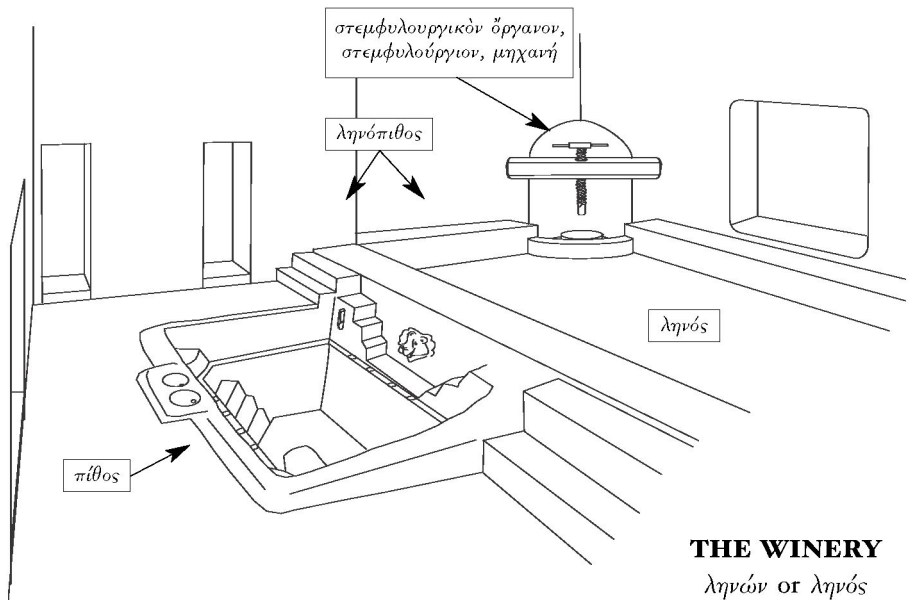


Fig. 12. A reconstruction of the winery
(drawing Dorota Dzierzbicka)

V. CONCLUSION

The winery was, therefore, a building or a set of buildings located either in the urban area or in the vicinity of a vineyard. The most important structure was a compound consisting of a raised treading platform and a collection basin, built within an enclosed and roofed space. The room in which the press unit was located may have been entered from a courtyard, and in some cases it was equipped with a large window giving easy access to the treading floor. Grapes were thrown through this window, or simply carried through the door, to the treading platform, where they were crushed.

Most wineries were also equipped with a mechanical press – either a movable bag press, or a more sophisticated, fixed screw press. These devices were used to squeeze the remaining liquid out of the trodden

grape pulp either directly on the treading floor, or in an area separated from it. In the latter case a channel connected the place of the mechanical press with the main collection basin, or with a smaller, separate vat.

The must flowed into a plastered vat or vats dug into the ground. It remained there through the first, turbulent phase of fermentation, during which the basins were covered with wooden planks for protection against contaminants. After this phase was over, the wine was poured into vessels that had been obtained from a pottery, pitched, and checked for defects. The jars may have been made in a workshop located within the complex, but they were usually acquired from outside the winery. Old vessels, either used in the winery in the previous year, or 'empties' collected from wine sellers, may have also been used. Wine that was paid for in advance was distributed straight from the vat and carried off from the winery in vessels provided by the buyer. The filled jars that remained in the winery were placed in storage rooms or in the *bêliastêrion* for maturing. Both of these facilities were usually rooms or buildings within the wine-making complex and they were equipped with doors and locks. Maturing wine was occasionally controlled to check if it had not gone sour or spoiled. After the process of fermentation had ended, the vessels were sealed.

Thus, the texts and archaeological finds, despite defying complete interpretation, give us enthralling and detailed insight into the workings of one of the most important and productive of Egyptian industries and an understanding of a process which may have parallels in other parts of the Mediterranean world.

Dorota Dzierzbicka

Department of Papyrology
Institute of Archaeology
Warsaw University
Krakowskie Przedmieście 26/28
00-927 Warsaw 64
POLAND
e-mail: *ddziedzic@op.pl*