

Chapter one

SOURCES AND RESOURCES FOR THE STUDY OF OLEOCULTURE IN ROMAN AND BYZANTINE SYRIA–PALESTINE

1.1 Recent scholarship on olive oil production in the Greco-Roman Mediterranean

Interest in historic aspects of olive cultivation and oil making dates back to a general renaissance of modern studies on ancient Greece and Rome, including archaeology (more in Amouretti *et alii* 1984), this despite the living lasting tradition that has become an inseparable element of the Mediterranean landscape since at least the Greco-Roman era, transferred virtually unchanged from generation to generation in respective regions.

1.1.1 Agronomists, inventors and travelers

Roman agronomists like Cato or Columella, to mention the most cited, benefited equally from a renewed interest resulting from the reintroduction of classical literature into European culture as from the industrial revolution and 18th century rationalism which sought to develop ever more effective farming techniques through agricultural studies. In 1771, the Académie Royale des Sciences de Marseille published the work of a certain Monsieur Sieuve, who proposed to improve methods of oil extraction from olives by introducing two boards pulping olives without crushing the stones instead of the traditional techniques of crushing fruit in a stone mill or treading it *Histoire de l'Académie Royale* 1771: 79–82). Provençal agronomists thus added their share to the discussion lasting since antiquity concerning the impact that crushing of olive stones had on the taste of the produced oil. Considering the oleoculture traditions in Provence, it was hardly surprising that in 1782 the same Académie de Marseille

announced a competition to introduce new methods of olive cultivation and oil making. An anonymous competitor published in 1783 a work exemplifying to perfection the knowledge of authors of the time and their scope of interest (*Mémoire* 1783: especially 7–9 and 212–235). The part of the memoir devoted to the history of olive cultivation was based on views expressed by ancient authors, as proved by invariable interest in mythological motifs recalling the implantation of olives in Attica, made possible thanks to the Hercules' intervention. Cato figured prominently in the chapter on the cultivation of the olive tree, whereas a description of methods of oil making drew extensively on Pliny's *Naturalis historia*, expertly mixed with contemporary experience of local, Provençal agronomy. Contemporary authors were also interested in the technological aspects of oil production. One of the significant engineering textbooks of the early 19th century, written by Joseph-Antoine Borgnis, described oil presses in detail, both simple ones comprising a wooden screw fixed in a rock-cut niche and the much more sophisticated examples with a wooden beam pressed down by a huge screw (Borgnis 1819: 245–271). One can hardly overlook the fact that all the systems described by Borgnis had already been invented in antiquity.

Expertise from metropolitan France was practised beyond its borders. Algeria became an experimental plot for colonists seeking to develop cash crop farming, including the olive tree. One of them, a landowner from Bougie devoted several works to different issues linked to oleoculture in Algeria (Maffre 1847; 1851a; 1851b). With a zeal characteristic of a man of

action, he described achievements in olive oil production using a new hydraulic device. He noted also that a favorable climate associated with modern methods of cultivation resulted in harvests half as big as those known from France, not to mention the rentability of production achieved by the local population. His writings, subtly suggesting the need for governmental support for the colonists, mirrored the process of transferring new agronomic techniques between regions of the Mediterranean world during the 19th century, but also demonstrating the usefulness of autochthonous agricultural traditions based on medieval, but also earlier, Roman and Punic, heritage,

The findings of an emerging archaeological practice were still rather negligible for this initial phase of the study of ancient oil presses. Pioneering studies on settlements buried in the Vesuvius eruption of AD 79 are readily invoked in Roman archaeology. In 1779–1780, a complete oil press was discovered at the Casa dei Miri in Stabiae, just 4.5 km from Pompei, and regardless of what we think of those early methods of excavation, it can be considered as the first site to be explored archaeologically (La Vega 1783: 59–71, Pls i–iii). For a long time it remained an isolated find, it being much more common to find elements of presses scattered on the surface and identifiable because of their dimensions and the material they were made of. Large press beds or piers made of local stone and sticking out from the ground are even today a common element of the landscape in many Mediterranean regions. These remains, noted by travellers, often fell victim to misinterpretation, being presented in books as offering tables, idols or even menhirs (Brun 2003: 218–219, with examples from Cyrenaica and Cyprus). Notwithstanding, there were scholars who interpreted the finds correctly, making use of ethnographical observations, as did V. Paton and H. Myres in the case of Asia Minor (1898).

Even as research on antiquity developed greater methodological sensitivity focused on new sources and their proper interpretation, scholars turned toward regional studies aiming to identify historical phenomena described in the written, epigraphic and archaeological sources. A telling example is offered by Roman Baetica and the mass production of olive oil, which was subsequently exported in locally made amphorae to Italy and the provinces along the Rhine. Introducing this research was the discovery of millions of amphora sherds accumulated during the centuries of the flourishing of the Roman empire on Monte Testaccio in Rome itself. On the basis of the research conducted there, Heinrich Dressel identified, among other types, amphorae dedicated to the transport of olive oil from Baetica, as suggested by *dipinti* on their shoulders (Dressel 20 type of amphora) (Dressel 1878).¹ A broader view of a seemingly marginal observation was given by large-scale surveys and excavation projects in the region, from where the amphorae and their content originated. Longterm research in the valley of the Guadalquivir river revealed a dense and intricate network of farms associated with olive groves, producing olive oil and exporting it through centers specialized in amphora production, and their transport and distribution as far as the legionary camps in Germania.² The example of Baetica can still be a source of inspiration for research on the supply and demand of agricultural products in the ancient world.

A parallel interest in technological aspects of oil production and the intention to revise some of the incorrect interpretations of antique devices known from the academic literature of the early 20th century led A.G. Drachman to undertake a detailed review of all available written testimonies and the modest archaeological evidence, and to confront them with interpretations given by modern research, including his own important contribution (Drachman 1932; see also later remarks in

¹ New excavations conducted by a Spanish team on Monte Testaccio have considerably broadened our knowledge of the nature of the olive oil commerce recorded in the sherds on the hill, see Blázquez Martínez, Remesal Rodríguez 1999; 2001; 2003; for olive oil exported to Germania, see Remesal Rodríguez 1997; 2002.

² The Guadalquivir region has been investigated since the end of the 19th century, see Clark-Maxwell 1899; Bonsor 1931; Ponsich 1974.

Drachman 1963). Drachman essentially focused on one type of device, the lever-and-screw press, and on one type of crushing device known as the *trapetum*, proposing solutions that were accepted, at least in part, and remain valid until today.

The interest in the Levantine evidence in this early period is poorly represented, chiefly by the rare mention of discovered oil press elements. In 1860 Ernest Renan described the rural areas around Tyre as dotted with monolithic blocks forming a kind of gate or the Greek letter P, which he correctly identified as elements of oil installations, that is, piers characteristic of presses uncovered less than a century later in nearby Umm el-'Amed (Renan 1864: 633). The accurate interpretation of these remains enabled him to record other similar facilities at Amrit, Scheptin in the northern part of ancient Phoenicia and Kabr Hiram in the south near Tyre (Renan 1864: 95, 251, 598, 633). Some of the piers seen by Renan may have been mentioned a few years later by members of the British Survey of Western Palestine, who reported “three presses near Tyre, with piers” (Conder, Kitchener 1881/I: 56). Despite it, in the 1930s Claude Schaeffer still described the oil installations uncovered in Late Bronze Age Ugarit–Ras Shamra as associated with religious ceremonies presumably performed in the nearby sanctuary (Schaeffer 1931: 4, see also Minet al-Beida, *Syria* 13, 1932: 4 and Fig. 6). Similar misinterpretations appeared a little later in the case of the Iron Age Tell el-Far'ah near Nablus and Tel Dan in the north of Israel (de Vaux 1951; Biran 1980). But the majority of travelers or early explorers were satisfied with descriptions of olive groves they were passing and focused on other, speculative cultures, like mulberry tree or cotton, that were popular in their times.³

1.1.2 New discoveries, new perspectives

If previous interest in ancient oleoculture, with the exception of the isolated example of Baetica, was rather accidental and limited to singular finds, the development of archaeological methods and expansion into new regions since the 1960s has brought a massive growth in the body of the evidence pertaining to oil production in antiquity and a growing understanding of the phenomenon, in terms of both technology and economy. Scholars working on the history of the Greco-Roman world recognized the importance of studies of mass categories of finds, such as pottery, and of local communities, especially those living in rural areas.

The new approach to the study of the past started to give fruit in the 1980s. Marie-Claire Amouretti addressed the issue of the foodstuffs in ancient Greece, dealing especially with technological and economic aspects of olive oil production (Amouretti 1986). Her particular interest in the history of technology in antiquity resulted in a very important publication which, thanks to the competence of the contributors, presented the state of research on wine and oil production in the Mediterranean from the Bronze Age until late antiquity (Amouretti, Brun 1993). Many of the papers published then remain valid, especially when pertaining to less known regions. Amouretti's works on traditional oil installations from Portugal, investigated with modern ethnographical methods, as well as in the light of descriptions preserved in the writings of Roman authors, with special regard to Cato, also proved inspiring for researchers studying oleoculture (Amouretti *et alii* 1984).

At the same time French scholars focused their attention on the oleoculture in Roman Gallia. In his study of oil installations from Provence, Jean-Pierre Brun gave

³ C.-F. Volney wrote around 1784 of the agriculture in Lebanon south of Beirut, without mentioning olives: “The mulberry tree constitutes the wealth of the whole country of the Druzes, by the beautiful silks which are produced on it, while the vine, supported on poles, or winding round the oaks, supplies grapes which afford red and white wines that might rival those of Bordeaux” (Volney 1788: 319); the Swedish traveler F. Hasselquist around the mid-18th century recalled the cotton industry near Nazareth (Hasselquist 1766: 153); to balance this view one should perhaps recall É. Blondel, who in 1838–1839 saw traces of extensive oleoculture in the Chouf region, south of Beirut: “A l'époque de notre course, les oliviers étaient encore chargés de leurs fruits que les paysans commençaient seulement alors à récolter. L'huile qu'ils en expriment est d'un goût passable ; elle pourrait être excellente s'ils savaient donner un peu plus de soin à la manière de la préparer” (Blondel 1840: 77).

a comprehensive review of the issue. Using a wide range of available sources, including archaeological and ethnographical data, he proposed a typology of installations that is still valid today (Brun 1986). In the following years he published important studies on oil and perfume production on Delos and in Paestum, gathering material for a more general and synthetic publication dealing with the wine and oil in the Mediterranean world (Brun, Brunet 1997; Brun, Jockey [eds] 2001; Brun 2000).

The pioneering work of Georges Tchalenko in Northern Syria in the 1930s and 1940s resulted in a first of a kind study of landscape and rural settlement, taking into account villages and their relation with the environment, as well as isolated buildings dated between the 1st and the 6th century AD (Tchalenko 1953–1958). Oleoculture, which was one of the aspects of Tchalenko's research and was prematurely considered by him to be the foundation of a local economy, became the focus of another detailed analysis by Olivier Callot. This work remains a priceless source of information on the types of installations used in the Limestone Massif during late antiquity, and the applied technical solutions in particular (Callot 1984). Deriving from Callot's interest in oil production were important studies devoted to the facilities uncovered in Late Bronze Age Ugarit–Ras Shamra and the Byzantine presses from Khan Khalde in Lebanon (Callot 1982; 1987).

Starting from the 1980s Israel and the West Bank also saw a rise of interest in ancient oil production. Rafael Frankel's in-depth knowledge of the field evidence enabled him to propose a general, holistic image of the wine and olive oil production in ancient Palestine, both from the point of view of the typology of installations and their chronology, as well as their geographical distribution and socio-economic aspects, seen through the lens of the written evidence (Frankel 1984; 1997; 1999). At the same time, Shmuel Avitsur, David Eitam, Etan Ayalon and Michael Heltzer continued their research aiming

at better availability of material evidence of oleoculture in Palestine and beyond its borders, during the Late Bronze and Iron Ages, but also in the modern era, drawing on the rich and inspiring resources provided by ethnographical studies (Heltzer 1987; Frankel, Avitsur, Ayalon 1994; Avitsur 1984).

Lastly, there is the contribution of British archaeologists, who have been focusing on North Africa since the late 1970s. Their methodological approach, stressing the importance of data collected during field surveys, resulted in a series of publications concerning the ancient territories of modern Libya and Tunisia. The UNESCO Libyan Valleys Survey (ULVS) of the 1980s permitted the systems of terraces, walls and farms to be mapped in several sectors of the Libyan coast adjacent to the desert. The results of this project, including evidence for oil production, accompanied by limited excavation and study of environmental and climatic conditions in selected regions, have contributed importantly to the study of ancient farming methods in marginal territories, characteristic not only of Libya (Barker [ed.] 1996; Mattingly 1989a). Another extensive and influential survey was conducted by a team headed by Robert B. Hitchner in the olive-producing area of Kasserine in southern Tunisia (Hitchner 1988; 1989; 1990). The extensive use of archaeological data combined with environmental evidence and analysis of written evidence have contributed significantly to our knowledge of Roman- and Byzantine-period patterns of production and trade in this particular sector of the Mediterranean. Neither can one overestimate the value of these studies for the technical aspects of oil installations, so thoroughly studied by David J. Mattingly (among many others, see Mattingly, Hitchner 1993; Mattingly 1993).

A milestone of research is the four-volume publication by Jean-Pierre Brun, crowning decades of the author's interest in the wine and oil production of the ancient Mediterranean world (Brun 2003; 2004a; 2004b; 2005). The scope of each volume is

different, starting from a review of sources and a wide panorama of methods of wine and oil production from the Neolithic to the Hellenistic periods and ending on two core volumes containing a large body of evidence and devoted to different aspects of the phenomenon in particular provinces of the Roman Empire with special emphasis on Roman Gaul. This specific quartet has turned out to be an invaluable companion to the study of ancient oleoculture thanks to its geographical and chronological scopes, the extent of the collected material and the learned use of archaeological, historical and environmental evidence leading to a summing up of the discussion of wine and oil production and distribution in antiquity.

In brief, the past three decades have witnessed a major step toward the comprehension of different aspects of olive cultivation and oil production, mostly owing to a dramatic increase in evidence available from the Mediterranean and the onstart of dialogue between archaeologists and specialists working on the phytogeography of the olive tree, as well as, among others, the issue of the origins and distribution of the olive tree. A major shortcoming of the present state of research is the absence of evidence from regions like Asia Minor, Jordan and Lebanon, as well as the insufficient number of excavated sites with oil facilities that could provide a credible date based on stratigraphy, thus giving firm information determining the beginning and end of each installation.

Regional studies should thus be intensified, especially in areas considered as suitable for oleoculture, but with gaps in the archaeological record.⁴ It seems that either we seldom use the reliable tools that we have or the available data are still too scarce to serve as a solid base for convincing and well documented conclusions valid on regional and interregional levels.

1.1.3 Review of olive oil production in the Greco-Roman Mediterranean

The outlined research trends concerning Mediterranean oleoculture have led to intensive explorations carried out in different areas of the region and a review of this work will be beneficial for the present study, although restrictions of space invite a short summary presentation at best. For the sake of clarity, I propose to commence from North Africa clockwise to the east, ending on the Levant, which is treated separately as the main subject of this study. As a matter of fact, the division could be justified on the grounds of differences in climatic, ecological, historical and sociocultural factors on either side of a line running down the Adriatic Sea to the Libyan Desert, dividing the Mediterranean into the Western and Eastern areas, as well as of an east-west segregation of wild olive populations characterized by two groups of mitotypes (see Terral *et alii* 2004: 72–73).

1.1.3.1 Africa [Fig. 1.1]

Studies on the origins of olive cultivation in Africa are still in a germinal phase and new discoveries are to be expected (see Brun 2004b: 185–259; also Frankel 1999: 94–98 for Libia, Tunisia, Algeria, Morocco). Even so, preliminary biogeographical observations proposed by a group of scholars working with Jean-Frédéric Terral suggest strong morphological convergence between Greek and Tunisian cultivars, the phenomenon being connected to the fact that domesticated olive was introduced by the Greeks or even more likely by the Phoenicians. Similarities noted between cultivars from Africa and those found on archaeological sites from the Iberian Peninsula should probably be explained by the continued expansion of olive cultivation in Punic colonies moving into modern Andalusia from the 10th century BC on (Terral *et alii* 2004: 73–75).

⁴ Cilicia offers a perfect example. Situated close to Antioch-on-the-Orontes, one of the *metropoleis* of the Roman world, the province was known for extensive wine production and exports. It was replete with plains suitable for grain cultivation and hills for olive groves. Even so, the archaeological evidence, as documented by J.-P. Brun, is modest and remains in sharp contrast with the pottery, especially the Late Roman Amphora 1 type widely distributed in the late antique Mediterranean, which is said to have come from here, see Brun 2004b: 94–95.

1.1.3.2 Tripolitania

Cyrenaica and Tripolitania, covering the territory of modern Libya, were never considered particularly conducive to agriculture. The only part suitable for cultivation is a narrow belt of land stretching between the sea and the desert inhabited by nomads. The rainfall rate noted there (about 150–300 mm of annual rainfall for pre-desert areas) and lighter, sandy and silty soils, were largely sufficient for olive growing. Thus, any knowledge that is available about the spread of agriculture in this area, especially the olive tree, comes from studies of rural territories of local urban centers like Apollonia, Cyrene, Leptis Magna and Sabratha, all of which developed as a result of Roman expansion, but which emerged from an earlier settlement tradition, Greek in the east and Punic in the west. Cyrenaica, benefitting of Greek settlement going back to the 7th century BC was strongly attached to Greek culture, but especially to Crete, thus there should probably be a stronger technological differentiation between Cyrenaica and Tripolitania.

Scarce evidence from Cyrenaica in the 4th–5th century AD indicates extensive

agricultural production, including olives, in the hinterland of Cyrene, Berenice and Ptolemais, in Jebel Akhdar. In the ruins of Lamluda, a village situated east of Cyrene, up to 50 oil installations were noted, but it seems that most of the facilities linked to agricultural production were located in the *gsur*, fortified farms, like Siret Gasrin el-Giamel, east of Cyrene near el-Beida, the site dating from the 5th–7th century AD. Four oil presses were added to the wine press in the first half of the 6th century (Wilson 2004: 147–149). Nevertheless, Cyrenaica never had a strategic or economic position comparable to Alexandria and Egypt or Africa Proconsularis, and local olive oil, considered to be too heavy, was not widely exported. The installations were abandoned at the end of the late antique period owing to the collapse of local administrative structures and nomadic incursions from the desert.

The state of research on selected areas of Tripolitania, which roughly shared the same natural conditions as Cyrenaica, is quite different thanks to British archaeologists who focused on the hinterland of the Roman metropolis of Leptis Magna within the frame of a broader UNESCO Libyan Valleys Survey project (ULVS) (Mattingly 1985; 1988a). It was demonstrated that the urban elites invested considerable money not only in public architecture, but also in agricultural production concentrated in farms scattered across the hinterland of the city (see, e.g., Kolendo 1986). The Jebel Tarhuna survey recorded at least 262 presses, some of them for wine, but mostly for oil. Judging from an analysis of surface pottery collection, there was a major increase in the number of sites from the 1st century AD on. Most of the sites were clustered along major Roman trackways to facilitate transport. The region was also known for the production of containers suitable for exporting oil (Tripolitanian I and Tripolitanian III amphorae). These containers, bearing stamps that clearly showed an association with prominent urban families, have been found at Rome in contexts from the 1st century AD.

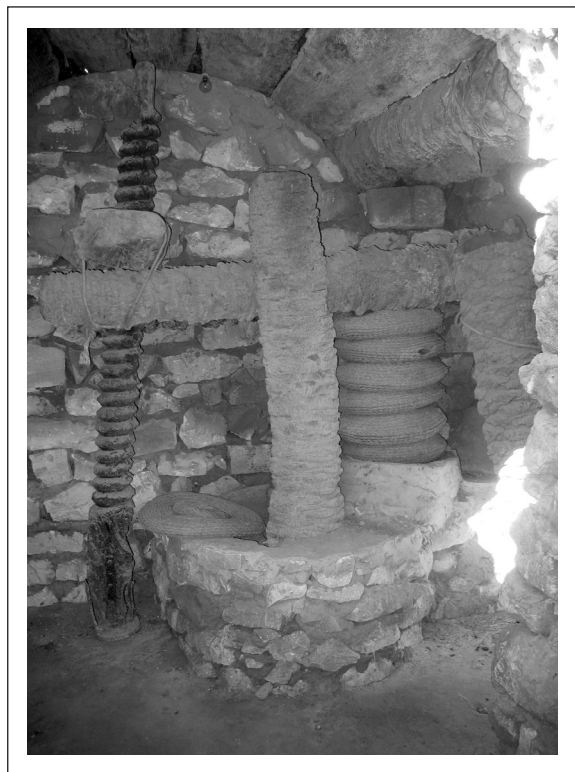


Fig. 1.1. Traditional oil press at Guellala in Tunisia

David J. Mattingly estimated that the 262 presses from Jebel Tarhuna could have produced annually between 1,310,000 and 2,620,000 liters of olive oil, this when the annual consumption of the city was estimated at approximately 1–1.5 million liters. Some of the surplus could have been intended for military contingents stationing on the desert border, as indicated by the content of Latin ostraca from the mid-3rd century AD found in Bu Njem. The documents confirmed, among others, a consignment of 210 liters of grain and 210 liters of oil brought to the fort by a certain Macargus (for the ostraca, see Marichal 1979; 1992). It was also suggested that the farms were usually kept by tenants and at least a part of this population was involved in a market economy, to produce a surplus in good years. Sources suggested also a resettlement of the local Berber population in the early period of the Roman presence (1st century AD) from the coast to the semiarid zone on the fringes of the desert and its involvement in agricultural production, including olive oil (Brun 2004b: 188).

1.1.3.3 Africa Proconsularis [Figs 1.2–1.3]

Africa Proconsularis, corresponding to parts of modern Tunisia, and stretching in the south to the aligned cities of Thelepte, Sufetula (Sbeitla) and Thysdrus (El Djem), had suitable conditions for agriculture. Olive cultivation here is clearly divided between the Punic and the Roman periods. The domesticated olive was introduced by the Greeks or more probably by the Phoenicians (Zohary, Hopf 1993: 136). Once planted near Carthage, it was propagated by the Punicians elsewhere in the Western Mediterranean, although archaeological evidence for the early period of olive tree propagation in the Punic world is rather scarce (on the olive tree in Punic Africa, Wolff 1996). An oil press consisting of a lever-and-weights system with counterweight for a windlass was discovered in Gammarth near Carthage. It seemed to be a part of a wealthy Carthaginian farm destroyed during the third Punic war (149–146 BC) (Brun 2004b: 187–191).

Ancient authors reported this issue in contradictory manner. Herodotus (*Histories*, 4.195,1) writing in the 5th century BC spoke

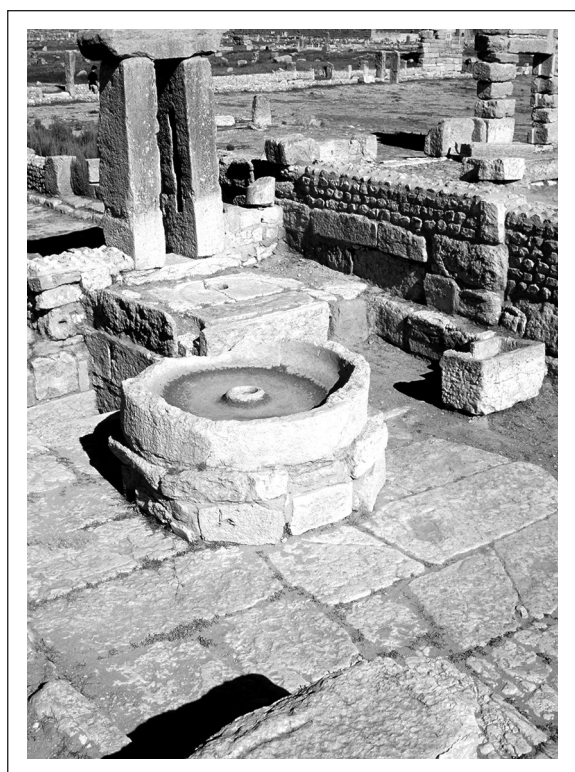


Fig. 1.2. Late antique oil installation at Sufetula (Sbeitla)



Fig. 1.3. Press beds from a late antique oil installation at Sufetula (Sbeitla)

of olives on the Island of Cirannys (Kerkennah Islands), while Diodorus Siculus (13.81.4–5) mentioned Carthage in the 5th century BC importing olive oil from Sicily owing to the limited spread of olive cultivation in Africa at the time. Perhaps the discrepancy between the two accounts can be explained, if we assume that Herodotus was referring to wild olives, and not cultivated ones. Already in the end of the 4th century BC olive groves covered the fertile plains of Cap Bon (Diodorus Siculus 20,8,4). The significance of the olive tree in Punic agriculture is bone out by the achievements of native Punic agronomists. Twenty-eight books on agriculture, written between the mid-3rd and the mid-2nd century BC by Mago, pertaining, among others, to olive-tree grafting techniques, were translated into Latin, following a decision of the Senate after the destruction of Carthage in 146 BC. Frequent invocation of Mago's heritage by Roman writers of the

Republic and early imperial periods confirmed the impression of its particular popularity, despite the hostility between the Romans and the Carthaginians (Cato, *De agri cultura* 17,112,125ff.; Columella, *De re rustica* 17; Pliny, *NH*, 17,93, 18,22–23).

Carthaginian olive groves were destroyed by order of Scipio Emilianus, but were soon rebuilt. There can be no question as to this considering the contribution of three million pounds of olive oil that Caesar imposed on Numidia following the struggle with Pompeian opponents (Plutarch, *The Life of Julius Caesar*, 55). The process of rebuilding the agricultural potential of Africa, including olive cultivation, is well illustrated by the results of a field survey conducted by R. Hitchner and his team in the remote area of Cillium (Kasserine) in southern Tunisia, where 42 oil facilities were recorded. The authors suggested a density of 1.4 presses per km² and some 100 presses for



Fig. 1.4. Roman-period oil press at Bir Sgaoun in Algeria, southeast of Tebessa

the whole area surveyed (approximately 80 km²) (Hitchner, Mattingly 1991; Mattingly, Hitchner 1993; hundreds of oil installations in different regions of Tunisia were reported by Brun 2004b: 204–229). The considerable expansion of olive tree cultivation into the highlands of Africa Proconsularis, possible due to investments made by rich landowners, is to be explained by Rome's increasing demand and the system of the *annona* linking Africa with Rome is witnessed by 4th century AD ostraca from excavations in the circular harbor of Carthage (Peña 1998).

As in Libya, the oil installations situated usually in farms or small farmsteads belonged to the lever-and-weights type for the most part and were equipped with stone orthostats anchoring the beam and the windlass, and flat crushers of the *mola olearia* type. Beside the huge installations belonging to large rural estates, like that from Henchir et-Touil, many presses associated with individual farms seem to suggest a system of production founded on small landowners and/or tenants. The scale of business transactions in Vandal Africa, concluding deals even on one olive tree, is well described in the so-called Albertini Tablets, ostraca containing purchase contracts dated to AD 493 and 494, which mention respectively 20, 4 and 11 olive trees (Mattingly 1989b; Brun 2004b: 206). However, this image does not necessarily apply to the previous period of Roman domination in the province.

1.1.3.4 Numidia and Mauretania

[Figs 1.4–1.9]

Numidia, a belt of land touching to the Atlas mountains, entered the orbit of Roman influences in the second half of the 1st century AD. Scarce information referring to oil production comes from surveys conducted during recent decades, like the one in the mountainous region between Timgad and Lambesis, during which 175 oil presses or their elements were registered (Morizot 1993). It seems more likely, however, that the lack of evidence for oleoculture in Roman Numidia does not reflect the actual position of this branch of agriculture, but reflects again the

insufficient state of archaeological research, as evinced by the example of Madaura.

Much more abundant material has been preserved in Roman Mauretania, divided under Claudius into Mauretania Caesariensis in the east and Mauretania Tingitana in the west. The ancient kingdom of Juba II offered favorable conditions for cultivating grain, grapes and olives, especially in the hilly country squeezed between the coast and the Atlas mountains. Two Roman-period *villae* are known from Tipasa and nearby Nador. They represent typical suburban complexes furnished with wine and oil presses, although a proper identification of their initial functions remains elusive (Brun 2004b: 239–244). A survey of the area of Cherchel produced rather modest results in the form of the discovery of three *villae* equipped with a few press installations, but at least 88 stone blocks identified as counterweights from oil presses were noted in the more remote rural areas (Leveau 1984; 1985). Yet the most telling illustration for a highly specialized and well developed olive oil production in Mauretania Caesariensis is



Fig. 1.5. Beam counterweight from Cherchel in Algeria



Fig. 1.6. General view of late antique oil installation at Madaura in Algeria



Fig. 1.7. Pressing area in late antique oil installation at Madaura in Algeria

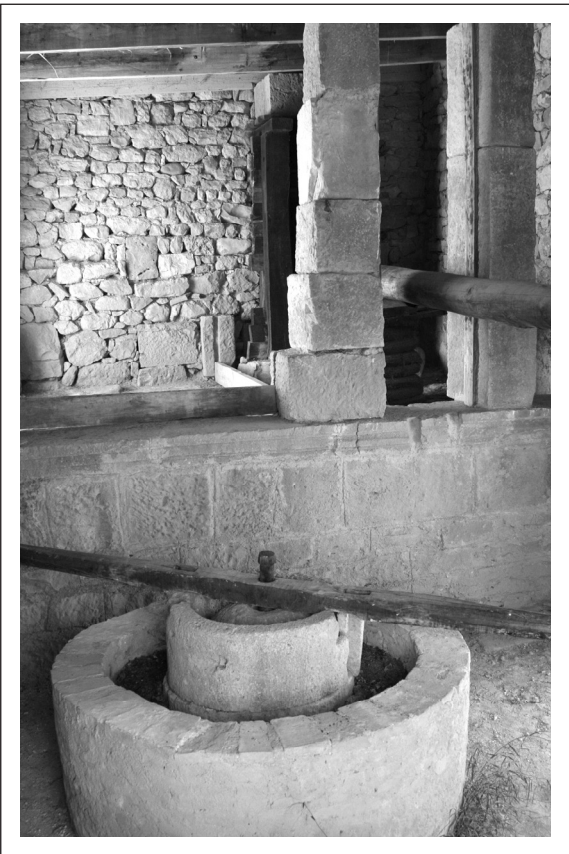


Fig. 1.8. Crushing basin in reconstructed oil installation at Volubilis in Morocco

offered by Volubilis, where 55 facilities were located inside wealthy houses, integrally connected with the architecture (Akerraz, Lenoir 1982). At least some of them were dated to the 2nd century AD and can be interpreted as evidence for economic forethought with local elites aiming to maximize their income based on what was the mainstay of the local economy.

General characteristic

A general characteristic of the African oil presses can be drawn up based on the evidence gathered so far. There is very limited knowledge of simple, rock-cut installations that are associated in other regions with common wine and oil production by the lower classes of society (e.g., rock-cut presses identified near Azeffoun in Algeria, Brun 2004b: 239). Sophisticated installations were much more numerous, as the above review of the evidence has demonstrated. Lever installations with windlass and counterweight predominated, continuing apparently without any technological changes for many

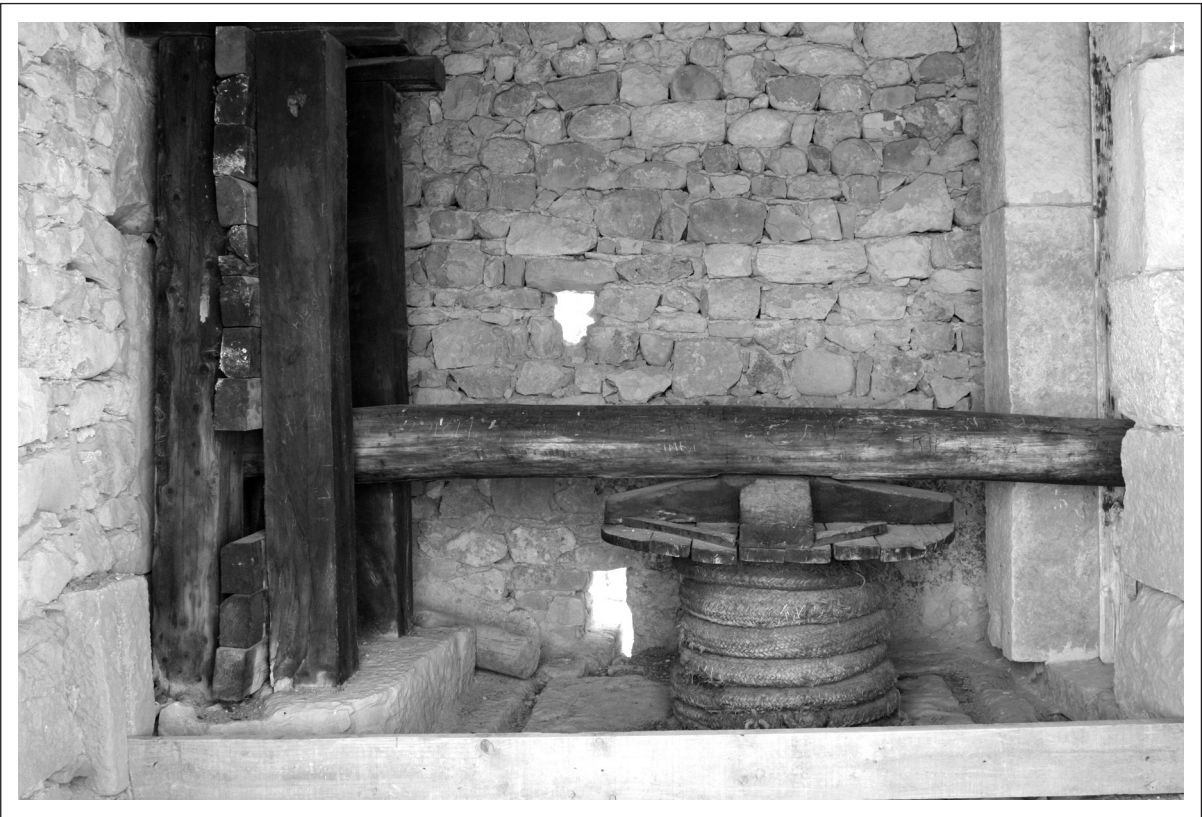


Fig. 1.9. Reconstructed lever press installation at Volubilis in Morocco

centuries (Mattingly 1996a). In many cases from Tripolitania, Africa Proconsularis and Numidia, the lever was anchored to massive stone orthostats (Latin *arbores*), set into a base and capped with a lintel block. Similar solutions were noted only on Cyprus and in Phoenicia. It is also striking that lever-and-screw presses, so popular in many regions of the Mediterranean during Late Antiquity, were recorded in Africa only in Mauretania Tingitana, close to Spain where screw-weights were much more popular. As for crushers, they were generally of the *mola olearia* type, shallow and flat bottomed, and operated by humans (Mattingly, Hitchner 1993). *Trapetum*-type crushers were noted, in limited number, in regions considered generally as being under direct Punico-Phoenician influence, in Cap Bon and the Dougga and Thuburbo Maius region (Brun 2004b: 209, 212).

1.1.3.5 Baetica and Tarraconensis

The Iberian Peninsula, which was under Punic domination for many centuries, became Roman as a result of gradual conquests between the 3rd and 1st century BC. The natural conditions were favorable for olive tree cultivation everywhere with the exception of the high mountains in the central part of the peninsula, but the true “olive land” was in the south (for a synthesis of wine and oil production in Roman Spain, Brun 2004b: 261–302). The olive tree appears to be indigenous to the country. Athracological evidence from several sites across Spain, especially Cova de l’Esperit, suggest that wild olives were used mainly as fuel by the local population already in the Mesolithic and early Neolithic. Domesticated cultivars of the olive tree were introduced in the 1st millennium BC, first by the Phoenicians developing local fruit tree cultures around their trade centers, such as Carthago Nova, then by the Romans (see Terral 1999: 103–112; see also Terral, Arnold-Simard 1996; Terral 2000). Despite the absence of archaeological examples of presses, oil production in Phoenician Spain is suggested by the local production of amphorae dated

to the 7th century BC, closely related to Phoenician examples intended for olive oil transport (Brun 2004b: 193).

With the advent of Roman rule oil production increased, competing with wine production to become the dominating culture. The example of Baetica and the survey of the valley of Guadalquivir river was already evoked (see above, page 22). Oil-producing estates connected with *figlinae* producing containers (Dressel 20 amphorae) and linked to the rich senatorial families have left scarce archaeological remains and only a few have been excavated to deliver more accurate chronological data (although a detailed account of business concluded by these families and estates can be reconstructed based on a study of amphora stamps, e.g., Jacques 1990). Nevertheless, it is safe to assume that this activity, reflected in millions of amphorae found on Monte Testaccio in Rome, peaked in the late 2nd and 3rd centuries AD.

Technological characteristics of oil producing installations considered, the province can be said to be a region of innovation. Most of the known presses from the 1st or 2nd century AD was of the lever-and-weights type with windlass system. They were replaced with screw-weights starting from the 2nd century AD, the new system dominating the Baetica and Lusitania industry during the next few centuries. Crushers were mostly of the usual *mola olearia* type with shallow bottom, although *trapeta* are known from Baetica and Tarraconensis, near Carthago Nova (Brun 2004b: 273).

1.1.3.6 Gallia Narbonensis

The zone of olive tree cultivation in Gallia was limited by environmental conditions, that is, temperature, soils and rainfall, to the coastal belt of Gallia Narbonensis, stretching to the east and west of Massalia (Marseille). The conditions there were favorable for oleoculture, but the prevalence of viticulture in Gallia is borne out by ancient written accounts as well as archaeological research. Wine was produced and consumed locally and only later, after the conquest of Massalia by

Caesar in 49 BC, it started to be exported on a limited scale. Recent environmental research combined with archaeological observation have suggested, however, that olive tree cultivation was apparently indigenous to the region well before the Roman period (Leveau *et alii* 1991; Leveau 2003; dynamics and development of oleoculture in Gallia Narbonensis, for example, Leveau 2000: 111–113). The cultivation of the wild olive as suggested by some authors would have been supplanted by the introduction of the domesticated olive by the Greek settlers of Massalia, as recounted by Strabon.

Surveys by Jean-Pierre Brun in the 1980s indicated that oil was being produced in the eastern part of Gallia Narbonensis from the 1st century AD and continued to operate during the 2nd century, to decline during the 3rd century and be revived in the early Middle Ages (Brun 1986). This production was intended most probably for a local market, but for all practical purposes it had to be replenished with oil imported from other regions.

Most of the evidence for olive oil production in Gallia Narbonensis came from field surveys and is limited to isolated examples of counterweights and crushers (58 presses and 50 counterweights in the department of Var, see Brun 1986). The olive tree was cultivated in the region parallel with the development of Greek Massalia, but production on a larger scale developed during the Roman period. The rare excavated remains of oil installations are associated with large estates or farms that might belong to these *villae*. A good example is offered by the *villa* of Saint-Michel in La Garde (department of Var) where a set of oil presses was installed in the beginning of the 1st century AD in two parallel rows of rooms abutting a courtyard. Preserved stone bases indicate that olives were crushed in a *trapetum*-type crusher and pressed in a lever-and-weights type of installation with windlass system. The absence of other stone elements characteristic of oil presses could be explained by better accessibility to wood used for the lever beams, as well as for the vertical *arbores* for mounting, which can be considered a parallel for

monolithic stone orthostats known from Africa (for a review of the state of research, Brun 2005: 78–103; see also Brun 1993a). Generally speaking, the domination of the lever-and-weights press system in Gallia Narbonensis is obvious, but the evidence for crushing apparatus is strikingly modest. A few *trapeta* were registered at Saint-Michel in La Garde and Costebelle and a *mola olearia* type of crusher was discovered at Candéou (Brun 2005: 319). The use of the screw-weight system appears to have been limited to some wine installations as demonstrated by the example of the *villa* of Les Toulons in Rians from the beginning of the 3rd century AD (Brun 2005: 49–52).

1.1.3.7 Italy

The issue of the presence of olive trees in Italy is as complex as in the case of Baetica or Gallia. The olive or at least the wild olive may have been known locally already during the Bronze Age and later (the question conveniently summarized in Brun 2004b: 176–179). Pliny was mistaken therefore when he declared that the olive tree was absent from Italy, Spain and Africa before the time of Lucius Tarquinius Superbus (Pliny, *NH* 15,1). It has been suggested that the domesticated olive was propagated by Greek settlers coming to Italy (against, Foxhall 2007: 14), but many scholars tend to accept the view that local oleoculture was stimulated already by the second Punic war. Shortly it became an emblematic plant, on par with the grapevine, of the late Republic and early Empire and like it, became a mainstay of many Roman family fortunes. It is to these users that the famous agronomists of the time, men like Cato, Varro and Columella, addressed their works. The image emerging from archaeological research concurs, at least in part, with what should be expected after reading the written sources. Most oil facilities in Campania or Latium were connected to great estates organized around *villae*. It suggests a surplus-oriented production, but conclusions could be premature as the humble remains of smaller farms or villages have seldom received as much attention in Roman rural archaeology as the spectacular evidence of the opulent life of the elites.

A review of discoveries leaves no doubt that most of the oil installations from the Roman Republic and imperial Latium and Campania occurred together with wine facilities and belonged to a lever-and-weights type with windlass (Brun 2004b: 7–59). The first presses for oil or perfume production were discovered already in the end of the 18th century in places like Casa dei Miri in Stabiae, for example. Typical installations, like the ones from Villa de la Pisanella in Boscoreale, containing a *trapetum*-type crusher, were discovered in the following years. Elaborate systems of oil presses have been recorded in Sicily, Apulia, Lucania, Picenum and Etruria. A large *villa* from Settefinestre, built in the third quarter of the 1st century BC, appears to follow to the dot Vitruvius's instructions on how to arrange an estate, including oil press; it could be that it was modeled according to the most current trends (Carandini [ed.] 1985). The evidence from Liguria is by contrast rather scarce, merely some small rural installations, like that from Mont-Bastide in the Alpes-Maritimes, far from the great estates of Latium or Campania (Arnaud 2001). Viticulture seems to have predominated in the regions of Emilia, Venetia and Transpadana, although oleoculture has been attested in the lattermost region. The oil installations from Istria are especially well known due to extensive archaeological research. Indeed, the peninsula was extensively exploited by a network of large estates from the Roman imperial period. Both Pliny (*NH* 15.8) and Palladius (*Opus agriculturae* 12.18) praised the good quality of locally produced olive oil. The production was intended for Rome and the Danubian provinces, and transported in amphorae classified as being of type Dressel 6B. A telling example of a *villa* involved in oil production comes from Barbariga. The estate there was equipped with ten presses operating between the 1st and 6th centuries AD and belonging probably to a senatorial family (Matijašić 1982: 58–59; see also Matijašić 1998: 125 and 185; more on oil production in the region in Matijašić 1993).

From a technological point of view, Italian examples show a prevalence of lever-

and-weights presses with windlass, paired with *trapetum*-type crushers, described in detail by Cato. The oldest example of a lever-and-screw press, dated to the first half of the 1st century AD, was uncovered at Posto villa at Francolise in Campania (Cotton 1979).

1.1.3.8 Balkans

Conditions were favorable for olive trees in the Balkan Peninsula in very few regions, excluding almost totally Pannonia, Dacia and Moesia, where the predomination of grape cultivation is attested by archaeological discoveries (Brun 2004b: 61–72). By contrast, the mountainous Dalmatian coast, cut by rivers flowing into the sea, was a perfect region for both viti- and oleoculture. Traces of the oil production are known from Salona, where oil presses dated to the 5th–6th century AD were excavated. The lever-and-weights type of press with windlass predominated among the known examples, even in late antiquity.

1.1.3.9 Greece

Contrary to the widespread stereotype linking Greek culture closely with vine and olive, the state of research seems to suggest a much smaller scale of oil production than was the case in Italy or Africa. The pollen evidence from Greece and the Aegean is inconclusive: the earliest attestation is from Crete about 3900 BC and an increase of olive pollen is observed around 1300 BC in Macedonia and southwestern Greece (Runnels, Hansen 1986; Sarpaki 1992: 70). It seems, however, that the first archaeological evidence for olive processing comes from the Late Bronze Age or even later and is linked by some authors to Near Eastern origins (Curtis 2001: 272). The early installations composed of a stone spouted press bed on top and a jar or *pithos* as the lower receptacle, their function is difficult to discern, as they may have been used for both grapes and olives.

The agriculture of classical Greece, which operated on a smaller, domestic scale, did not need an elaborate and efficient technology, and archaeological discoveries seem to reflect this situation (for an up-to-date comprehensive

introduction to oleoculture in Greece, see Foxhall 2007; see also Brun 2004b: 73–86). Early oil production is presented usually on the example of sites like Olynthos in Macedonia, where the North Hill, which was developed in the later 5th century BC, included multifunctional installations, for wine and oil, used also perhaps for dyeing and fulling (House a XI 10); possible oil presses were uncovered in House a VI 8 and a VI 10). The ambiguity of interpretation derives from simple construction and poor state of preservation. Vats, simple weights and mortises for beams are hardly enough to determine usage as oil presses.⁵ The town was destroyed by Philip of Macedonia in 348 BC, thus making the Olynthos presses some of the earliest known from ancient Greece.

Similar doubts were expressed about the installations from Halieis on Peloponnesos, a city settled around 700 BC, where excavations uncovered five to eight installations in ordinary houses, interpreted as presses for oil (Ault 1999; Brun 2004b), grapes or for dyeing (Foxhall 2007: 143–148), all dated to the 4th century BC (see also Jameson 2001). One of them belonged to the lever-and-windlass type, another to the usual lever-and-weights system. Examples from Olynthos and Halieis illustrate an urban-based production, which could suggest that inhabitants owned land outside the city perimeter and were involved actively in its cultivation.

Delos is another interesting case. This important religious, political and cultural center was extensively excavated during the 20th century, recording several presses: one in street 5 and another, in House I B situated in the Stadium Quarter and dated to the late 2nd–early 1st century BC (Foxhall 2007: 161–165).⁶ a study of the press in House III O in the Theatre Quarter established that this lever-and-weights installation with

windlass operated in the 1st century BC and was abandoned not later than in the middle of the 1st century BC. Scholars were inclined to consider it as a workshop in the middle of the city meant to press olives (from as many as 650 trees) brought by several individual owners (Brun, Brunet 1997).

Generally, however, olive cultivation was fairly limited on the Greek islands in antiquity, due to environmental as much as economic reasons. The scarcity and generally incomplete character of the evidence from Greece is puzzling, but it may only reflect the state of research.

1.1.3.10 Crete

The island of Crete offers a separate and interesting chapter in the history of olive cultivation and oil production. Pollen cores from the island, like those from the Akrotiri Peninsula, indicate the presence and increasing number of olives from the Middle Neolithic to the Late Neolithic. Organic traces of the olive tree in the form of stones and twigs dating from the Early Minoan period (about 3500–2100 BC) were found in Knossos and Myrtos. In turn, finds from Late Minoan Kommos, especially large spouted press beds, attest to a change in the scale of production, from domestic to “industrial”, although the Linear a and Linear B tablets seem to suggest that already in the Middle Minoan period olives were one of the basic arboricultures on the island (Blitzer 1993). Scholars have assumed generally that viticulture appeared in Crete earlier than oleoculture, because the first unquestionable proof of oil production and consumption comes from the beginning of the Late Bronze Age or the neopalatial period (Hamilakis 1999).⁷

From 48 BC Roman Crete was a single province with Cyrenaica. The earlier tradition of oil making on the island could have been

⁵ A lever press represented on a black figure Attic *skyphos* (6th century BC) from the Boston Museum of Fine Arts (Inv. 99.525) may have been used for either wine or oil production, see Foxhall 2007: 135, Fig. 6.2. Many of the simple, domestic installations known to archaeologists from across the Mediterranean were probably multipurpose, for purely economic reasons and because of a similar production technology.

⁶ Believed by J.-P. Brun to be a perfumery establishment (Brun 2000).

⁷ According to Y. Hamilakis, wine and oil cannot be considered as indispensable elements of diet, thus he considers their consumption and usage during ritual ceremonies as a sign of belonging to the elite. See also Bunimovitz 1987; Riley 2002.

continued, but the present archaeological evidence is rather disappointing and calls for further investigations. Scattered elements of oil presses like crushers or counterweights were reported from different areas, but none of the alleged sites was excavated (Brun 2004b: 84–86).

1.1.3.11 Asia Minor [Fig. 1.10]

Well rooted in Near Eastern civilization, the Asiatic part of modern day Turkey entered the sphere of Hellenic culture through the colonization of its coasts by the Greeks, then became part of the Roman and Byzantine world. Despite favorable natural conditions, which were reported by ancient authors, oil presses uncovered in the course of archaeological discoveries are surprisingly scarce, considering the vast territory, and investigations have also been quite random.⁸

Strabo (*Geographica* 12,3,12,30) described olive groves and vineyards planted on the Black Sea coast in Pontus and Bithynia, yet archaeological discoveries accompanying this account are limited to a few crushers or counterweights found during a survey of the hinterland of Sinope (conducted since 1990) and dated generally to the Roman and Early Byzantine period (Doonan 2002; 2004: 93–118; 2010: 181).⁹ For now, the only remains of oil installations, including screw-weights, were uncovered during excavations of an amphora production center at Demirci, some 15 km to the south of Sinope. The stratigraphy recorded at the site clearly ascribes the origins of the oil facilities to a phase directly following the abandonment of pottery kilns, dated to the end of the 5th–beginning of the 6th century AD. Oil production here was subsequently abandoned after another century.¹⁰

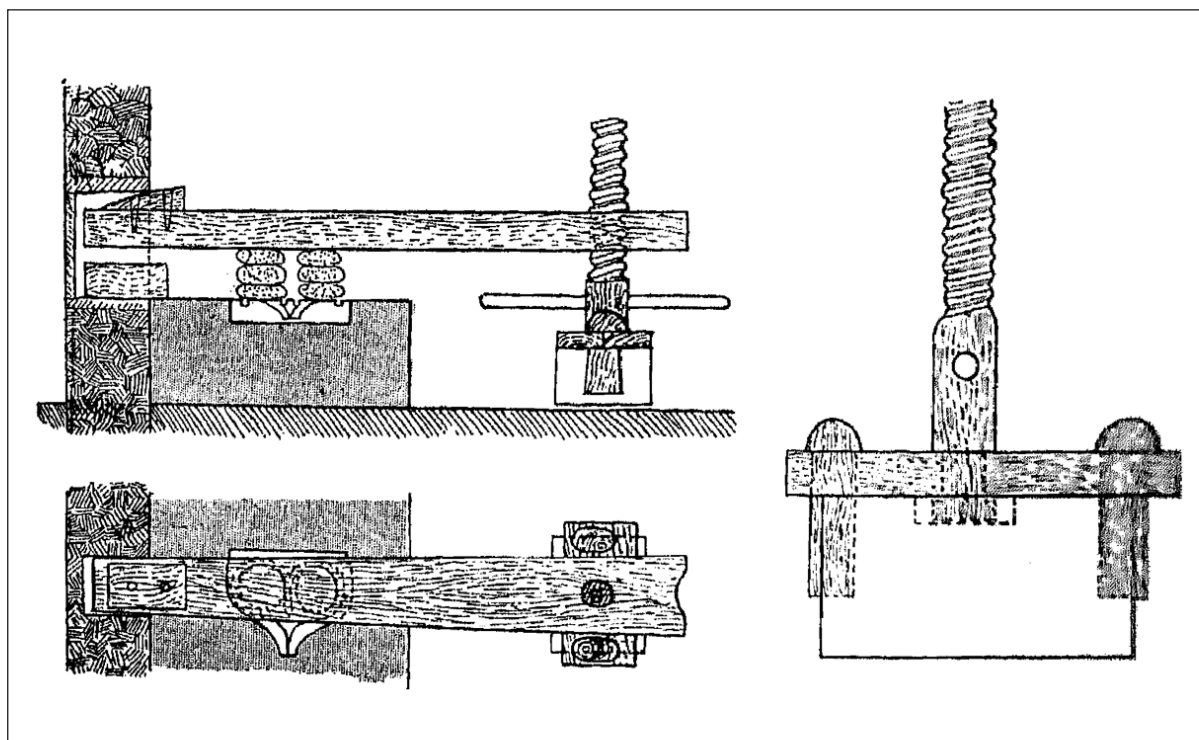


Fig. 1.10. Oil press from Arginunta on Kalymnos

⁸ Remains of olives suggest olive oil production already in Early Bronze Age Troy. Olives seem to have been replaced as a crop by flax during the Middle Bronze Age, only to return as one of the most important sources of fat in the Late Bronze Age (Riehl 1999: 63). For a synthesis of current research on olive oil production in different provinces of Asia Minor, see Brun 2004b: 91–96 and Mitchell 2005. A recent publication, Aydınoglu, Şenol [eds] 2010, which I was unable to consult, contains articles, the titles of which suggest a considerable effort in the past decade to investigate the issue in a more detailed and comprehensive manner.

⁹ Generally on the Asiatic provinces, see Brun 2004b: 91–96.

¹⁰ At least three screw-weights, two other counterweights and two presses reported in Kassab-Tezgör 2010: 73–75, Figs 41, 45, 46 and 100–101, Fig. 7.

Another significant discovery was made in Lydia and concerns the earliest oil installations documented so far in the region. Although across the sea from Greece, the presses excavated in Klazomenai in Lydia should be considered as a part of the Greek technological legacy. A room or courtyard in the western part of the city contained several pits cut into bedrock and installations to crush olives, press them and separate the oil. The oldest press, a simple lever-and-weights one, was dated to the first half of the 6th century BC. The excavators suggested that a crushing basin with rotating flat millstone was already in use during this phase, but the paved Hole 1 could be interpreted, according to Lin Foxhall, also as a settling tank. The second phase, equipped with windlass, should be attributed to the period directly preceding the destruction of the city in 530 BC (Koparal, Iplikçi 2004; Foxhall 2007: 141–143, who also puts in doubt the presence of a windlass).

In Caria, where some of the earliest discoveries of oil presses were made at the end of the 19th century, screw-weights and press beds were correctly identified, not only from the region, but also from neighboring islands, like Kalymnos, and attributed to the Hellenistic and Roman periods. Authors writing of these discoveries compared them with ethnographical observations of presses in use at the time by the local population (Paton, Myres 1898).

Another perspective on the oil production in Caria was proposed in effect of ethnoarchaeological research conducted in the Carian interior. A pronounced difference between the coastal and mountain oil industry in the Hellenistic and Roman periods resulted from more elaborate and large-scale installations in urban areas like Cnidus and Halicarnassus and simple, open air, rock-cut facilities in more remote areas. The latter were located close to olive



Fig. 1.11. Oil installation at Idalion, Cyprus, 4th century BC

groves, probably to minimize transportation costs and were intended for household consumption (Diler 2004: 57–60).

A somewhat similar picture emerges from Lycia, where rural-type rock-cut presses were registered, although with elusive chronology as well as identification, whether as oil- or as winepresses (Konecny 1998; 1999). The discovery of *trapetum*-type crushing basins could indicate the presence of presses on an industrial scale as well.

Extensive multidisciplinary research conducted on the site of ancient Sagalassos in Pisidia, combined with a survey of the town's hinterland, has revealed a number of counterweights found at an altitude of up to 1460 m a.s.l. Palynological studies have indicated the beginning of olive tree cultivation around Sagalassos about 400–260 BC, peaking from about 90 BC–AD 5 to about AD 560–620. Olives disappeared from the local landscape in the 6th–7th century AD due to a complex combination of natural, political and social factors, such as plague, earthquakes, Arab invasion and demographic decline of the city (Vermoere *et alii* 2003; Vermoere 2004; Vanhaverbeke 2003: 244–245).

Cilicia, which is an actual bridge between the Anatolian highlands and the Syrian steppe, is marked by mountains in the north and the plain in the south, gravitated toward Antioch-on-the-Orontes, the largest and the most influential economic and political city in the region, during the Greco-Roman era. It is surprising to find meager evidence of oil and wine production in this part of Asia Minor, especially in view of the better known production of containers for liquids, known as Late Roman Amphorae 1, widely distributed during late antiquity across the Mediterranean (Brun 2004b: 94–95; Decker 2009, 163–164; Rauh *et alii* 2006). An oil-press building with 5000 liters worth of storage tanks, suggesting a commercial production, was excavated at Domuztepe, a village north of Hierapolis-Castabala, developed in the later 4th century AD and destroyed in the late 5th century (Rossiter, Freed 1991). A crushing basin of the *trapetum* type was signaled in

Iotape (Blanton 2000: 25 and Pl. 3,5–6), but various elements interpreted as parts of olive oil presses identified on 42 sites during the Cilicia–Isauria survey, conducted within the frame of the *Tabula Imperii Byzantini* project (Hild, Hellenkemper 1990: 100,09), suggest that more evidence from the region would be forthcoming were it not for the insufficient research base.

1.1.3.12 Cyprus [Fig. 1.11]

Although isolated in geographical terms, Cyprus was always in the middle of the political and economic affairs in the Eastern Mediterranean. A mild climate, sufficient rainfall and high percentage of hilly landscapes made the island suitable for wine and oil production, yet its production seldom exceeded the needs of self-sufficiency.

Olive pits, wild and domesticated, were recovered from several Neolithic and Chalcolithic sites like Khirokitia, Agios Epiktetos, Lemba and Kissonerga, but failed to appear in Early and Middle Bronze Age contexts. Intensive cultivation of the olive tree began in the Late Bronze Age, parallel to urbanization and labor specialization processes, as witnessed by the large-capacity installations associated with storage facilities, like those excavated at Kalavassos–Ayios Dhimitrios in the southern part of the island (South *et alii* 1989).

The absence of oil installations from the archaeological evidence from Cypro-Geometric and Cypro-Achaic times does not necessarily mean that production had ceased. Amphorae of the Plain White type with raised handles, known, e.g., from Salamis or Tel Kabri, and linked to oil transportation by the epigraphic evidence, suggest a continuation of olive tree cultivation and its export (more in Hadjisavvas 1987; 1992; 1996; 2009; Brun 2004a: 124–129; 2004b: 96–99).

The Cypro-Classical period was marked by production growth and the introduction of some technological innovations, like the *trapetum*-type crushing basins. A perfect example of this kind of facility with three parallel lever-and-weights presses installed

in a courtyard building is known from Idalion. The building, which is interpreted as a Phoenician administrative center, was dated to the end of the Cypro-Classical or the beginning of the Hellenistic period (Hadjicosti 1997). Such elaborate installations evince central control of olive oil production by the ruling elite.

Scarce evidence from the Roman and Byzantine periods does not correspond with written sources, which described the island as flowing with wine and oil (Strabo, *Geographica* 14,5,6). Oil presses or their elements have been signaled especially from the region between Paphos and Limassol, from the sites of Kourion and Amathus, in contexts always associated with farmsteads or churches. A telling example of continued production, despite economic and political obstacles, is a press from Salamis, a lever-and-screw-weights press installed in an abandoned urban residence from the 5th–6th century. The press itself was built during the first half of the 7th century AD (Argoud *et alii* 1980).

1.1.3.13 Egypt [Fig. 1.12]

Generally speaking, Egypt lies outside the ecological range of wild olive and its arid or hyperarid climate is rather unsuitable for olive tree cultivation, unless irrigation is introduced. The most ancient olive stones hitherto found in Egypt come from Thirteenth-Dynasty Memphis (Kom el Rabi'a) and Second Intermediate Period Tell el-Dab'a in the Eastern Nile Delta, and are considered in both cases to be imported from outside the country (Murray 2000: 610; Newton *et alii* 2006: 407). Modern research in Egypt, combining traditional archaeological sources with archaeobotanical investigations, has supplied strong arguments in favor of the inception of the olive during the New Kingdom (Meeks 1993; Serpico, White 2000: 389–390). The morphometric analysis of olive stones found at 'Ain Mawanir south of Kharga Oasis (5th century BC) and at al-Zarqa in the Eastern Desert (1st–2nd century AD) shows that they are closely related to cultivars originating from the Levant, suggesting the direction from which the culture of olive tree was probably introduced to Egypt (Newton *et alii* 2006).

Contrary to the previously considered regions, Egypt offers abundant written and almost inexistent material evidence for oil production during its rich history. The picture that emerges from these sources is rather complex. First, oil in Egypt was produced from many sources other than the olive, thus it is to be expected that the presses mentioned in texts or known from the archaeological record may have served other purposes than olive oil production alone (Schnebel 1925: 302–308). The scarcity of the material evidence may be due to the relative fragility of installations made of wood, which was always a precious material that was used and reused over the centuries for many different purposes, but the cases of neighboring Cyrenaica and Tripolitania with similar conditions do not lend credence to this idea. On the other hand, the Egyptian written evidence, mostly papyri documents, gives unmatched insight into entirely different aspects of oil production, especially regarding economics and social aspects of production (Sandy 1989; Morelli 1996).



Fig. 1.12. Rigid frame direct-pressure screw press from the Monastery of St Anthony in Egypt

The modest archaeological evidence does not permit a reconstruction of either the geography, chronology or technology of ancient Egyptian olive oil production. It seems, however, that production in the Hellenistic and Roman period concentrated in two main regions: Fayum and Memphis, and in Middle Egypt (Serpico, White 2000: 401). J.-P. Brun signaled several presses or rather only isolated elements scattered across Egypt: a crushing basin of the *mola olearia* type in Byzantine Marea, crushing basins and bases of direct-screw presses in Roman Karanis in Fayum Oasis, which is attested as an important production center for olive oil in the papyrological, collection of crushing basins (*mola olearia*) and counterweights from ancient Tebtynis in the same oasis where they seem to have operated between the 2nd and 10th century AD, sites in Middle Egypt like Akoris near Oxyrhynchos where Japanese excavators reported ten direct-screw presses operating between the 4th and the 6th century AD, remains of oil production at Medinet Habu, Esna, Dendera and Philae (Brun 2004b: 143–183; Tsujimara 1995, *non vidi*). Oil presses uncovered in the monasteries of Apa Jeremias in Saqqara or Saint Simeon near Aswan reflect on olive oil production in ecclesiastical context. Generally speaking, Egyptian installations seem to be dominated by direct-screw presses and crushing basins of the *mola olearia* type. Despite all these examples, the material evidence of olive oil production in Egypt is far from systematic and certainly requires further research. A good illustration of this need comes from a recent survey of the Eastern Marmarica, near Marsa Matruh, which focused on the pottery production centers located there, mainly from the Roman period through the 4th century AD; researchers involved in this study sought to explain the large quantities of containers found in what is a deserted landscape today by referring to the known agricultural production of the region in antiquity, namely wine, barley, figs but also olives and olive oil (Rieger, Möller 2011).

The picture of olive tree cultivation and oil production emerging from a reading of the written evidence, perhaps one-sided due to the nature of the preserved documents, is that of large estates owned by members of the elite, such as Apollonios, finance minister to Ptolemy II. Documents from the so-called Zenon Archive, kept by Apollonios's employee and private secretary, give a detailed account of his business affairs between 260 and 229 BC (on olives and olive oil in this archive, see Wittenburg 1983). A letter from 255 BC, addressed to Zenon, ordered him to choose at least 3000 olive shoots from Memphis and prepare it for his estate near the village of Philadelphia in Fayum oasis, confirming the considerable efforts that were undertaken in Ptolemaic Egypt to make the cultivation of the olive tree more popular (P.Cair. Zen. 2 59184, written before 8 October 255 BC). The Zenon Papyri speak of imports of olive oil to Egypt from abroad, including Ptolemaic Palestine and Phoenicia; one is "white oil" mentioned in P. Cair. Zen. 1 59013, about 260–258 BC, and the other, *epipleusantoi epi tou elaiou* transporting oil, referred to in a letter from Crotos to Zenon, P.Cair. Zen. 1 59077, 8 May 259 BC (Durand 1997: Nos 13 and 49 respectively). It should be remembered, however, that in an effort to protect the local market the Ptolemies imposed strict limits on olive oil imported into the country (Sandy 1989: 24–29).

As far as the papyrological sources indicate, in late antique Egypt the olive tree continued to be associated with the large estate, an observation coinciding also with its rehabilitation, even if slightly over generalized, by J. Banaji (2001). But the situation seems to have been more complex and one should consider a number of smaller owners or simple tenants leasing olive groves for a limited period of time, e.g., contract for five years signed in Karanis in AD 300 (Porges 1961). Oil in general, and more specifically olive oil, was part of the payment to soldiers and state officials in reward for their services, distributed usually on a daily or monthly basis (telling examples in Gascou,

Worp 1990; Mitthof, Papathomas 1994; see also Morelli 1996: 139–152, for more general remarks).

Any account of the olive in Egypt will not be complete without mentioning the key role of vegetable oils. The local climate was better suited to raising castor, sesame, linseed and safflower, which filled the basic demand for oil in the diet (Sandy 1989: 35–71 and 83–87; see also Serpico, White 2000: 391–398). There is also some ambiguity concerning the word *elaion* found in the written evidence. It means “oil” without any specification, but even if most scholars are inclined to admit the basic meaning of *elaion* as “olive oil”, it does not change the simple fact that the olive tree and its products played a rather secondary role in Egypt compared to many other regions of the Mediterranean.

1.1.3.14 Towards a comprehensive view of olive oil production in the Greco-Roman Mediterranean

This brief geographical review of the regions constituting the world of the Greeks, Phoenicians and Romans may appear fairly disappointing and the knowledge is hardly uniform. While olive tree cultivation and oil production in the provinces of the Roman Empire, such as Baetica, Gallia Narbonensis, Africa Proconsularis and the Palestines is relatively well understood from the statistical, technological and chronological perspective, much less can be said paradoxically of Italy, Tarraconensis, Greece and Syria where the evidence, even when substantial, is limited in extent and thus incapable of sustaining general conclusions, and regions like Asia Minor, Phoenicia, Arabia, but also Numidia and Mauretania and some of the Balkan Peninsula which are completely unknown and no conclusions can be drawn based on the minimal data available. With very few exceptions, the concentration of disposable sources is nowhere satisfactory enough to support conclusions credible on a regional level and, it follows, on the superior, Mediterranean level. The discussion continues to center on more or less convincing theories.

Substantial progress on understanding the technology of oil production was made during the past century. Analyzing the writings of Roman authors, compared with ethnographical observations and current archaeological discoveries led to Gustaff Drachmann studying ancient technologies, Jean-Pierre Brun establishing a typology of presses on a Mediterranean level and Rafael Frankel on a regional one, for example. Important progress was made in understanding the chronology and geography of inventions, like the screw-weight press or *trapetum*-type crushing basin, but still there are details that need to be elucidated.

It would be irritatingly banal to say that more surveys and excavations are necessary, but even so one should emphasize the need for well planned, stratigraphically controlled excavations of selected oil presses, paired with prospection aimed at recording all the preserved evidence of agricultural activities in a given region. Cases are still too numerous of presses being excavated without the excavator understanding the broader settlement context. Chronological interpretation would also benefit from this, being based too often still on elusive typological comparisons or an analysis of surface pottery. The impression is also that scholarship has focused hitherto on the more spectacular and hence easier to document aspects of the olive oil industry, marked by presses made of wood and stone, housed in solid buildings that demanded considerable investment. Ethnographic research conducted concurrently in the same regions of the Mediterranean has demonstrated the simultaneous use of more primitive and less effective, but also much less expensive rock-cut presses that responded better to the needs of local communities. Finally, the incompleteness of accessible evidence has left a comprehensive analysis of the subject vulnerable to criticism. Oil manufacturing was a complex activity demanding the involvement of many people of different skills on different levels of social life, yet we know very little about the functioning of oil facilities in local societies, as well as about the impact of oil production in antiquity on the functioning and relationships of a more complex sociological organism exceeding the borders of microregions.