

volume 10/2020

SAP Società Archeologica s.r.l.

Mantova 2020

# pca

#### EDITORS

Gian Pietro Brogiolo (chief editor) Alexandra Chavarría (executive editor)

ADVISORY BOARD

Martin Carver (University of York) Matthew H. Johnson (Northwestern University of Chicago) Giuliano Volpe (Università degli Studi di Foggia) Marco Valenti (Università degli Studi di Siena)

ASSISTANT EDITOR

Francesca Benetti

#### EDITORIAL BOARD

Paul Arthur (Università del Salento) Margarita Díaz-Andreu (ICREA - Universitat de Barcelona) José M. Martín Civantos (Universidad de Granada) Girolamo Fiorentino (Università del Salento) Catarina Giostra (Università del Salento) Catarina Giostra (Università Cattolica del Sacro Cuore di Milano) Susanne Hakenbeck (University of Cambridge) Vasco La Salvia (Università degli Studi G. D'Annunzio di Chieti e Pescara) Bastien Lefebrre (Università degli Studi G. D'Annunzio di Chieti e Pescara) Bastien Lefebrre (Università degli Studi G. D'Annunzio di Chieti e Pescara) Alberto León (Universidad de Córdoba) Tamara Lewit (University of Melbourne) Federico Marazzi (Università degli Studi Suor Orsola Benincasa di Napoli) Dietar Quast (Römisch-Germanisches Zentralmuseum Mainz) Andrew Reynolds (University College London) Mauro Rottoli (Laboratorio di archeobiologia dei Musei Civici di Como) Colin Rynne (University College Cork)

**Post-Classical Archaeologies** (PCA) is an independent, international, peer-reviewed journal devoted to the communication of post-classical research. PCA publishes a variety of manuscript types, including original research, discussions and review articles. Topics of interest include all subjects that relate to the science and practice of archaeology, particularly multidisciplinary research which use specialist methodologies, such as zooarchaeology, paleobotany, archaeometallurgy, archaeometry, spatial analysis, as well as other experimental methodologies applied to the archaeology of post-classical Europe.

Submission of a manuscript implies that the work has not been published before, that it is not under consideration for publication elsewhere and that it has been approved by all co-authors. Each author must clear reproduction rights for any photos or illustration, credited to a third party that he wishes to use (including content found on the Internet). For more information about **ethics** (including plagiarism), copyright practices and guidelines please visit the web site www.postclassical.it.

PCA is published once a year in May, starting in 2011. Manuscripts should be submitted to **editor@postclassical.it** in accordance to the guidelines for contributors in the webpage http://www.postclassical.it

*Post-Classical Archaeologies*' manuscript **review process** is rigorous and is intended to identify the strengths and weaknesses in each submitted manuscript, to determine which manuscripts are suitable for publication, and to work with the authors to improve their manuscript prior to publication.

This number will be entirely in **open access**. For more information on our open access policy please visit the web site www.postclassical.it.

How to quote: please use "PCA" as abbreviation and "European Journal of Post-Classical Archaeologies" as full title.

**Cover image**: Giorgio de Chirico, *L'archeologo*, 1927, Monaco, private collection (reproduced with permission of the Fondazione De Chirico).

"Post-Classical Archaeologies" is indexed in Scopus. It was approved on 2015-05-13 according to ERIH PLUS criteria for inclusion and indexed in Carhus+2018. Classified A by ANVUR (Agenzia Nazionale di Valutazione del sistema Universitario e della Ricerca).

DESIGN

Paolo Vedovetto

PUBLISHER SAP Società Archeologica s.r.l. Strada Fienili 39/a, 46020 Quingentole, Mantua, Italy www.archeologica.it

Authorised by Mantua court no. 4/2011 of April 8, 2011

For subscription and all other information visit the web site www.postclassical.it.



volume 10/2020

	CONTENTS	PAGES
EDITORIAL		5
DOSSIER - ARCHAEOLOGY: FROM THE AGENDA 2030 TO THE WORLD POST-COVID		
G.P. Brogiolo,	<b>A. Chavarría Arnau</b> Archeologia e sostenibilità nell'era post (?) COVID-19	7
P. Gould	Resilience and innovation: an economic contemplation on public-facing archaeology after COVID-19	21
P. Gelabert	Past diseases: present questions and future perspec- tives from an archaeogenetic approach	35
C. Holtorf	An archaeology for the future: from developing contract archaeology to imagining post-corona archaeology	57
P. Everill	Quo vadis? What next for British archaeology?	73
D. Henson	Archaeology's place in education: under threat or an opportunity?	91
A. Rey da Sil	va Sailing the waters of sustainability. Reflections on the future of maritime cultural heritage protection in the global sea of development	107
R.J. Williams	<b>con, M. Nevell, B. Humphrey-Taylor</b> Increasing the resilience of cultural heritage using novel technologies: the perspective from a UK volunteer-led site	135
C. Rynne	Waterpower and sustainable energy in 19 <sup>th</sup> -century Europe and the USA. An archaeology of the water turbine	147
RESEARCH - RETHINKING THE LATE ANTIQUE COUNTRYSIDE		
C. Corsi	The villa- <i>mansio</i> in the Late Antique Mediterranean: between historiographical creation and archaeological impotence	165
T. Lewit	" <i>terris, vineis, olivetis</i> ": wine and oil production after the villas	193

N. Conejo	Coins and <i>villae</i> in late Roman Lusitania: collapse of the Roman currency economy?	219
A. Carneiro	Adapting to change in rural Lusitania: zooarchaeological record in the Horta da Torre Roman villa (Portugal)	247
R. Montagne	tti, D. Pickel, J. Wilson, F. Rizzo, D. Soren New research in the Roman villa and late Roman infant and child cemetery at Poggio Gramignano (Lugnano in Teverina, Umbria, Italy)	279
J.M. Nolla, M	. Prat, A. Costa, N. Corominas, L. Palahí La visualiza- ción de los visigodos en Gerunda y sus entornos. Datos significativos de un problema sin resolver	303
BEYOND THE	THEME	
N. Tsivikis	Moving beyond the Invisible Cities of Byzantium	325
P. Todaro, G.	Barbera, A. Castrorao Barba, G. Bazan <i>Qanāts</i> and historical irrigated landscapes in Palermo's suburban area (Sicily)	335
S. Bianco, E. A	<b>Ilué, S. Riera Mora, A. Fernández, M. Soberón Rodríguez,</b> <b>C. Miró Alaix</b> The evolution of wood fuel exploitation in the El Born Market site (Barcelona, Spain) during the 15 <sup>th</sup> -18 <sup>th</sup> centuries starting from charcoal analysis	371
A.R. Staffa	La transumanza in Abruzzo fra tarda antichità e medioevo	401
P. Marcato	Analisi diacronica del paesaggio storico delle malghe di Brentonico (TN) tra XIX e XXI secolo	449
REVIEWS		473
E. Dodd, <i>Romal</i> ranean: (Turkey)	n and Late Antique Wine Production in the Eastern Mediter- A Comparative Archaeological Study at Antiochia ad Cragum and Delos (Greece) - by <b>T. Lewit</b>	
M. Cavalieri, F. insediati e medioe	Sacchi (eds), <i>La villa dopo la villa. Trasformazione di un sistema</i> vo ed economico in Italia centro-settentrionale tra tarda antichità evo - by <b>G.P. Brogiolo</b>	
F. Grassi, J.A. ( <i>de época</i>	Quirós Castillo (eds), <i>Arqueometría de los materiales cerámicos</i> a <i>medieval en España</i> - by <b>C. Citter</b>	
G.P. Brogiolo, A prospett	. Chavarría Arnau, <i>Archeologia postclassica. Temi, strumenti, </i> <i>ive</i> - by <b>A. Guidi</b>	
C. Giostra (ed), by <b>V. La</b>	Migrazioni, clan, culture: archeologia, genetica e isotopi stabili - Salvia	
E. Guttmann-Bo Planet -	nd, <i>Reinventing Sustainability: How Archaeology Can Save the</i> by <b>M. Fecchio</b>	
I. Huvila (ed), <i>Ar</i> by <b>L. Du</b>	chaeology and Archaeological Information in the Digital Society - riava	
C. Holtorf, A. Pa tempora	antazatos, G. Scarre (eds), <i>Cultural Heritage, Ethics and Con-</i> ry Migrations - by <b>A. Borsato</b>	

Tamara Lewit\*

# *"terris, vineis, olivetis..."*: wine and oil production after the villas

The production of wine and oil during post-villa occupation at a site deserves special attention as an indicator of continued exploitation of land, even if within a changed economic framework; continuity of diet and technical traditions; and a stable resident population. Scales of production can also give insights into secular and ecclesiastical demand for these products. This paper examines three case studies in Spain, France, and Italy. **Keywords:** land use, wine production, wine presses, ecclesiastical estates, abandoned villas, late antiquity

La produzione di vino e olio nel periodo successivo a quello delle ville merita attenzione speciale, in quanto indicatore di: un continuativo sfruttamento della terra anche se in un mutato contesto economico, continuità di dieta e tradizioni tecniche e infine una popolazione residente stabile. La scala di produzione può inoltre offrire idee riguardo la domanda secolare e ecclesiastica di questi prodotti. Questo articolo esamina tre casi studio, in Spagna, Francia e Italia.

**Parole chiave:** uso del suolo, produzione vinaria, presse da vino, proprietà ecclesiastiche, ville abbandonate, tardo antico

From Cato in the 2<sup>nd</sup> c. BC to Palladius in late antiquity, the Roman agronomists assumed that olive oil and wine were a major part of production at a villa, and a central concern of its owner. These writers devote considerable attention to the growing, harvesting, and processing of olives and grapes, and to the correct storage of their products. Cato, Varro, Columella and Palladius give us details of wine and oil processing, including the labour and equipment required (Cato *De Agric.* 10-19; Varro *Rerum Rustic.* 1. 18), preparations for the harvest (Columella *De Re Rustica* 12.18), and the layout of the wine-treading and vinification areas (Palladius *Opus Agric.* 1.18).

The archaeological investigation of Roman villas in the western Mediterranean, particularly with the greater focus on productive areas



<sup>\*</sup> School of Historical and Philosophical Studies, University of Melbourne, Australia, *tlewit@unimelb.edu.au*.

over the last three decades, has confirmed that oil and wine production were indeed an important component of the production carried out on virtually every villa estate. In favourable regions, many appear to have engaged in specialised market production of either wine or oil during the high imperial period. A typical example is that of the villa of Roguemaure-La Ramière (Gard), in *Gallia Narbonensis*: a modest farm developed into a villa with buildings grouped around a courtyard in the 1<sup>st</sup> century AD, seemingly specialising in wine production. Viticulture continued until the late 3<sup>rd</sup> century AD<sup>1</sup>. The two *cellae vinariae*, with around 70-80 vinification *dolia* (vessels used for both secondary fermentation and storage of wine) had a total capacity of approximately 100,000 l per annum. This suggests that the extent of its vinevards would have been around 25 ha. similar to the 100 *iugera* used as an example by Cato (*De Agr.* 11; Brun 2005, pp. 32, 62-64). Archaeologists have rightly paid great attention to these activities at 1<sup>st</sup> to 3<sup>rd</sup> century AD villas, and the layout of vinevards and work rooms, technology of oil milling and oil and wine-pressing, systems of storage and the place of oil and wine within the villa economy have all received investigation<sup>2</sup>.

In contrast, less attention has been paid to wine and oil production in the West in late antiquity<sup>3</sup>, particularly at villa sites which were no longer serving as elite residences. Studies of sites across various regions indicate that during the 6<sup>th</sup> and 7<sup>th</sup> centuries AD there may have been an increase in cultivation of rye, oats, hemp and chestnut, and perhaps a tendency to reduce extensive grain production and increase mixed animal husbandry of pigs, sheep, and goats. The impact of changing economic circumstances following the end of the Roman Empire is clear, although it is possible that at least some of these changes were related to climate change<sup>4</sup>.

However, olives and grapes were still cultivated<sup>5</sup>, and the extent to which this was continued at the former villa sites, where production had previously centred, deserves greater consideration. Oil and wine production remained an integral element of farming up to the 6<sup>th</sup> century and

<sup>3</sup> Notable exceptions include Rossiter 2007; Peña Cervantes 2005, 2009; Vizcaíno Sánchez 2009.

<sup>&</sup>lt;sup>1</sup> POMARÈDES, PETITOT 1996. The villa was ruined and its stones reused by the end of the 4<sup>th</sup> century; a pottery, a forge, and burials date to the 5<sup>th</sup> century.

<sup>&</sup>lt;sup>2</sup> Individual site publications too numerous to list; syntheses for the western Mediterranean are provided in, for example, AMOURETTI, BRUN 1993; BOISSINOT 2001; BRUN 2004; BRUN 2005; PEÑA CERVANTES 2010, 2012; VAN LIMBERGEN 2011; MARZANO 2013a and 2013b; CARRATO 2017.

<sup>&</sup>lt;sup>4</sup> See, for example: COMET 2004; MCCORMICK *et al.* 2012; SALVADORI 2013; PEÑA-CHOCARRO, PÉREZ JORDÀ 2017; SQUATRITI 2018; CHAVARRÍA *et al.* 2019; BROGIOLO, CHAVARRÍA 2020, pp. 55-58; CARNEI-RO in this volume. Important differences in climate patterns between different Mediterranean regions are explored by LABUHN *et al.* 2019.

<sup>&</sup>lt;sup>5</sup> E.g. Volpe, Turchiano 2013; Rottoli 2014; Bosi *et al.* 2019; Peña-Chocarro *et al.* 2019.

presumably beyond, since wine was certainly significant within the early medieval diet and oil was essential for lighting. In addition, both of these products had a central place in the celebration of church ritual, particularly the eucharist and baptism (see e.g. Vizcaíno Sánchez 2009), and also in the "revolution" of ecclesiastical lighting, which became an important symbolic and liturgical feature of churches (Dendy 1959; Parani 2019). Since the Church itself acquired a significant proportion of land from the 6<sup>th</sup> to 8<sup>th</sup> centuries, it is likely that they formed an important part of production on ecclesiastical estates, whether for local use, liturgical purposes, charitable distribution, or trade. It is therefore important to develop our understanding of the cultivation and processing of these crops at post-villa sites.

Wine production requires year-round farming and care for vines, including trenching, pruning, protection from frost, shaping, digging, clearing, and maintenance of support structures<sup>6</sup>. Harvesting must be carefully timed and rapid, drawing on a much-increased labour force: Cato (De Agr. 11) recommends 40 grape-harvesting knives for a vineyard normally farmed by 10 men; while Columella (De Re Rustica 1.17.1-4) specifies that additional hired men (*mercenariis*) are needed for the wine harvest. The presence of wine-making equipment therefore suggests the existence of a reliable, stable and resident population in a particular locality, as well as access to sufficient labour at harvest time. While olive cultivation is less labour-intensive, olives must be processed rapidly as they ripen and both Columella (De Re Rustica 12.52.3) and Palladius (Opus Agric. 12.17) recommend that they be milled the same day they are picked. Further, the setting up of new presses for either oil or wine or investment in substantial changes to old ones is a strong indication of surplus production, since both products can be made without recourse to these sometimes expensive and elaborate machines. In the case of wine, the majority of the juice is obtained simply by treading, without the further process of pressing. It is also possible for small quantities of oil to be produced from crushed olives by decantation or by simpler mechanisms, without using a press<sup>7</sup>. The setting up of new oil and especially of wine pressing equipment within a former villa should therefore be seen

<sup>&</sup>lt;sup>6</sup> Columella devotes half of book 3 (3.11-21) and the whole of book 4 to these processes, commenting (4.4.1) "Let us plant our vineyards with great resolve and tend them with greater zeal" (*magno animo vincas ponamus ac maiore studio colamus*) (translation by Boyd Ash). Work on vines appears in every month of Palladius' farm calendar, with the sole exception of June (2.1, 10-13, 3. 9-16, 29-30, 4.1, 7, 5.2, 6.2, 4, 8.1, 9.1-3, 10.1, 11, 17-18, 11.4-7, 9, 12.2-4, 9-10, 13.2). See also WHITE 1970, pp. 231-266.

<sup>&</sup>lt;sup>7</sup> For summaries of wine and oil making processes, see Frankel 1999, pp. 41-48; Brun 2003, pp. 53-63, 146-158; Peña Cervantes 2010, pp. 29-34; Waliszewski 2014; Thurmond 2017, pp. 50-202.

as a significant indicator of continued surplus production after the disuse of the villa residence. The technologies used in oil and wine presses are also an indication of links to a specific local or broader technical tradition and of the continued maintenance and communication of technical expertise, since press parts require repairs and renewal and must be created and assembled with sufficient accuracy to be functional, especially in the case of screw presses<sup>8</sup>.

Therefore, continued production of wine and oil, and particularly the setting up or renovation of presses, during post-villa occupation can be interpreted as an indicator of:

- 1. the continued agricultural exploitation of land for the same purpose, at least in part, even if within a changed economic framework or on a reduced scale
- cultural continuity, such as the inclusion of oil and wine within the diet and technical expertise for the construction and repair of machinery for their production
- 3. a stable resident population, and access to sufficient supplementary labour for harvests, particularly for grapes
- 4. a degree of reliable demand for these products, whether local or distant, for both secular and new ritual and ecclesiastical purposes.

While for many other agricultural products we are dependent on ephemeral botanical remains, the processing of both wine and oil can leave more durable traces. These may include stone oil mills, large weight-stones from presses, opus signinum and opus spicatum floors sturdily built to withstand pressures and remain waterproof, stone-built vats, or distinctive dual-level rooms. It is sometimes difficult to distinauish wine from oil installations, since many of their features (such as the presses) are identical. However, wine processing can be identified by a treading floor and/or by a *cella vinaria*, with distinctive and substantial depressions dug for the vinification jars (*dolia defossa*). These jars, which measured around 2 m in height and are sometimes found still in situ, were used for the secondary fermentation of wine as well as its storage, and so required careful temperature regulation which was achieved by a specially constructed space in which the many regularly-placed vessels were half-buried in the ground<sup>9</sup>. Oil production can be distinguished by the presence of a crushing mill and/or decantation vats, where these elements are discovered. The particular press technology used in production can be discerned from the characteristics of the weight-stones which were used, if these are still in place, as well as from the size and

 <sup>&</sup>lt;sup>8</sup> Brun 2005, pp. 160-164; Peña Cervantes 2010, p. 213; Peña Cervantes 2012; Lewit 2020.
<sup>9</sup> CARRATO 2017, who also explores the associated structural challenges.

layout of the space, or other surviving stone parts such as the base blocks of wooden supporting posts. However, it is often extremely difficult to date precisely these stone elements or alterations to them, particularly since they were often used for very long periods of time, and reused or moved in later periods<sup>10</sup>.

This paper examines production of wine and oil during post-villa occupation from the 4<sup>th</sup> to 7<sup>th</sup> centuries AD through three case studies of villa sites from north-eastern Spain (Vilauba), southern France (Saint Martin de Taradeau), and southern Italy (San Giusto). Oil and wine production were established as significant elements of farming in each of these regions during the Roman period, and were consistently carried out within the villa-based economic system of the high empire. Each of these sites has been the subject of intensive and well-published investigation; each was the site of a classical Roman style villa which was built in the 1<sup>st</sup> century AD but which was no longer used as an elite residence in late antiquity; each was occupied and used for farming from before the building of the Roman style villa up to the 7<sup>th</sup> century at least; and each produced wine and/or olive oil over a long period.

### 1. Vilauba

Investigations at the site of Vilauba (*Hispania Tarraconensis*), situated near modern Girona in a valley extending from Banyoles Lake, have traced its evolution from the 2<sup>nd</sup> c BC to 7<sup>th</sup> century AD (Castanyer Masoliver, Tremoleda Trilla 1999). Both archaeozoological evidence and archaeobotanical evidence attest that the modest residential villa, built in the 1<sup>st</sup> century AD, produced the typical Roman mix of free-threshing wheat and grapes, as well as walnuts, and some olives, although the remains of the latter are poorly preserved. Domestic animal species included a high percentage of cattle – used for traction in agriculture, rather than meat, since they were mostly killed between the 5<sup>th</sup> and 8<sup>th</sup> year – and approximately equal percentages of pig and ovicaprids (Colominas *et al.* 2019).

After the villa was partially destroyed by fire late in the 3<sup>rd</sup> century AD, the site underwent a series of reforms and rebuilding over two centuries. More extensive functional buildings, arranged around a large central space, replaced the former residential villa<sup>11</sup>. It has been proposed that the site became an agricultural complex which was now part of a

 $<sup>^{10}</sup>$  In-depth discussions of all these issues can be found in Brun 1986; Brun 1993; Frankel 1999; Peña Cervantes 2010.

<sup>&</sup>lt;sup>11</sup> The changed use of villas in the western Mediterranean has been the topic of a long historiography. See, for example, BROGIOLO 1996; BROGIOLO, CHAVARRÍA, VALENTI 2005; BALDINI, SFAMENI 2018.

larger estate (Castanyer Masoliver, Tremoleda Trilla 1999, pp. 120-124), particularly as other villas in the region, such as Centcelles, experienced a contemporaneous flowering and enrichment (Chavarría 2004, p. 85). Chavarría (2004) has outlined such a phase in a number of Hispanic villas in the 3<sup>rd</sup>-4<sup>th</sup> centuries AD, which in some cases may have been a consequence of a concentration of ownership in the hands of large landowners who used the former residences of smaller owners as productive centres of estates they had acquired, in a pattern described by Hyginus Gromaticus:

"... the owners of several contiguous estates usually throw together two or three fields into one villa estate and abandon the boundary markers that established the boundaries for the single fields, and ... the other farms are uninhabited except the one to which the fields have been assigned ..."12.

At Vilauba, the rebuilt structure of the 4<sup>th</sup> century included two oil and wine processing areas: in Room 11, twin decantation vats have been identified, indicating that this room was for oil production. In another series of rooms in the northern part of the site, a stone press bed with channels for liquid, in room 31, is built at a higher level than the adjoining room 24, where the weight-stone would have been housed. This arrangement is characteristic of large lever presses but, since the weight-stone has not been found, there is no clear evidence to show exactly what type of lever press was used. An elongated floor space adjoining the press, thickly paved with opus signinum resting on a bed of stone and with a gutter for the flow of liquid, has been convincingly interpreted as a treading floor (calcatorium), indicating that this area was for the production of wine. This production zone was used until the end of the 5<sup>th</sup> century or early 6<sup>th</sup> century (Castanyer Masoliver, Tremoleda Trilla 1999, pp. 127, 135-143). There was little change to other cultivated crops in this period or to the proportion of domestic mammals (Colominas et al. 2019, pp. 72-73).

Following a gradual and partial abandonment during the 5<sup>th</sup> century and the use of some rooms for burial (Castanyer Masoliver, Tremoleda Trilla 1999, pp. 132-133), the site of Vilauba was again reoccupied on a different basis at some time between the late 5<sup>th</sup> century or early 6<sup>th</sup>

<sup>&</sup>lt;sup>12</sup> Praeterea solent quidam complurium fundorum continuorum domini, ut fere fit, duos aut tres agros uni uillae contribuere et terminos qui finiebant singulos agros relinquere: desertisque uillis ceteris praeter ea<m>, cui contributi sunt, uicini non contenti suis finibus tollunt terminos, quibus possessio ipsorum finitur, et eos, quibus inter fundos unius domini fines obserua<n>tur, sibi defendunt. (On Types of Quarrels 93-94, translation by author).



Fig. 1. Reconstruction of the  $6^{{\rm th}}\text{-}7^{{\rm th}}$  century hamlet at Vilauba (image courtesy of P. Castanyer Masoliver).

century. A much smaller area was used for mixed habitational and productive functions, probably a hamlet with animal pens (fig. 1). Farming at the site seems to have focussed more on meat production, with increased predominance of sheep and decreased cattle numbers, and both species slaughtered at a young age, and a greater diversity of cereals were grown (Colominas et al. 2019, pp. 73-74). However, during this period a new multi-room sector containing a lever press was set up, and used until the 7<sup>th</sup> century, perhaps as a shared facility within the hamlet (fig. 2). The overall size of this installation (15 x 6.5 m) corresponds well with the recommendation of Vitruvius, many centuries earlier, that a pressing room should "occupy no less than 40 feet" (*De Arch*. 6.6.3)<sup>13</sup>, and its walls were powerfully built of mortared stone (Castanver Masoliver, Tremoleda Trilla 1999, p. 152) Since no weight-stones were found, it is again not possible to identify the precise pressing technology used, although the size and existence of different floor levels imply the presence of a large lever press with a counterweight. Based on parallels at 4<sup>th</sup>-5<sup>th</sup> century sites in the region<sup>14</sup>, a lever-and-screw press is likely to have been used, a hypothesis reflected in the excavators' reconstruction (fig. 3; Peña Cervantes 2010, pp. 546-548 & 2005, p. 108; Castanyer Masoliver, Tremoleda Trilla 1999, pp. 157-159). Recent excavations have brought to light 16 pits for *dolia defossa*, demonstrating that the product was wine (since such buried dolia were not used for oil: Peña Cervantes 2010, pp. 85-89). While it is difficult to calculate the volume of wine produced, since the actual *dolia* have not been found *in situ*, their number indicates a capacity of at least 10,000-20,000 l per annum<sup>15</sup>. This number and the scale of the pressing area suggest a volume of production well above the internal needs of this small hamlet, since average wine consumption per person has been estimated at 140-180 | per annum for males and perhaps half of that quantity for females<sup>16</sup>. The guality and organisation of construction lead the excavators to hypothesise a communal effort (Castanyer et al. 2018, pp. 266-267)<sup>17</sup>. It has

 $^{14}$  E.g. Can Sans (4th c.) and Can Ferrerons (5th c.): PEÑA CERVANTES 2010, p. 103.

<sup>&</sup>lt;sup>13</sup> ne minus longum pedes XL constituatur.

 $<sup>^{15}</sup>$  C.f. estimations of production of 18,000-27,000 l. p.a. for sites in southern Gaul with similar numbers of *dolia*: BRUN 2005, p. 25; and of 9,000-20,000 l. p.a. for sites in Italy with similar numbers of *dolia*: VAN LIMBERGEN 2011, p. 80.

<sup>&</sup>lt;sup>16</sup> The high figure of 10 quadrantals (250 I.) given by Cato (*De Agric*. 57) may be an allowance per family, calculated per male head as has been suggested for all his calculations of food rations: ROTH 2007, pp. 39-42. The lower per person figures, first calculated by TCHERNIA 1986, p. 26 are generally preferred.

<sup>&</sup>lt;sup>17</sup> Ethnographic evidence for clan or community sharing of presses in villages exists for a number of regions in the 19<sup>th</sup>-20<sup>th</sup> centuries: see GULICK 1955, pp. 72-73; AVITSUR 1994, p. 102; WALISZEWSKI 2014, pp. 241-242, 250-251, 272.



Fig. 2 (above). Plan of the  $6^{th}$ - $7^{th}$  century wine installation at Vilauba (image courtesy of P. Castanyer Masoliver).

Fig. 3 (right). Hypothetical reconstruction of the  $6^{\rm th}-7^{\rm th}$  century wine press at Vilauba (image courtesy of P. Castanyer Masoliver).



been observed that wine and oil production structures have been found at other small hamlet-style settlements dated to this period in northeastern Spain<sup>18</sup>.

The continued production of wine at this level in the 6<sup>th</sup> and 7<sup>th</sup> centuries AD attests the existence of a permanent population, exploiting the land not only for pastoral activities, but also cultivating and harvesting grapes and continuing to invest labour and resources in long-term wine production at the site. The setting up of a new press, including the complex of rooms, vat and storage area, would have represented a substantial investment, requiring supplies of good quality wood and stone building, the continuation of Roman technical traditions and access to expertise for the construction and maintenance of machines, as well as the expectation that an on-going and reliable regional market existed for the surplus production of wine.

#### 2. Saint Martin de Taradeau

The site of Saint Martin de Taradeau (*Gallia Narbonensis*), situated in the Var region near the confluence of the Florièye and Argens rivers a few km from the Via Aurelia, was continuously occupied from the 1<sup>st</sup> century BC to the 7<sup>th</sup> century AD. A medium-sized villa habitation in classical Roman style was built on the site in the 1<sup>st</sup> century AD. The *pars urbana* was constructed around a peristyle courtyard with a rectangular pool, an aqueduct bringing water from the nearby hills (Bérato 2004). The early *pars rustica* has not been the subject of excavation, but the region of *Gallia Narbonensis* saw a blossoming of viticultural installations in the 1<sup>st</sup> and 2<sup>nd</sup> century AD (Brun 2005, p. 25), when Gallic wine amphorae finds peak in Rome<sup>19</sup>.

This villa was disused as a residence in the second half of the 2<sup>nd</sup> century AD, and transformed into a wine and oil production facility, presumably by an absentee owner. Three wine-production areas with multiple wine vats and treading floors (including a very large 45.2 m2 example in the south-eastern zone), a *defrutarium* for the production of boiled spiced wine, and a *cella vinaria* for secondary fermentation and storage (located in the East wing of the former residence) were constructed (Bérato 2004, pp. 71-78). Based on the size and number of vats, the

 $<sup>^{19}</sup>$  Via Sacra, Rome 23.5% of total amphora finds; Terme del Nuotatore, Ostia 25.5%: Reynolds 2010, p. 49, tables 1b and 2a.



<sup>&</sup>lt;sup>18</sup> PEÑA CERVANTES 2005, p. 108, citing the examples of Vilaclara (Castellfollit del Boix, Barcelona), El Bovalar (Selos, Lérida), La Solana (El Garraf, Tarragona), Puig de les Muralles (Roses, Gerona) and Sanitja (Menorca), with references.

production capacity is estimated to have been at least 100,000 I per annum, and the size of the vineyard around 20-40 ha (Bérato 2004, pp. 83, 101), perhaps even larger than the 100 *iugera* vineyard used as an exemplar by Cato (Cato *De Agr.* 11). Since the excavated *cella vinaria* contained only 29 *dolia*, too few for this scale of production, further storage must have existed within unexcavated spaces (Bérato 2004, p. 75). An oil production area, with a press, and a vat with a capacity of at least 980 I, has also been identified. The former decorative pool of the peristyle was converted to accommodate a watermill, probably used for grain processing (Bérato 2004, pp. 76-78). These transformations seem to parallel the changes in villa use observed at Vilauba and elsewhere in *Hispania Tarraconensis*, discussed above, as well as other at other western Mediterranean villa sites<sup>20</sup>.

A number of villa sites near Taradeau, occupied until the 5<sup>th</sup> or 6<sup>th</sup> centuries AD, have been proposed as the possible estate centre to which this production facility was attached. Within a few kilometres, for example, the *pars rustica* of the unexcavated villa of Laurons was used as a rubbish dump for an apparently very rich estate. The zooarchaeological finds indicate an exceptionally high consumption of beef from young cattle and game meat, including high levels of deer (Bérato *et al.* 1990), probably reflecting the practice of hunting which was a symbol of status among the late Roman elite and a frequent image in late villa mosaics such as that at Centcelles (Balmelle 2001, p. 300; Chavarría 2006, p. 82).

The north-western wine production zone at Taradeau consisted of four treading floors connected directly to four vats, situated a few steps down at a lower floor level (fig. 4). This arrangement, as the excavator notes, is very similar to that described by Palladius, who recommends a raised wine-treading floor with the liquid channelled by means of gravity directly into vinification vessels on a lower level, terming this arrangement "basilica-like" (*Opus Agric.* 1.18)<sup>21</sup>. No press remains were found in this area, and it would be impossible to fit a lever press into the narrow spaces (each 1 x 2.6 m) demarcated by small dividing walls behind the treading floors. As the excavator notes, these spaces could have accommodated direct-screw presses constructed entirely of wood, which would have left no archaeological trace (see fig. 5 and discussion below). However, the spaces seem too narrow and confined to allow work at the presses — including turning the handles to work the screw (cf. fig. 6). Bérato's alternative suggestion (2004, p. 76) that these were spaces

<sup>&</sup>lt;sup>20</sup> The site of Monte do Meio in *Lusitania* is one example where decorative elements were converted for similar use: a press was built over a late 4<sup>th</sup> century mosaic and a marble sculptural piece was reused for a weight-stone (PEÑA CERVANTES 2005, p.106).

<sup>&</sup>lt;sup>21</sup> basilicae ipsius forma calcatorium loco habeat altiore constructum.



Fig. 4. North-western wine production area, Taradeau (photo courtesy of J. Bérato).



Fig. 5. Traditional direct-screw olive oil press (Grimaldi Castle Museum Haut-de-Cagnes) (photo courtesy of M. Hoffman).

to place loads of grapes in their baskets before treading is therefore to be preferred. The water-proof surface with which they are constructed would ensure that any of the highly-valued liquid which flows *before* treading could run naturally over the treading floor and then down into the vats. It should be noted that Palladius' "basilica-like" arrangement also has no press: he describes a treading floor (*calcatorium*) from which the grape must (juice) is channelled directly into vats at a lower level and then into fermenting jars, again placed at a lower level. Treading is capable of extracting most of the must from grapes. Columella describes "*lixivum*" must from grapes which had been "not too much trodden", taken from the vat "before being pressed by the beam", which could be used to make "the best *mulsum* wine" (*De Re Rustica* 12.41, 12.27)<sup>22</sup>. We

<sup>&</sup>lt;sup>22</sup> Mulsum optimum sic facies. Mustum lixivum de lacu statim tollito; hoc autem erit, quod destillaverit antequam numium calcetur uva: "You will make the best mulsum in this way. Take the lixivum must immediately from the vat and this will be what will have dripped down before the grape is too much trodden" (12.41); ... calidas uvas proculcato, mustum lixivum hoc est antequam prelo pressum sit quod in lacum musti fluxerit tollito: "Trample the warm grapes, take the lixivum must - this is what will have flowed into the must vat before it has been pressed by the beam" (12.27). Translations by author, with thanks to L. Lewit-Mendes and P. Burton for their helpful advice. Must called "protropum" could also be produced simply by the weight of the grapes piled on the treading floor (Pliny Nat. Hist. 14.11.85; Dopp 2020), but Columella clearly describes trodden grapes.





Fig. 6. Four men working a direct-screw oil press in 19<sup>th</sup> century Provence, illustration from L. Figuier, *Les merveilles de l'industrie ou, Description des principales industries modernes* (Paris: Furne, Jouvet, et Cie, 1873) (digital image El Bibliomata https://commons.wikime dia.org/wiki/File:01\_Pres se\_%C3%A0\_huile\_Provence.jpg).

therefore conclude that this area was dedicated to the production of unpressed must. This would explain its storage in a separate area (as yet unidentified) from the *cella vinaria* in the East wing, which sits between the south-eastern and north-eastern press rooms, both of which were designed for the use of large lever presses.

In the north-eastern production zone, processing was first carried out using the traditional method of southern Gaul, in which a large lever press was weighted with a heavy parallelepipedic weight-stone, raised by a winch mechanism, a form of press depicted in the Autumn scene of the calendar mosaic of St-Romain-en-Gal<sup>23</sup>. One parallelepipedic weight-stone (Brun Type 14) has been found, while the fragment of another was reused in a 6<sup>th</sup> century wall (Bérato 2004, pp. 84, 90). No weight-stone has been found associated with the south-eastern wine production zone, but the arrangement of work-spaces and the elevated floor of room 35, where the pressing zone was located, as well as its size and proportions<sup>24</sup>, suggest that wine in this zone was also processed using a lever press with a weight-stone of a type which cannot be determined.

 $^{24}$  The raised press area is 4.4 x 5.2 m, a size which would accommodate a lever press.

<sup>&</sup>lt;sup>23</sup> Images accessible online at https://musee-archeologienationale.fr/objet/pavement-de-mosaique. The calendar, dating to the  $3^{rd}$  century AD, may have continued artistic traditions in representing a technology no longer in wide use: BRUN 2003, p. 210. Until their abandonment at the end of the  $2^{nd}$  century AD, production of oil at the nearby sites of Farm A and Farm B at l'Ormeau – which may have been dependencies of the earlier villa – was also carried out using winch mechanisms, although possibly with fixed wooden drums rather than weight-stones, as described by Cato centuries earlier (Cato *De Agric.* 18-19; BRUN 1986, pp. 204-215).

However, production of wine and oil at Taradeau extended over a period of several hundred years, and during this time the technology of pressing changed. At a point in time before the disuse of the facility in the first half of the 6<sup>th</sup> century, the parallelepipedic weight-stone used for oil pressing was converted for use with a wooden screw instead of a winch. As noted above, screw presses appear at many late antique villa sites, especially from the 3<sup>rd</sup> century AD onwards<sup>25</sup>. The phenomenon of conversion (at an undeterminable date) of a parallelepipedic weight-stone from an earlier winch-operated arrangement to a weight-stone to be used in a screw-operated press is paralleled elsewhere in the region, for example at the villas of Les Eyssalettes (occupied to the 5<sup>th</sup> century AD at least) and Rians-La Vicairie (finds of Dérivées-des-Sigillées Paléochrétiennes grise) (Brun 1986 pp. 184, 186). It is impossible to date precisely the conversion of a weight, unless it is clearly associated with a stratigraphically dated phase. However, it may be assumed that these weights would have been used for a reasonable length of time before their alteration, since their construction involved an investment of resources and they were extremely long-lasting. The converted weightstone at Taradeau, made of local sandstone, measures 149 x 60 x 57 cm and weighs approximately 1300 kg (Brun 1986, p. 216). Such objects were not easily constructed or worn out.

This technological change from winch to screw mechanisms reflects the very slow diffusion of an invention of the 1<sup>st</sup> century BC, referred to briefly by Vitruvius in the late 1<sup>st</sup> century BC, and recorded by Pliny as nearly a century old, and used "in some [presses]" by the 1<sup>st</sup> century AD (*Nat. Hist.* 18.74.317)<sup>26</sup>. Although various types of winch-operated presses (without screws) continued to be used throughout the Roman world, and indeed up to the 20<sup>th</sup> century in the Mediterranean<sup>27</sup>, Pliny comments that a screw-operated press using a weight-stone in this new way was "especially favoured". Ethnographic accounts and the ancient Alexandrian writer Hero indicate that such screw-presses were more re-

<sup>&</sup>lt;sup>27</sup> At, for example, the site of Lestagnac, Gers, occupied to the 6<sup>th</sup> century AD (BRUN 2005, pp. 116-117) and that of Valrose (Var), where the weight-stone was engraved with a cross (BRUN 1986, 175); sites in Istria and Dalmatia (MATIJAŠIĆ 1993); and in Greece (FOXHALL 1997; DODD 2020, pp. 107-111). Winch-operated presses most notably continued to be exclusively used in the massive Tripolitanian and Tunisian presses up to late antiquity (MATIJINGLY, BRUCE HITCHNER 1993). A winch press is depicted in the mosaic of the late 4<sup>th</sup>-century villa of Piazza Armerina in Sicily, as well as the 3<sup>rd</sup> century calendar mosaic of St-Romain-en-Gal noted above (BRUN 2003, pp. 213-215). Use of winch presses up to the 20<sup>th</sup> century: CRESSWELL 1965; LAUVERGEON 2004, pp. 46-48.



 $<sup>^{25}</sup>$  For example, the late  $3^{rd}$  to  $4^{th}$  c. lever and screw presses at the villas of Torre Palma, Portugal (PEÑA CERVANTES 2010, pp. 214-215, 1000-1006, Table 8); Sillans-La-Cascade, Var (BRUN 1986, p. 203); and numerous sites in the Moselle (BRUN, GILLES 2001).

<sup>&</sup>lt;sup>26</sup> For discussion of Pliny's text and its translation and significance, see BURTON, LEWIT 2019.



Fig. 7. Wine press dated 1711, with weight constructed of several slabs of stone in a wooden frame. Possibly German origin, currently in Museum Kloster Sankt Georgen, Stein am Rhein, Switzerland (photo Prisma by Dukas Presseagentur GmbH/Alamy Stock Photo).

liable and easier to use, although not more productive (Lewit 2020). However, the construction of a large (3-4 m) wooden screw out of good quality wood required financial investment. It also required access to the skills needed to accurately carve a wooden screw, to adapt the massive lever, and to construct the required new wooden and metal parts which would attach it securely to the large, heavy weight-stone (c.f. fig. 7). Repairs and replacement of parts would also be needed over time<sup>28</sup>. At the site of Taradeau, it appears that the craftsmen involved in converting the weight-stone made an error in the construction of the necessary points of attachment, since among the 8 neatly aligned sockets is a 9<sup>th</sup>, out of place and apparently without function — providing us with a rather charming insight into the difficulties of technological transfer (Brun 1986, p. 216).

<sup>&</sup>lt;sup>28</sup> AMOURETTI *et al.* 1984, p. 401 record that the screw of a Portuguese press still used in the twentieth century needed to be replaced every twenty years, when it had worn out. The new screw was made by the press operator in the village, who had been taught the method by his father. Medieval French records also record the need for constant repairs to screws by carpenters, due to breakages and rotting: LAUVERGEON 2004, p. 10.

Fig. 8. Weight-stone (*contrepoids 139*) for a screw press, found in Room 51 of the northeastern wine pressing zone at Taradeau (photo courtesy of J. Bérato).



A second weight-stone, found in the north-eastern wine production zone, was constructed *de novo* as a screw weight, rather than converted from one used with a winch (fig. 8; Bérato 2004, pp. 72, 84). This weight-stone is also parallelepipedic – an unusual phenomenon, as in the western Mediterranean the majority of screw press weights constructed *de novo* were roughly cylindrical in shape (Brun 1986, pp. 122-123; see also Peña Cervantes 2010, p. 71). It has been pointed out that the few parallelepipedic screw press weights which have been found seem to have a very late chronology<sup>29</sup>. Examples include those at Le Grand Loou II (Var), with finds of *Dérivées-des-Sigillées Paléochrétiennes* and ARS D, possibly to be identified as the *villa Filsicao* mentioned in the 10<sup>th</sup> century Cartulary of the Abbey of Saint Victor (Brun 1986 195-196); at Can Sans (Barcelona), which dates to after the 4<sup>th</sup> century AD when the baths were disused and converted to a press installation (Peña Cervantes 2010, pp. 401-404); and that of the 7<sup>th</sup> century AD hamlet at Bovalar<sup>30</sup>.

We may cautiously propose a series of phases of production of olive oil and at least three types of wine — wine made without pressing, wine made using lever presses, and *defrutum* — at this former villa between the second half of the  $2^{nd}$  century AD and the early  $6^{th}$  century. At first a winch mechanism was used, perhaps to produce oil (as at the nearby sites of l'Ormeau until their abandonment in the late  $2^{nd}$  century<sup>31</sup>),

<sup>&</sup>lt;sup>29</sup> PEÑA CERVANTES 2010, p. 71. I am most grateful to Dr Peña Cervantes for her advice and helpful discussion on this point (*pers. comm.* 25/02/2020).

<sup>&</sup>lt;sup>30</sup> PEÑA CERVANTES 2010, pp. 620-622. The example at Six-Fours, Var cannot be assigned to any particular phase of the occupation of this site between the 1<sup>st</sup> to 5<sup>th</sup> century (BRUN 1986, p. 216). <sup>31</sup> See note 23.

while at least some wine was produced without pressing. At a later stage, a different form of technology using a lever-and-screw mechanism was employed for both oil and wine production. At some point between the  $3^{rd}$  and  $5^{th}$  centuries, an older weight-stone was converted from a lever-and-winch to a lever-and-screw type for use in the oil press. A new lever-and-screw weight-stone of a very late type (based on parallels with other sites) was constructed for use in a wine press, possibly in the  $5^{th}$  century.

Although the aristocratic villa residence fell into disuse at the site of Taradeau, the continued use of oil and wine pressing facilities up to the  $6^{th}$  century and the new investment in screw press technology – including a new press stone – at a late stage suggest a vigorous level of production in these traditional Roman products and the continuation of Roman technical practices into the early years of the Middle Ages.

A second phase of transformation occurred at Taradeau at the start of the 6<sup>th</sup> century, and continued occupation up to the second half of the 7<sup>th</sup> century is attested by the presence of ARS and local *Dérivées-des-*Sigillées Paléochrétiennes. The entire site was reorganised, and occupation was spread over a larger area, although reusing many walls of the former buildings. New buildings were characterised by walls of unmortared stones fixed with clay and earth floors. The oil and wine facilities were demolished in the first half of the 6<sup>th</sup> century, as was the aqueduct, which was robbed to provide materials for the foundations of new buildings. Large buildings housed animals, and zooarchaeology indicates the raising of bovines slaughtered for meat at a young age, and the presence of equids reared at the site (Bérato 2004, pp. 86-96). However, we should not conclude that the production of olive oil and wine vanished from the region in this period. A number of 6<sup>th</sup> to 8<sup>th</sup> century manuscripts record olive and wine production in the locality, although not at this specific site. The cartulary of the church of Notre Dame de Paris records that in AD 558 King Childebert donated a villa in nearby Arcs-sur-Argens with an olive grove (along with another at Brignoles) in order to supply oil for lighting the church in Paris. In the early 6<sup>th</sup> century, King Theodoric also donated a villa with olive groves at Flassans to the bishop of Auxerre; and the AD 739 will of Abbo, last Patrician of Provence, donated his "lands, vineyards and olive groves" (terris, vineis, olivetis) in the territory of Toulon to the Abbey of Novalaise<sup>32</sup>.

<sup>&</sup>lt;sup>32</sup> Cartulary of the church of Notre Dame de Paris: ... cella, propter arbores oliviferas ad luminaria facienda...; donation of villa Flassans by Theodoric: ... villam quoque Flaccianam, sitam in pago Forojuliensi, quam, ei domnus Teodoricus rex concessit, et suo precepto confirmavit, cum edificis, mancipiis, olivetis ...; Will of Abbo: Cronia, in pago tolonense,... terris, vineis, olivetis ... (all cited in BÉRATO 2004, pp. 102-103; BRUN 2005, pp. 102-103).

Thus oil and wine continued to be produced in this locality not only for autoconsumption but also for surplus and for the performance of Christian lituray, and it is perhaps significant that these documents all relate the growing of grapes and olives to ecclesiastical ownership<sup>33</sup>. Archaeological evidence for surplus production of wine and oil on land owned by the Church, whether for commercial or liturgical use, has been observed at a number of sites in *Hispania*<sup>34</sup>: at the former villa of Torre de Palma, where a Christian church was built in the late 4<sup>th</sup> century, the lever-andscrew wine-press continued to be used until at least the 6<sup>th</sup> century and the press stone was engraved with a cross. A very large (550m<sup>2</sup>) cellar for fermentation (probably in barrels) indicates a high capacity of surplus production (Peña Cervantes 2010, pp. 1000-1006). Large dolia defossa with stamps reading "ECLESIESCEMARIE LACANTENSIAAGRIPI", probably referring to lands belonging to a church of St Mary located at a place called Agrippi, have been found at both an urban location (perhaps that of the church itself) in Vila Moura, and at the former villa site of Monte da Salsa (Beia), possibly its rural estate (Peña Cervantes 2009, pp. 352-53). The example of San Giusto which follows provides a further parallel.

# 3. San Giusto

Probably in the 1<sup>st</sup> century AD, a villa was built on the site of an earlier farmhouse at San Giusto, Apulia, located in the fertile valley of the River Celone close to the town of Luceria and port of Sipontum. The area is believed to have been part of the *saltus Carminianensis*, an imperial property controlled by the *sacrae largitiones* (Volpe 2012, pp. 45-51). Surveys in this region of Apulia indicate an unusual 4<sup>th</sup> and particularly 5<sup>th</sup> century increase in the numbers of small farms and *vici*, reversing a decline in site numbers in the early and middle imperial periods, accompanied by an enlargement and increase in luxury at villa sites (Volpe 2005, pp. 300-303). This increase in settlement was probably related to the production of cereal crops to supply Rome and elsewhere in Italy, particularly after the loss of territory in North Africa to the Vandals (Volpe, Turchiano 2010, pp. 538-539). The enriched villa sites in this region also specialised in other products: for example, a high level

<sup>&</sup>lt;sup>34</sup> See exploration of this topic in PEÑA CERVANTES 2009.



 $<sup>^{33}</sup>$  For a discussion of textual evidence for ecclesiastical farming of grapes and olives, see Vizcaíno Sánchez 2009, pp. 98, 100-102.



Figs. 9-10. On the left, wine production area and remains of *dolia defossa*, San Giusto. On the right, reconstruction of the two direct-screw wine presses at San Giusto (photo and image courtesy of G. Volpe).

of oil production has been discerned at the partially investigated villa of Agnuli, on the Adriatic coast, from the second half of the  $3^{rd}$  century to the first half of the  $6^{th}$  (Volpe *et al.* 1998).

The villa of San Giusto was expanded with rich residential features and mosaics at the end of the 4<sup>th</sup> century. At the same time, productive activity increased, with the construction of two wine presses, probably during this period (Volpe 2002, p. 33). These presses present features of particular interest, since the absence of weight-stones or a support system for a lever and the shape and position of the round 1.3 diameter press-bases strongly suggest that they were of a direct-screw type (figs. 9 and 10; Brun 2004, pp. 30-31). In such presses, the screw operated directly on the fruit, without the use of a heavy, weighted lever. The pressure was exerted by continual turning of the screw, rather than by weight (fig. 6). This type of press is described by Pliny in the late 1<sup>st</sup> century AD as having being invented "within the last 22 years", and as "small presses and in a smaller press building" (intra XXII hos annos inuentum paruis prelis et minore torculario aedificio). They have been more frequently found at smaller farms or in town contexts, where space was scarce, whereas rich villas specialising in wine-making normally employed a larger lever press which could process a bigger quantity of fruit (Brun 2005, p. 160; Peña Cervantes 2014, pp. 221-223; Burton, Lewit 2019, pp. 576-578). The 26 excavated *dolia* at San Giusto would have contained approx-



Fig. 11. Wool processing area, San Giusto (photo courtesy of G. Volpe).

imately 26,000 I per annum, around one-quarter of the estimated production at Taradeau during the same period. Large artisanal quarters attest the large-scale washing and treatment of wool and sheepskin, related to transhumant pastoralism, which played a prominent role in the late antique economy of the region (fig. 11; Volpe 2001, p. 325). Thus, based on the use of direct-screw presses, the number of dolia found, and the prominence of other forms of production, we may infer that wine production was not the primary economic focus of the site, unlike at Taradeau.

At the site of San Giusto, a richly-decorated church (Church A) was built in the 5<sup>th</sup> century approximately 50 m to the north of the villa residence, with a baptistery and a treasury containing 1043 3<sup>rd</sup> to 6<sup>th</sup> century coins and two bronze weights decorated with crosses, glass lamps and Greek letters indicating their weights. A number of privileged burials were placed within this church during the 5<sup>th</sup> century, and several rooms were added, including baths (Volpe 2002, p. 46). This complex has been interpreted as the residence of the bishop of the diocese, who as well as his pastoral role also appears to have played a fiscal and economic role (Volpe 2002, pp. 28, 33-35; Volpe 2007, pp. 157-159). A further expansion of the Christian complex in the late 5<sup>th</sup> to mid-6<sup>th</sup> centuries saw the addition of a twin church (Church B) with further (mostly male) burials inside (Volpe 2002, pp. 45-47).

During the same 5<sup>th</sup> to mid-6<sup>th</sup> century phase, the production of wine seems to have increased and the former villa residence was transformed

into a wine processing area to accommodate this expansion in production, with two vats large enough to hold 7200 I (Volpe 2002, pp. 28-34). It seems likely that the wine produced was for local consumption, serving the dietary needs of the resident and visiting population at the bishop's seat and liturgical requirements of the churches (Volpe 2001, p. 329). A large kiln was also built before the mid-5<sup>th</sup> century for the production of cooking pottery. The location of this kiln less than 10 m from the 5<sup>th</sup> century church suggests ecclesiastical ownership of this production, also (Volpe 2001, p. 325; Gliozzo *et al.* 2005; Volpe, Turchiano 2010, pp. 566-571).

The former villa building was destroyed by fire in the mid-6<sup>th</sup> century, and Church A was also destroyed and abandoned. This coincided with a reduction in wine production and the disuse of the larger wine vat. However, the wine-press connected to the smaller vat continued to be used. A small group of houses was built in the ruins in the 7<sup>th</sup> century (Volpe 2002, pp. 47-48).

Thus, at the former villa of San Giusto the building of the presses, probably in the late  $4^{th}$  century, indicates investment in grape cultivation and wine production. This was on a smaller scale than production at the sites of Taradeau and Vilauba, since wheat and textile production were the main economic focus of the region, and perhaps for this reason different direct-screw press technology, suitable for a smaller scale of production, was used. From the  $5^{th}$  to  $6^{th}$  centuries, after the abandonment of the villa residence, the production of wine, using the same technology, continued and increased under ecclesiastical ownership of the land — a pattern paralleled in *Hispania* and southern Gaul, as discussed above. Production continued on a smaller scale in the 7<sup>th</sup> century.

## 4. Conclusions

At these three sites, we see the production of wine and olive oil after the end of the villas as residences. In each case, the former high imperial elite residence was converted to productive functions. This is a phenomenon which has been observed at a number of villas in the western Mediterranean, and, it has been suggested, may have resulted from a concentration of land-ownership, including the development of ecclesiastical estates. At all three sites, the conversion of the villa into a productive centre seems to have ushered in a phase of increased production of wine.

At all three sites, there was investment in new presses and/or changed technology (employing a screw) in the  $4^{th}$  or  $5^{th}$  century. In the case of Vilauba, this occurred again in the late  $5^{th}$  or early  $6^{th}$  century, when another large new wine press was set up. At Taradeau, the con-

version of the 2<sup>nd</sup> century presses to changed technologies probably also occurred at a late phase, in at least one case possibly in the 5<sup>th</sup> century. At San Giusto, the new investment in presses occurred in the 4<sup>th</sup> century during the period of villa occupation, but production of wine increased after the abandonment of the former villa residence in the 5<sup>th</sup> to mid-6<sup>th</sup> century, when the site evolved into an ecclesiastical centre. 6<sup>th</sup>-8<sup>th</sup> century manuscripts also attest the importance to the Church and liturgical practices of the continued farming of olives and grapes in the region of Taradeau.

The three sites exemplify the spectrum of technological methods used to produce wine and oil in late antiquity: lever presses with a weight-stone converted from use with a winch to use with a screw; lever presses with a new style of weight-stone designed for use with a screw; direct-screw presses, using a screw without a lever; and the production of wine without the use of a press. All these technical traditions had already been established by the 1<sup>st</sup> century AD, indicating considerable continuity of technological practices from Roman times to the 7<sup>th</sup> century.

The production of wine and oil deserves special attention within the analysis of post-villa occupation, as it is an important indicator of the continued exploitation of land for the same purpose, if not always on the same scale. Such a persistence of long-standing land-use also indicates cultural continuity, in the form of a continuing role within the early medieval diet of oil and wine and the persistence of technical traditions from the 1<sup>st</sup> through to the 7<sup>th</sup> centuries. The wine production at all three sites discussed here provides evidence of a stable resident population, access to sufficient supplementary labour for harvests, and continuing reliable demand for these products, whether local or distant, above the level which could be produced through treading without recourse to the use of a press. Production was continued under ecclesiastical ownership of land, and may in part have reflected the liturgical importance of oil and wine as well as their everyday lay use. It is not yet possible to extrapolate from these examples or to judge how widespread such phenomena might have been beyond these particular sites. It seems unlikely, however, that the three sites were entirely unparalleled. Indeed, the 6<sup>th</sup> to 8<sup>th</sup> century textual evidence cited above for olive and wine growing strongly implies that they were not.

#### Acknowledgements

My thanks for their generous assistance to J. Bérato, J. Castanyer, J. Tremoleda, Y. Peña Cervantes, and G. Volpe. Any errors are my own.

#### References

- M.-C. AMOURETTI, G. COMET, C. NEY, J.-L. PAIL-LET 1984, A propos du pressoir à l'huile: de l'archéologie industrielle à l'histoire, "Mélanges de l'École française de Rome: Antiquité", 96, pp. 379-421.
- M.-C. AMOURETTI, J.-P. BRUN (eds) 1993, La production du vin et de l'huile en Méditerranée. Oil and wine production in the Mediterranean area, Actes du symposium international (Aix-en-Provence et Toulon, 20-22 Novembre 1991), Paris.
- S. AVITSUR 1994, Olive oil production in the land of Israel. Traditional to industrial, in R. FRANKEL, S. AVITSUR, E. AYALON (eds), History and Technology of Olive Oil in the Holy Land, Arlington, pp. 90-157.
- I. BALDINI, C. SFAMENI (eds) 2018, Abitare nel Mediterraneo tardoantico, Bari.
- C. BALMELLE 2001, Les demeures aristocratiques d'Aquitaine. Société et culture de l'Antiquité tardive dans le Sud-Ouest de la Gaule, "Aquitania" supp. 10, Bordeaux.
- J. BÉRATO 2004, L'établissement rural de Saint-Martin à Taradeau (Var), l<sup>er</sup> s. av. J.-C.-VIl<sup>e</sup> s. ap. J.-C. "Revue archéologique de Narbonnaise", 37, pp. 35-108.
- J. BÉRATO, M. BORRÉANI, M. LEGUILLOUX 1990, La villa gallo-romaine des Laurons (quartier Saint-Pierre). Les Arcs-sur-Argens, Var, "Documents d'Archéologie Méridionale", 13, pp. 221-247.
- P. BOISSINOT 2001, Archéologie des vignobles antiques du sud de la Gaule, "Gallia", 58, pp. 45-68.
- G. BOSI, D. LABATE, R. RINALDI, M.C. MONTECCHI, M. MAZZANTI, P. TORRI, F.M. RISO, A.M. MERCURI 2019, A survey of the Late Roman period (3°-6° century AD): Pollen, NPPs and seeds/fruits for reconstructing environmental and cultural changes after the floods in Northern Italy, "Quaternary International", 499, pp. 3-23.
- G.P. BROGIOLO (ed) 1996, La fine delle ville romane: trasformazioni nelle campagne tra tarda antichità e alto medioevo, Mantua.
- G.P. BROGIOLO, A. CHAVARRÍA, M. VALENTI (eds) 2005, Dopo la fine delle ville: le campagne tra VI e IX secolo, Mantua.
- G.P. BROGIOLO, A. CHAVARRÍA ARNAU 2020, Archeologia postclassica. Temi, strumenti, prospettive, Rome.

- J.-P. BRUN 1986, L'Oléiculture antique en Provence. Les huileries du département du Var, Paris.
- J.-P. BRUN 1993, La discrimination entre les installations oléicoles et vinicoles, in AMOURETTI, BRUN 1993, pp. 511-537.
- J.-P. BRUN 2003, *Le vin et l'huile dans la Méditerranée antique*, Paris.
- J.-P. BRUN 2004, Archéologie du vin et de l'huile dans l'Empire romain, Paris.
- J.-P. BRUN 2005, Archéologie du vin et de l'huile en Gaule romaine, Paris.
- P. BURTON, T. LEWIT 2019, *Pliny's presses: the true story of the 1st century wine press*, "Klio", 101(2), pp. 543-598.
- C. CARRATO 2017, Chais vinicoles et celliers oléicoles à dolia de Gaule Narbonnaise: caractérisation, interprétation et restitution fonctionnelle, in F. TREMENT (ed), Produire, transformer et stocker dans les campagnes des Gaules Romaines. Problèmes d'interprétation fonctionnelle et économique des bâtiments d'exploitation et des structures de production agropastorale, Bordeaux, pp. 457-478.
- P. CASTANYER I MASOLIVER, J. TREMOLEDA I TRILLA 1999, La vil·la romana de Vilauba. Un exemple de l'ocupació i explotació romana del territori a la comarca del Pla de l'Estany, Girona.
- P. CASTANYER, J. FRIGOLA, J. TREMOLEDA 2018, La vil·la romana de Vilauba (Camós, Pla de L'Estany): Les intervencions dels anys 2016 i 2017, in J. LLINÀS POL (ed), XIV Jornades d'Arqueologia de les Comarques de Girona, Caldes de Malavella, pp. 263-273.
- A. CHAVARRÍA ARNAU 2004, Interpreting the transformation of late Roman villas: The case of Hispania, in N. CHRISTIE (ed), Landscapes of Change: Rural Evolutions in Late Antiquity and the Early Middle Ages, Aldershot, pp. 67-102.
- A. CHAVARRÍA ARNAU 2006, *El final de las* villae *en* Hispania (*siglos IV-VII d.C.*), Turnhout.
- A. CHAVARRÍA, T. LEWIT, A. IZDEBSKI 2019, Settlement, land use and society in the Late Antique Mediterranean, 4<sup>th</sup>-7<sup>th</sup> c. An overview, in IZDEBSKI, MULRYAN 2019, pp. 135-151.

- L. COLOMINAS, F. ANTOLÍN, M. FERRER, P. CAS-TANYER, J. TREMOLEDA COLOMINAS 2019, From Vilauba to Vila Alba: Changes and continuities in animal and crop husbandry practices from the Early Roman to the beginning of the Middle Ages in the northeast of the Iberian Peninsula, "Quaternary International", 499, pp. 67-79.
- G. COMET 2004, Les céréales du bas-empire au moyen âge, in M. BARCELO, F. SIGAUT (eds), The Making of Feudal Agricultures?, Leiden, pp. 131-176.
- R. CRESSWELL 1965, Un pressoir à olives au Liban, "L'Homme", 5, pp. 33-63.
- R. DENDY 1959, *The Use of Lights in Christian Worship*, London.
- E.K. DODD 2020, Roman and Late Antique Wine Production in the Eastern Mediterranean. A comparative archaeological study at Antiochia ad Cragum (Turkey) and Delos (Greece), Oxford.
- L. FOXHALL 1997, Ancient farmsteads, other agricultural sites and equipment, in C. MEE, H. FORBES (eds), A Rough and Rocky Place. The Landscape and Settlement History of the Methana Peninsula, Greece. Results of the Methana Survey Project, Liverpool, pp. 257-268.
- R. FRANKEL 1999, Wine and Oil Production in Antiquity in Israel and Other Mediterranean Countries, Sheffield.
- E. GLIOZZO, C. FORTINA, I. MEMMI TURBANTI, M. TURCHIANO, G. VOLPE 2005, Cooking and painted ware from San Giusto (Lucera, Foggia): The production cycle, from the supply of raw materials to the commercialization of products, "Archaeometry", 47(1), pp. 13-29.
- J. GULICK 1955, Social Structure and Culture Change in a Lebanese Village, New York.
- I. LABUHN, M. FINNÉ, A. IZDEBSKI, N. ROBERTS, J. WOODBRIDGE 2019, Climatic changes and their impacts in the Mediterranean during the first millennium AD, in IZDEBSKI, MUL-RYAN 2019, pp. 247-270.
- B. LAUVERGEON 2004, Les grands pressoirs bourguignons pré-industriels: essai de chronotypologie, "In Situ. Revue des patrimoines", 5, http://insitu.revues.org/2447.
- T. LEWIT 2020, Invention, tinkering, or transfer? Innovation in oil and wine presses in the Roman Empire, in P. ERDKAMP, K. VER-BOVEN, A. ZUIDERHOEK (eds), Capital, Investment and Innovation in the Roman World, Oxford, pp. 307-353.

- A. IZDEBSKI, M. MULRYAN (eds) 2019, *Environ*ment and Society in the Long Late Antiquity, Leiden.
- M. MCCORMICK, U. BÜNTGEN, M.A. CANE et al. 2012, Climate change during and after the Roman empire: reconstructing the past from scientific and historical evidence, "Journal of Interdisciplinary History", 43, pp. 169-220.
- A. MARZANO 2013a, Agricultural production in the hinterland of Rome, in A. BOWMAN, A. WILSON (eds), The Roman Agricultural Economy. Organization, Investment, and Production, Oxford, pp. 85-106.
- A. MARZANO 2013b, Capital investment and agriculture: multi-press facilities from Gaul, the Iberian Peninsula, and the Black Sea Region, in A. BOWMAN, A. WILSON (eds), The Roman Agricultural Economy. Organization, Investment, and Production, Oxford, pp. 107-142.
- R. MATIJAŠIĆ 1993, Oil and wine production in Istria and in Dalmatia in Classical Antiquity and the early Middle Ages, in AMOURETTI, BRUN 1993, pp. 247-261.
- D.J. MATTINGLY, R. BRUCE HITCHNER 1993, Technical specifications for some North African olive presses of Roman date, in AMOURETTI, BRUN 1993, pp. 439-462.
- M. PARANI 2019, Lamps, in D.K. PETTEGREW, W.R. CARAHER, W. DAVIS (eds), The Oxford Handbook of Early Christian Archaeology, Oxford, pp. 313-332.
- Y. PEÑA CERVANTES 2005, Producción de vino y aceite en los asentamientos rurales de Hispania durante la Antigüedad Tardia (s. IV-VII d.C.), "CuPAUAM", 31-32, pp. 103-116.
- Y. PEÑA CERVANTES 2009, La producción de vino en contextos eclesiásticos tardoantiguos hispanos, in J. BLANQUEZ PEREZ, S. CELES-TINO PEREZ (eds), El vino en época Tardoantigua y Medieval, Madrid, pp. 343-355.
- Y. PEÑA CERVANTES 2010, Torcularia. La producción de vino y aceite en Hispania, Tarragona.
- Y. PEÑA CERVANTES 2012, Variantes tecnológicas hispanas en los procesos de elaboración de vino y aceite en época romana/ Spanish technological variants in the production of wine and olive oil in the Roman period, "Anales de Prehistoria y Arqueología", 27, pp. 37-57.

216

- L. PEÑA-CHOCARRO, G. PÉREZ- JORDÀ, N. ALONSO, F. ANTOLÍN, A. TEIRA-BRIÓN D, J. PEDRO TERESO, E. MONTES MOYA, D. LÓPEZ REYES 2019, Roman and medieval crops in the Iberian Peninsula: A first overview of seeds and fruits from archaeological sites, "Quaternary International", 499, pp. 49-66.
- L. PEÑA-CHOCARRO, G. PÉREZ JORDÀ 2017, Plant remains from the excavation at the baptistery of Padua: an insight into food in the early Middle Ages, in A. CHAVARRÍA ARNAU (ed), Ricerche sul centro episcopale di Padova. Scavi 2011-2012, Mantua, pp. 85-92.
- H.POMARÈDES, H. PETITOT 1996, *Roquemaure La Ramière*, "ADLFI. Archéologie de la France Informations" [En ligne], http://journals.openedition.org/adlfi/11872.
- P. REYNOLDS 2010, Hispania and the Roman Mediterranean, AD 100-700: Ceramics and Trade, London.
- J.J. ROSSITER 2007, Wine-making after Pliny: Viticulture and farming technology in late antique Italy, in L. LAVAN, E. ZANINI, A. SARANTIS (eds), Technology in Transition A.D. 300–650, Leiden, pp. 93-118.
- M. ROTTOLI 2014, Reflections on Early Medieval resources in northern Italy: The archaeobotanical and archaeozoological data, "Quaternary International", 346, pp. 20-27.
- F. SALVADORI 2013, L'allevamento nell'Italia medievale (secc. V-XIV). I dati archeozoologici, "Debates de Arqueología Medieval", 3, pp. 117-148.
- P. SQUATRITI 2018, Rye's rise and Rome's fall: Agriculture and climate in Europe during Late Antiquity, in IZDEBSKI, MULRYAN 2019, pp. 342-354.
- A. TCHERNIA 1986, *Le vin de l'Italie romaine*, Paris.
- D.L. THURMOND 2017, From Vines to Wines in Classical Rome, Leiden.
- D. VAN LIMBERGEN 2011, Vinum Picenum and Oliva Picena, "Babesch", 86, pp. 71-94.
- J. VIZCAÍNO SÁNCHEZ 2009, Vino y sociedad cristiana en la "Hispania" Tardoantigua. Documentación arqueológica y textual, in J. BLÁNQUEZ PÉREZ, S. CELESTINO PÉREZ (eds), El vino en época Tardoantigua y Medieval, Madrid, pp. 75-112.

- G. VOLPE 2001, Linee di storia del paesaggio dell'Apulia romana: San Giusto e la valle del Celone, in E. Lo CASCIO, A. STORCHI MARINO (eds), Modalità insediative e strutture agrarie nell'Italia meridionale in età romana, Bari, pp. 315-361.
- G. VOLPE (ed) 2002, *San Giusto. La villa, le* ecclesiae, Bari.
- G. VOLPE 2005, Paesaggi e insediamenti rurali dell'Apulia tardoantica e altomedievale, in G. VOLPE, M. TURCHIANO (eds), Paesaggi e insediamenti rurali in Italia meridionale fra Tardoantico e Altomedioevo, Bari, pp. 299-314.
- G. VOLPE 2007, Architecture and Church Power in Late Antiquity: Canosa and San Giusto (Apulia), in L. LAVAN, L. ÖZGENEL, A. SARANTIS (eds), Housing in Late Antiquity, Leiden, pp. 131-168.
- G. VOLPE 2012, Per una geografia insediativa ed economica della Puglia tardoantica, in C.D. FONSECA (ed), Bizantini, Longobardi e Arabi in Puglia nell'alto medioevo, Atti del XX congresso internazionale di studio sull'alto medioevo (Savelletri di Fasano (BR), 3-6 novembre 2011), Spoleto, pp. 27-57.
- G. VOLPE, L. CASAVOLA, F. D'ALOIA, L. PIETROPAO-LO 1998, *Le ceramiche tardoantiche della villa di Agnuli, Mattinata FG*, in L. SAGUÌ (ed), *La ceramica in Italia, VI-VII secolo* (Roma 1995), Florence, pp. 723-734.
- G. VOLPE, M. TURCHIANO 2010, The last enclave. Rural settlement in the 5th Century in Southern Italy: the case of Apulia, in P. DELOGU, S. GASPARRI (eds), Le trasformazioni del V secolo. L'Italia, i barbari e l'Occidente romano, Turnhout, pp. 531-577.
- G. VOLPE, M. TURCHIANO 2013, La villa tardoantica di Faragola (Ascoli Satriano) e oltre, in F.P. Rizzo (ed), La Villa del Casale e oltre. Territorio, popolamento, economia nella Sicilia centrale tra tarda antichità e alto medioevo, Macerata, pp. 305-352.
- T. WALISZEWSKI 2014, *Elaion. Olive Oil Production in Roman and Byzantine Syria–Palestine*, Warsaw.
- K.D. WHITE 1970, Roman Farming, New York.