

Rethinking landscapes through connectivity

Wine production, consumption, and trade in northern Tuscany: updates and future perspectives (3rd century BC–6th century AD)*

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Abstract The paper overviews wine production, trade, and consumption in northern Tuscany's coastal and inland areas from the 3rd century BC to the 6th century AD. Integrating new evidence from the villa at Aiano and the harbour context of *Vada Volaterrana* with legacy data related to unpublished or previous excavations allows analyzing the distribution of amphorae related to wine consumption in the *ager Volaterranus* and the coastal area bordering with *ager Pisanus*. Distribution patterns examined with settlements evolution, toponyms, inscriptions, and literary sources reveal how social networks impacted production, trade, and consumption dynamics over the *longue durée*, leading to modifications in landscape organization and management of resources.

Keywords landscape archaeology, wine consumption, amphorae/dolia, networks, northern Tuscany

Introduction

The pivotal role of wine in Etruscan life is beyond any doubt. Apart from its importance for local economies, this 'exotic' drink, introduced in Etruria in the 9th century BC, promoted the diffusion of drinking vessels and acquired a symbolic meaning around banquet, the ritual to communicate status, to develop alliances, to establish relationships¹.

* The paper is the result of the authors' collaboration. Introduction, conclusions, and paragraph on social network analysis approach were written by Valentina Limina. The paragraph on the coastal area by Simonetta Menchelli-Antonella Del Rio, the paragraph on hinterland by Marco Cavalieri.

1 Among the several studies concerning wine production/consumption in the Etruscan world and the ritual use of wine in Etruscan banquets, see Cristofani 1987; Lindsay 1998; Brun 2004; Giulierini 2005; Ciacci et al. 2007; Pieraccini 2011; Ciacci et al. 2012; Pieraccini 2013.

Etruscan amphorae known from 7th century BC shipwrecks in southern France attest to the existence of an active trade in Etruscan wine², and literary sources confirm that together with grain production, the Etruscans were also famous for their vineyards, olives, figs³. Among others, Strabo, Livy, Varro, Pliny⁴, and Dionysus of Halicarnassus⁵ defined the Etruscan territories as εὐδαίμων⁶, *uberior*⁷, or *opulenta*⁸. According to Livy, northern Etruria, specifically the area between Arezzo and Fiesole, was among the wealthiest of the Italian Peninsula⁹. Diodorus Siculus considered the Etruscan love for excess in drinking wine among the causes of the Etruscan τρυφή¹⁰. Besides the literary *topos*¹¹, wine amphorae and drinking vessels produced in northern Etruria were well-inserted into the broader trade networks of the Mediterranean¹². According to Martial the wine typologies produced in Etruria were of different qualities, while Pliny referred that the best one was that of Luni¹³. Since the 7th century BC, the wine produced in Etruria was part of a broader regional and supra-regional market, as attested by amphorae found in Gaul and in the western Mediterranean¹⁴. The shipwrecks found in the Tyrrhenian coastline attest the increase of trade in wine and cereals in between the Punic wars (240–220 BC) confirming that north Etruscan anchorages were fundamental in the wine route to Gaul¹⁵. At the end of the 2nd century BC, the wine trade between Italy and Gaul increased while a new wine amphora, the Dressel 1, was introduced. As proof that wine production in Etruria was active during the Roman Empire, from the 2nd to the 3rd century AD several centres of internal Etruria and Umbria traded their wine production in flat-bottomed amphorae known as *anfora tipo Spello*, *Forlimpopoli* and *anfora tipo Empoli* (this last produced in Etruria)¹⁶; at the same time, imported amphora attest the vitality of the Mediterranean wine trade in Late Antiquity.

At the core of northern Etruria, the case of *ager Volaterranus* is significant to analyze networks related to wine production and trade over the *longue durée*. The territory of Volterra was delimited by the Cecina, Era and Elsa Valleys, respectively, to the west, the north and the east, and bordered with the territories of Pisa, Lucca, Florence,

2 Gran-Aymerich – MacIntosh Turfa 2013; Brun et al. 2020.

3 Liv. 28, 45, 13–18; Dion. Hal. ant. 1, 37, 1–4; Liv. 5, 33; Plut. Camillus 15, 1–6.

4 Plin. nat. 18, 20, 87.

5 Dion. Hal. ant. 1, 37, 1–4.

6 Strab. 5, 2, 2.

7 Liv. 5, 24, 5; 9, 36, 11.

8 Varro rust. 1, 44, 1; 1, 9, 5–6.

9 Liv. 13, 3, 3.

10 Diod. 5, 40.

11 Further considerations on Etruscan τρυφή and related literary *topoi* in Becker 2016; Limina 2022.

12 Pasquinucci – Menchelli 2017; Menchelli 2020.

13 Plin. nat. 14, 68.

14 Gran-Aymerich – MacIntosh Turfa 2013, 395–396.

15 Several shipwrecks were found along the coast between Pisa and Baratti, dating from the archaic period and the Second World War. Shipwrecks containing wine amphorae were found at Secche dei Catini di Vada, Foce del Fine, and Secchitella. See Genovesi et al. 2013.

16 Pasquinucci – Menchelli 2017; Del Rio, Cherubini 2023.

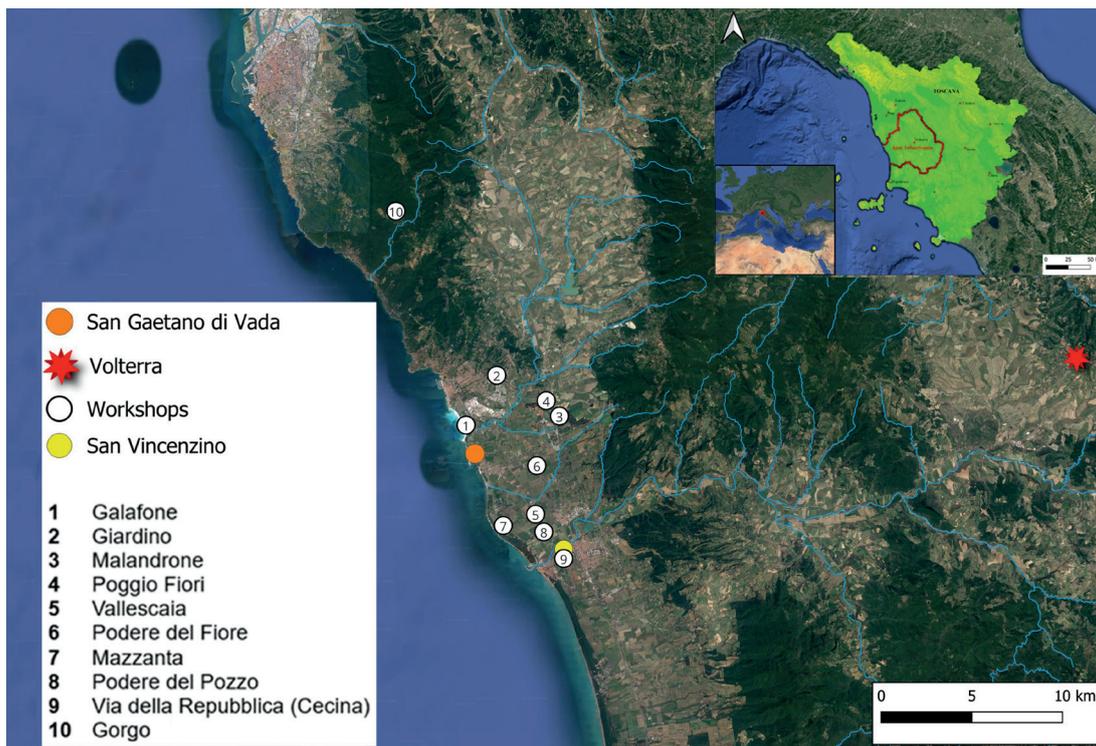


Fig. 1 QGIS map of workshops in the *ager Volaterranus* and sites mentioned in the text (V. Limina)

Siena and Populonia¹⁷ (Fig. 1). The *ager* extended for 2000 sq.km; its estimated population was between 16,000 and 20,000 inhabitants¹⁸. Among the several resources and the related economic activities: the agricultural products (grain, olive, wine), extended wooded areas, stone quarries (alabaster, selagite, Pignano limestone), saltpans and water springs, and clay deposits. Thanks to the abundance of clay, water and wood, the district between the rivers Cecina and Fine was particularly suitable for pottery manufacture. The archaeologically identified workshops specialized in the production of bricks, roof tiles, pottery, and winery amphorae, and their activity continued until Late Antiquity¹⁹. In the 3rd century BC, due to the spread of wine trade the Greek-Italic amphorae, then the Dressel 1 type, were produced in the district workshops (Gorgo, La Mazzanta)²⁰. The development of the district at the end of the 1st century BC is attested by the remarkable manufacturing activity of the coastal workshops producing Dressel 2–4 amphorae which are found along the coast in Liguria, in Gaul and the trade axe between Rhône and Rhin. Since the mid-2nd century AD in the district and in the rest of Italy, a change in the organization of production has been attested. Wine amphorae

17 The borders of *ager Volaterranus* are those identified in Fiumi 1968. Further considerations on this topic in Limina 2021.

18 For the territory extent and estimated population, see Limina 2021, and related bibliography.

19 Menchelli et al. 2023.

20 Cherubini et al. 2006; Del Rio – Cherubini 2023, 361.

(Spello/Forlimpopoli/Empoli types) started to be produced in the same workshops that produced the previous ones but had smaller capacity and a flat bottom or a small spike; the production of wine amphorae in the coastal area of *ager Pisanus* and *Volaterranus* continued to the end of 5th to the beginning of 6th century AD with Empoli amphora²¹. The direct involvement of the Volterranean *gentes* in entrepreneurship/manufacturing related to agricultural products such as wine, is attested by stamps on amphorae or *tituli picti*. Archaeological materials such as the Keay LII amphorae used for trading wine from Calabria and Sicilia found at San Gaetano and dating from the 5th century AD proves the existence of solid ties with southern Italy. At the same time, African and Oriental productions attest to the vitality of the Mediterranean network in Late Antiquity. The analysis of sites such as San Gaetano di Vada, along the coast, and the villa at Aiano in the hinterland, not only confirms the local production/consumption of wine in the *ager Volaterranus* over the *longue durée* but also allows a better understanding about dynamics of control and management of ancient landscapes and resources into a broader Mediterranean connectivity.

The coastal area and the harbour system

The vast number of amphorae (5521 items) found in the *Vada Volaterrana horrea* (loc. San Gaetano)²² allow us to rethink several aspects of wine production, trade, and consumption in northern Tuscany's coastal areas from the Late Republic to the Late Antiquity²³. The first significant result emerging from the analysis of archaeological materials found in the *horrea* is the remarkable connection of *Vada Volaterrana* and the north Etruscan harbour systems in the Mediterranean Sea routes specializing in import-export activities. Of 5521 amphorae, 3984 items (72.16%) are provincial imports. The remaining 27.84% are Italian imports: 276 items (4.99%) from several regions of the Italian Peninsula; 729 items (13.21%) were produced in the hinterland of Vada; 532 items were from the Pisan-Volaterran district and the low Arno Valley (9.64%). Concerning content, the amphorae locally produced and those from subregional workshops found in San Gaetano *horrea* (1271 items = 23.02%) are wine amphorae from Dressel 1 to the Empoli type. Such a diachronic continuity was identified in the productive landscape whose workshops were detected through decennial field surveys in the coastal and hinterland areas. Among the imported amphorae, at least 845 items contained wine. The total of locally produced and imported wine amphorae amounts to 2116 items, 38.32% of amphorae found in San Gaetano *horrea*. It is significant to stress that the pre-

21 These amphorae had a minor capacity (above 15 l) and featured a flat bottom, which made it impossible for their trade-in ships to be stocked as the previous amphorae. We should imagine a different way in the technique used for their trade, considering that they were spread locally, in Rome, and along the western Mediterranean coasts (Pasquinucci – Menchelli 2013; Menchelli 2020; Del Rio – Cherubini 2023).

22 Menchelli et al. 2023.

23 The quantitative data come from Del Rio – Cherubini 2023, 345–486.

ponderant trend of locally produced wine amphorae (1271 items = 60% vs 845 items = 40% for imported ones) was constant until the 4th century AD. Out of the 729 amphorae from the Vada hinterland, the majority (518 items = 71%) were produced in the workshops at Poggio Fiori (270 items) and Galafone (248 items), the former identified in the middle river Fine valley, the latter near the river mouth; among the amphorae found in the *horrea*, fewer were produced in the workshops identified in the river Cecina Valley (La Mazzanta, Podere del Pozzo, Giardino, Via della Repubblica) (Fig. 1).

Due to their localization, the *horrea* at San Gaetano connected to the northern district of the *ager Volaterranus*: reasonably, other warehouses should have been in the southern coastal area where the workshop identified at La Mazzanta was highly productive. As already said, the presence of wine amphorae in San Gaetano *horrea* is attested from the Late Republican period; however, the Dressel 1 amphorae could be considered as residuals considering that the *horrea* was built at the beginning of the 1st century AD. It was in the 1st and the beginning of the 2nd century AD that it is possible to confirm an expansion phase of the site, as attested by the 165 items of Dressel 2–4 amphorae found. These wine containers represent the district's significant development of wine-growing and related manufacturers. This phenomenon must be interpreted with the expansion phase registered in Volterra and the increase of villas and minor settlements in its *ager*²⁴. The topographical – and reasonably economic/managerial – relation villa-workshop is attested at Poggio Fiori on a knoll north of Botro del Gonnellino, tributary to river Fine. At Poggio Fiori there were traces of a villa dominating over a workshop consisting of at least six furnaces (two of which had a firing chamber of 6 × 4.5 m) located in the valley below²⁵. The villa and the workshop were strategically positioned, directly connected to river Fine and near the consular *Via Aemilia* (probably traced from the actual Strada Regionale 206). A similar correlation between villa and amphorae production seems possible for the case of the San Vincenzino villa and the Mazzanta workshops²⁶. Such a correlation would imply the managerial activity of the Cecina family owning the villa. In this significant phase, between the 1st and the beginning of the 2nd century AD, the import-export activities were intense: Dressel 2–4 amphorae produced in the workshops of *ager Volaterranus* (Poggio Fiori, Galafone, Giardino, Podere del Pozzo, la Mazzanta) were traded in regional and Mediterranean networks while Dressel 2–4 amphorae from *ager Pisanus*, the southern Tyrrhenian area (*Latium* and *Campania*), from Spain (*Baetica* and *Tarraconensis*), as well as other wine amphorae typologies from Gaul and the East, were imported. The range and quality of wines were diverse: the popular from Gaul, the prestigious from southern Italy and the East. Even if it is not possible to exclude that imported amphorae found at San Gaetano were intended to be reloaded onto smaller vessels for the redistribution trade, the same amphorae found in the Vada *horrea* are attested at *Pisae*, *Volaterrae* and in

24 Pasquinucci et al. 2023.

25 Repetto et al. 2018, 43–66.

26 Costantini 2012.

the *villae* and minor settlements of northern Etruria²⁷. Thus, it seems evident that in the globalizing economy of the 1st century AD²⁸, even in a region with a wine vocation, there was also a demand for ‘foreign’ wines of different quality levels to meet the needs of the different market segments. In the second half of the 2nd and the 3rd century AD, despite the imported 174 items, most wine amphorae found at San Gaetano *horrea* were locally produced. The 304 items were manufactured in the local workshops (il Gorgo, Giardino, Malandrone, Galafone, Poggio Fiori, Podere del Pozzo, La Mazzanta). This local production counts 235 items of Spello amphorae, 49 items Forlimpopoli type, 20 items Empoli amphorae which will become prevalent in the following centuries. Notwithstanding the minor capacity of amphorae (Forlimpopoli types roughly maintained an average capacity of 25.6 l, while amphorae of Spello and Empoli contained 15 l)²⁹, the high percentage of amphorae and active workshops confirm the resilience of the district to the 2nd century AD crisis. Imported wines came from Gaul (contained in Gauloise 4 amphorae) and North Africa (in Dressel 30/Keay IA; African IIIA/Keay 25.1). Wine from Africa will have great success in the following centuries (Fig. 2). In the 4th and 5th centuries AD, the Empoli amphora was the most attested at Vada (in total 344 items) with an emerging trend: 130 items were produced in the workshops of Vada hinterland, but 108 items were from the manufacturers located in the hilly area between Leghorn and Pisa, while 106 items were from low Arno Valley productions: this could be considered as a sort of commercial *koiné* between the Pisa-Volterra productive district. The absence of Empoli amphorae produced in medium and inner Arno valley, for which fabrics are easily distinguishable at the macro-scale, could prove their maritime distribution from the Pisa harbour system to the north³⁰ and river trade through Arno/Tevere. However, even if the Empoli amphora was highly successful in the centuries 4th–5th AD, the quantity of imported wine is prevalent: a total of 357 items (African Keay 25.1 form, 184 items; Sicilian Keay 52, 80 items, and Eastern amphorae LR1, 70 items, LRA2, 15 items, LRA3, 8 items). Local production of Keay 52 amphorae (15 items) can be attributed to the workshops in the hinterland of Vada (Galafone and Podere del Pozzo) attesting the high reception of external models even in the Late Antiquity. At the end of the 5th century AD, the progressive crisis of the Empoli amphora concluded at the beginning of the 6th century AD. Despite this, wine production continued in the rural settlements, as confirmed by palaeobotanical data from Podere San Mario in the inner *ager Volaterranus*³¹. In the centuries 6th–7th AD in the *horrea* at San Gaetano, only imported wines are attested. The relevant number of amphorae attest to a vital hinterland with high consumption standards: from Italy, the Sicilian amphorae Keay 52 of late tradition (47 items), and Crypta Balbi 2 (8 items); from the Eastern Mediterranean, transitional LRA1A and LRA1B (total 56 items) and LRA2, LRA3 (6 items), from Palestine, LR4 and LR5A, and Samos cistern type amphora. The African wine is

27 Menchelli 2020.

28 De Haas – Tol 2017.

29 About the amphorae capacity: Molina Vidal – Mateo Corridor 2018.

30 Bulgarelli et al. 2018.

31 Motta et al. 1993.

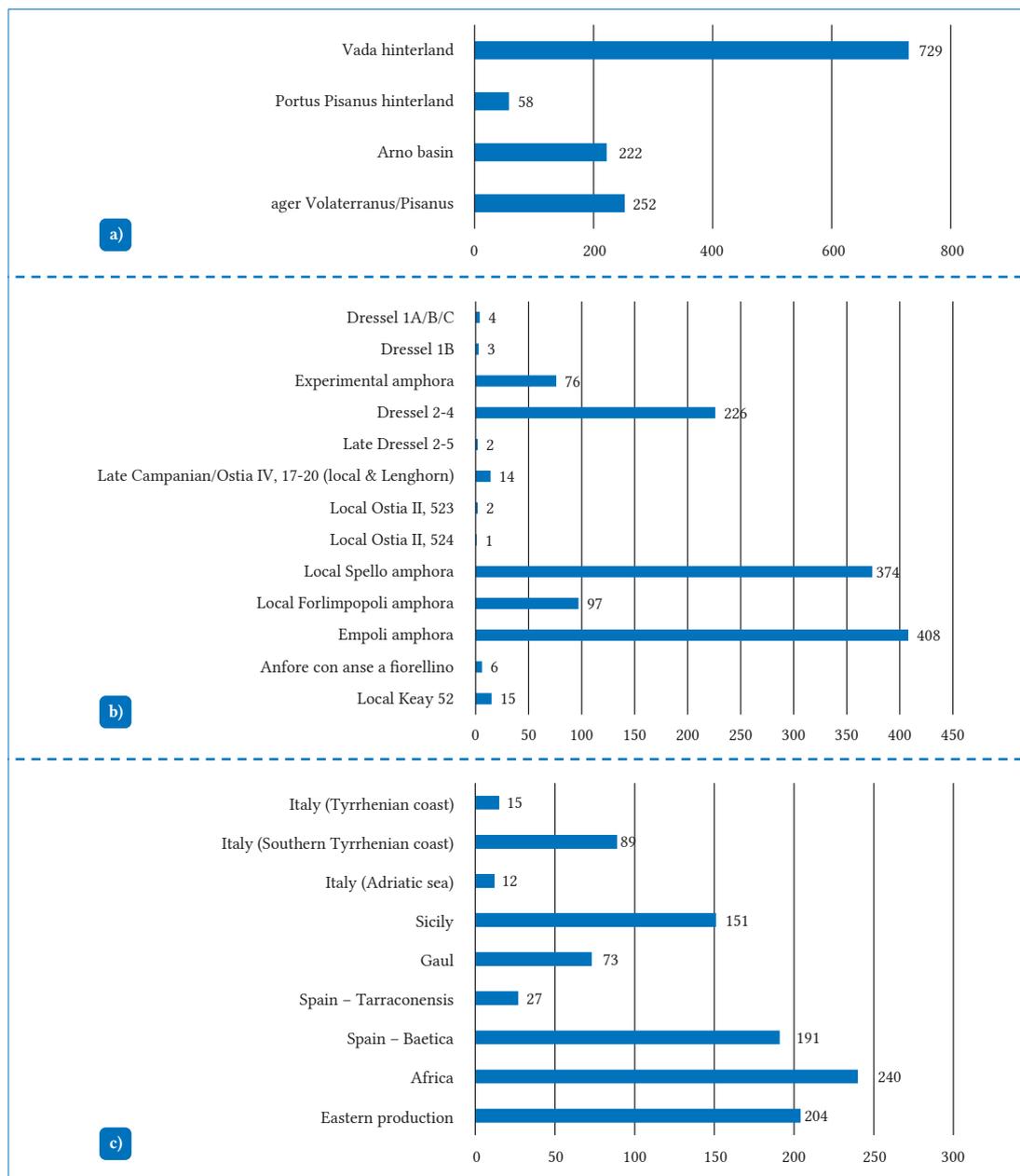


Fig. 2 a) San Gaetano *horrea*. Volaterran-Pisan wine amphorae; b) San Gaetano *horrea*. Volaterran-Pisan wine amphorae: the forms; c) San Gaetano *horrea*. Imported wine amphorae: the origin (V. Limina, after Del Rio, Cherubini 2023)

not noticeable because the numerous containers attested – for example, Keay 55, Keay 56 and 57 (44 items), Hammamet 3 form – are considered both for wine and fish contents. At the end of the 7th century AD in the rural settlements, wine production continued for subsistence and with tools and containers that are hard to distinguish at an archaeological level. The Samos cistern type amphora and the globular amphoras found in the Vada *horrea* attest to the last connection to the ‘Roman’ sea routes.

The hinterland: The late-antique villa in Aiano and its wine production

Since 2005 a luxurious Roman villa in Aiano (San Gimignano, near Siena, Italy) has been extensively excavated. The villa was partly discovered during the numerous archaeological campaigns carried out by a Belgian-Italian team coordinated by the Université catholique de Louvain (UCLouvain, Belgium) as part of the international project ‘VII REGIO – the Elsa Valley during Roman Age and Late Antiquity’. The villa in Aiano is one of the few rural sites in Roman Etruria where we can trace an extraordinary long life; it is also an example of the wealthy rural residences of Central Italy belonging to late-antique aristocracy, and dating from the 4th to the 7th centuries AD. The building complex (dating between the end of the 3rd and the beginning of the 4th century AD) was enriched with polylobate *ambulatio* surrounding a hexalobate hall (dating to end of the 4th and the beginning of the 5th century AD). This room underwent various building phases that led to its current triapsidal appearance. The villa was abandoned at the end of the 5th century AD. After a short time, some production workshops were established in its disused rooms, where a very organised recycling system was set up to recuperate all the decorations from the previous residential complex. The site was then definitively abandoned in the mid-7th century AD.

The excavated area comprises about 4,000 sq.m. (in 2022) of the estimated surface of more than 10,000 of the site. That confirms the great archaeological interest and the remarkable state of preservation of this monumental residential complex. During its lifespan (dating from the end of the 3rd to the second half of 5th century AD), the residential area of the villa (*pars dominica*) presented a unique plan. It features particularly opulent decorations (marble, *opus sectile*, mosaics, frescoes and stucco decorations) dating from the end of the 4th to the beginning of the 5th century AD. Of these, few traces are left because all the materials have been deprived of their original decorative functions and repurposed for other uses. This precise and organized recovery work of raw materials, taking place before the building was abandoned, makes the reconstruction of the living spaces and their function particularly difficult. The reconstruction of the surviving decorations shows the refinement of the materials: marble works for the floors, wall paintings simulating *opus sectile*, mosaics in stone tiles and gold-leafed transparent and opaque glass paste, traces of architectural stuccoes, *crustae marmoreae*, glass paste *opus sectile* depicting fish, attributable to Egyptian craftsmanship. Lastly, the excavation also brought to light a building that can be traced back to the rustic area of the villa (*pars fructuaria*): this is supposed to be a monumental *cella vinaria* (9 × 30 m.) where several *dolia* were still stored, most probably to contain wine. After tracing the history of the villa at Aiano, we come briefly to the recent discovery of a wine cell (*cella vinaria*), a building of considerable size that, after years of research on the site, clarifies the productive nature of the villa during its late ancient phase.

In 2019, a new quarter of the villa was discovered and partially excavated, a fundamental part of the *pars fructuaria* of the villa, located northeast of the residential area. This area is still under excavation (Fig. 3) and consists of several rooms. To the northeast is the 9 × 5 m α room, with four external buttresses on the eastern and western

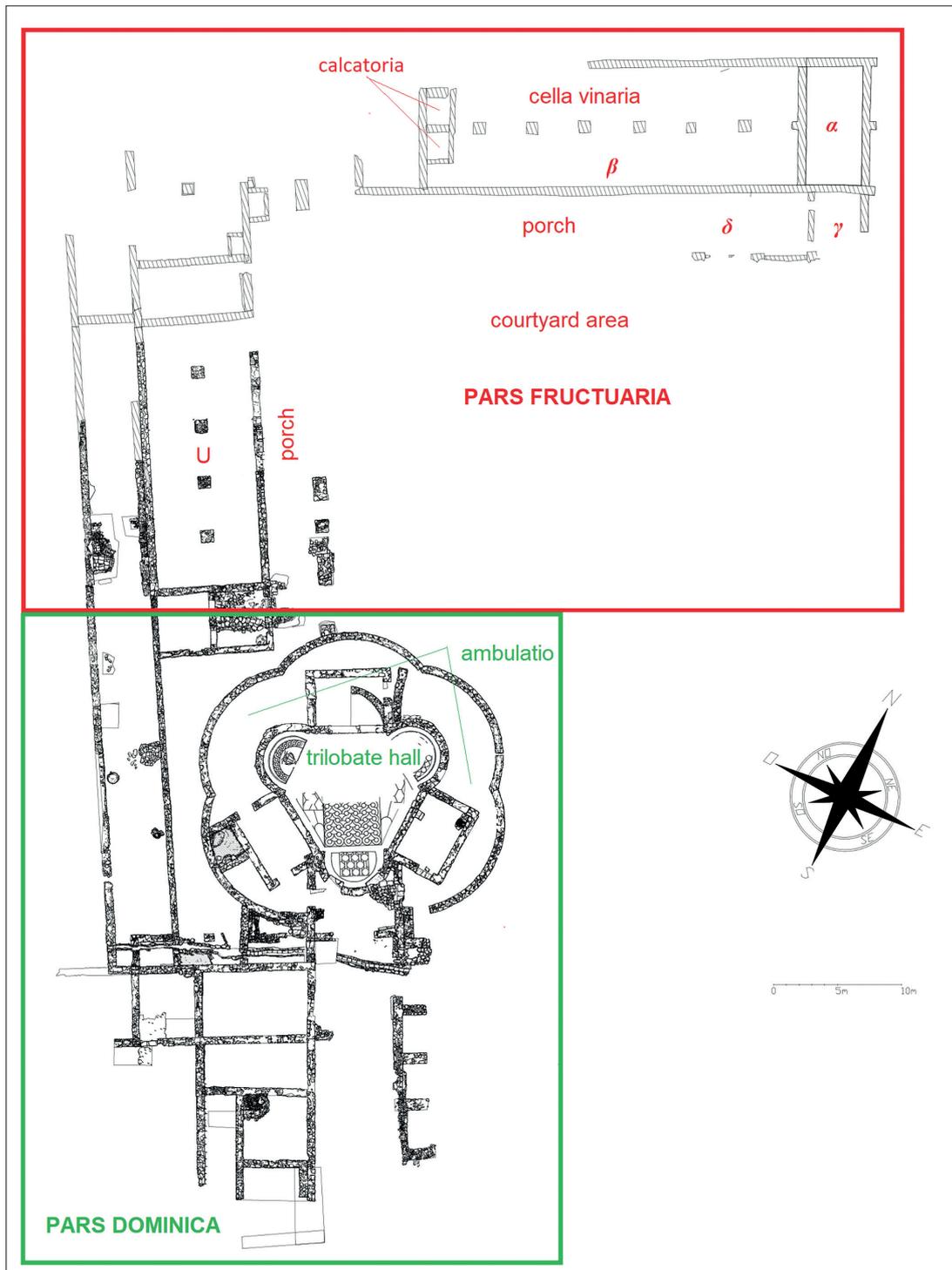


Fig. 3 The villa at Aiano. Overall survey of the structures excavated by the UCLouvain mission (2005–2011; 2014–2023) with the *partes dominica ac fructuaria* (respectively framed in green and red) and the rooms (in Greek characters) of the latter (A. Novellini, M. Cavalieri)

sides. To the south of this space and of compartment β , which will be dealt with below, two other environments have emerged (δ and γ), whose eastern and western limits remain unknown to the current state of research. Towards the west is a large room (β), about 30×9 m, punctuated by six axial pillars. Inside this space, at the moment, one of the largest brought to light of the villa, sixteen underground sinkholes, were found and partially investigated during the 2019 and 2021–2023 campaigns. However, others could still be identified since archaeological research in the environment is far from complete. The south side of the complex is surrounded by a courtyard area, separated from the compartment β by a portico (compartment δ), located to the south of the environments δ and γ and parallel to the building, which continues to the west with a north-wing south, close to compartment U. The total area of the courtyard on the eastern and southern sides remains unknown (Fig. 3).

The presence of a warehouse with *dolia* is a fairly standard feature in Roman villas. These containers were used to store oil, wine or even cereals, all agricultural goods produced in situ (Fig. 4).

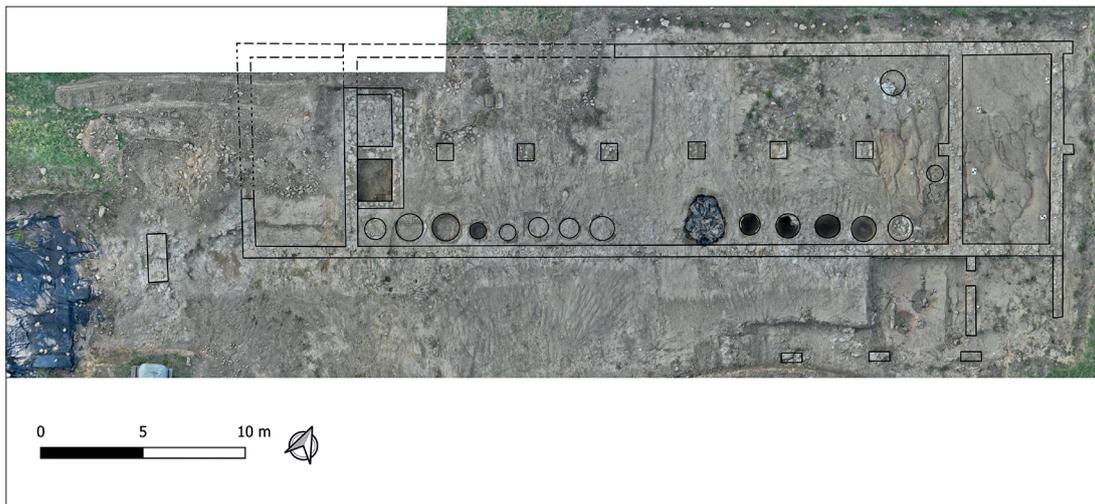


Fig. 4 The villa at Aiano. Orthophoto and drawing of the *cella vinaria* to the North-East of the triapsidal Room, with the sixteen *dolia defossa*, fourteen of which in battery (partially excavated). On the left, the alleged *calcatoria* of which only the southern tank excavated in summer 2023 (A. Peeters, 2023)

As for the orientation, some ancient authors such as Varro, Columella, Pliny the Elder or Palladio³² suggested placing the wine cell to the north or east of the site and the oil cell to the south to benefit more from the sun. In practice, these recommendations did not consider the specific topography of the various contexts that, sometimes, adopted

32 Varro rust. 1, 13, 7; Colum. 12, 52, 13; Plin. nat. 14, 27, 132; Pall. agric. 1, 18, 1.

different solutions. Accordingly, only the actual presence of *dolia* and the analysis of their content³³ allow us to confirm the function of the various environments. However, some studies based on regional corpora allow us to identify empirically different planimetric characteristics of these storage spaces for *dolia*³⁴. Thus, despite a plurality of possible shapes and sizes, the model of a rectangular room predominates over the T or U-shape³⁵. In rare cases, the volumes have pillars in a central position to support an upper floor with an additional function, sometimes to accommodate a residential space³⁶, and other times to store foodstuffs. The latter case could refer to what Columella describes as *granarium*³⁷.

Such a mixed solution could be adopted in the villa at Aiano, as well as in other sites, for example, in the Gauls, near Aix-en-Provence³⁸, or at the site of Notre-Dame-de-Consolation near Béziers: here five central pillars mark a rectangular space of 27.3 × 9.6 m, not far from that of Aiano. Similar examples are also found in Spain, such as in the villa de Las Mullas in Arellano, where a wine cell of 28.5 × 7.1 m with 34 *dolia* was discovered. In this case, a second floor was also assumed, perhaps for residential use³⁹.

The *dolia defossa* inside the compartment β (twenty with a spatial potential of the environment that could be quadrupled) are housed in pits dug directly into the layer of local clay, lined inside by powerful layers of *cocciopesto*, to ensure a constant temperature at the contents of the vessels. They are not identical in capacity and shape: the more numerous the globular, but others have pyriform profiles. In conclusion, the axial pillar environment hosting the underground sinkholes could, from the point of view of the planimetric characteristics, be entirely related to the *dolia* warehouses found in the Mediterranean basin (Fig. 4). Its location, north of the residential districts of the villa, would also coincide perfectly with the ancient agronomists' recommendations about the ideal location for a *cella vinaria*. The analysis of the contents of the *dolia* may bring new elements. In the meantime, in the 2023 campaign, two probable tanks for the grapes pressing and fermentation were found, leaning against the compartment β, with evident traces still in situ – at least for the one excavated today – of a thick *cocciopesto* covering. Probably connected by a short channel but not yet excavated, a basin was in place downstream of the tank investigated in order to receive the juice of the pressing.

33 Analysis on the residual remains inside the *dolia* are still in progress, undertaken by the Science for Cultural Heritage (SCICH) at the University of Pisa: the first results seem to confirm the presence of coniferous resins and traces of fermentation processes.

34 For Gaul, cfr. Carrato 2017; Carrato – Cibecchini 2020; Brun 2004. About the Iberian provinces see Cervantes 2010; Cervantes 2020; Domínguez 2017. For a general summary on granaries and storage spaces in Vesuvian areas, with the indication of *cellae vinariae*, see Pellegrino 2017.

35 Carrato 2017, 198.

36 The presence of a storage area on the ground floor and a residential area on the upper floor is assumed in the villa of San Giovanni di Ruoti (in Basilicata) where all the service areas and warehouses are located on the ground floor, while the domestic and residential spaces are located on the upper floor (Small et al. 1994, 93).

37 Colum. 1, 6, 10.

38 Carrato 2017, 340–341; Brun 2005, 23; Mocci – Nin 2006, 351–354.

39 Cervantes 2010, 697–701.

Although still preliminary, the villa in Aiano, in terms of production, can be interpreted as a site that performs functions mainly related to agricultural activities (such as the production of cereals known from palynological data)⁴⁰, and wine production reasonably for trade purposes, as attested by the productive installation. A remarkable quantitative production would make one think of the high statistical attestation of *dolia* found in primary or fragmentary positions. About the marketing, although in Aiano are attested containers in the tradition of so-called Empoli amphora⁴¹ of probable local production, but later, their scarce evidence could make us think of other forms of transport, such as casks and wineskins, as attested in the Provençal area and beyond⁴².

A study of viticulture in Late Antiquity in Valdelsa remains a complex undertaking; in Aiano, however, still in the 5th century AD when we can date the wall structures of the *chai* with the second phase of monumentalization of the villa⁴³, the production now seems to be confirmed: the discovery of the wine cell and its *dolia*, preserved since largely shaved and then filled scrupulously with earth and stones before being obliterated by early medieval floor preparations, is incontrovertible proof of the ancient wine tradition of this section of Tuscany.

Wine production & consumption in the *ager Volaterranus*: testing a social network analysis approach

Archaeology could benefit from tools used in social sciences to investigate, at different scales and forms, the conceptualization of relationships between human beings, communities, material assemblages. Social network analysis (SNA) is based on methods and theories developed in sociology and sociocultural anthropology⁴⁴. Adopting such approaches in archaeology has increased exponentially over the last decades⁴⁵. The basic principle of SNA could be summarized as follows: interactions are featured by relationships (edges), actors (nodes) who manage them, and a space (network). Networks can incorporate both people and objects, but also a temporal dimension, meaning that networks can be helpful to simplify the complexities of how specific phenomena are generated over time; but the power of networks relies on the mechanism for which disparate parts of the whole system may affect each other. Considering that archaeology is featured by several spatial, material, biological, and ideological ties, it is evident that their investigation requires a clear understanding of the connection between ancient human behaviour and the archaeological record. SNA approach based on material culture could address research questions such as identities, power structures, economic

40 Cavalieri 2023, 36.

41 Cavalieri 2018.

42 Botte 2021, 189–195.

43 Cavalieri 2023, 43–53.

44 For a general introduction on SNA, see Wasserman – Faust 1994; Borgatti et al. 2013.

45 On this topic: Mill 2017.

transactions, the diffusion/transmission of technological innovations, and participation in ideological and other social movements⁴⁶. Because of this, applying an SNA approach to *ager Volaterranus* appears interesting to compare archaeological evidence results and evaluate the significance of eventual anomalies in the system to see quantitative data from a new angle.

Gephi, an easy open-access network analysis tool, very intuitive in its structure and design, has been used to visualize data about wine amphorae in *ager Volaterranus* gathered from a secondary data collection. Quantitative data on locally produced and imported wine amphorae were collected using previous publications and raw data from archaeological excavations. One of the main problems relating to secondary data collection is the impossibility of comparing datasets, especially when archaeometry data about provenience are unavailable. Aware of the arbitrary limits of this kind of data collection and the limits on the analyzed relations, the SNA approach has been applied, testing both the *Fruchterman Reingold* and the *ForceAtlas2* layouts⁴⁷ in a directed graph to test the different data visualization in order to better understand the eventual presence of anomalies in the chronological period from the 2nd century BC to the 7th century AD (Fig. 5). Aware that the algorithms at the base of the graph structure strictly depend on the quality of the information given to the system (the quantitative data on wine amphoras and their production), it seems evident that the visualized situation replicated the archaeological context. It is not surprising that statistics measures, such as the *Degree centrality* highlighting the densely connected hubs, identified San Gaetano di Vada as the leading actor in the middle of the network (considering that most amphorae taken into consideration were found there). At the same time the site of Casavecchio (Casale Marittimo, Pisa) is the weakest one, isolated in the network (both for the scarce quantity of amphorae and one only secure provenience from southern Etruria), but for this, in an eventual position for brokerage. Similarly, it is not unexpected that weighed statistics about edges (ties) report strong connections between San Gaetano-African productions and the San Gaetano-Vada hinterland. However, some aspects are worth discussing if we focus on statistics, such as *Authority* and the *Eigenvector centrality* (also known as prestige score) or the *Betweenness centralities* measures⁴⁸. San Gaetano, San Vincenzino, and the urban centre of Volterra appear from measuring *Authority* and *Eigenvector centrality* as the most influential nodes in the network, meaning that these three sites, among the others taken into consideration, were the best connected to nodes that were themselves well connected. Analyzing the *Betweenness centrality*, San Gaetano appears again as the site with the maximum score, with the highest potential for controlling (trade) flows. Anyway, San Vincenzino, Volterra, Gaul, Tyrrhenian coast, and Eastern Mediterranean also appear as nodes in a good position in the network to filter information and alter flows. These nodes in dif-

46 Further considerations in Knappett 2011, 8–14; Donnellan 2020.

47 An introduction to Gephi is given by Bastian et al. 2009. Open-access publications and tutorials are available from the website <https://gephi.org/> (17. 05. 2024).

48 For detailed description of these measures, see Borgatti et al. 2013.

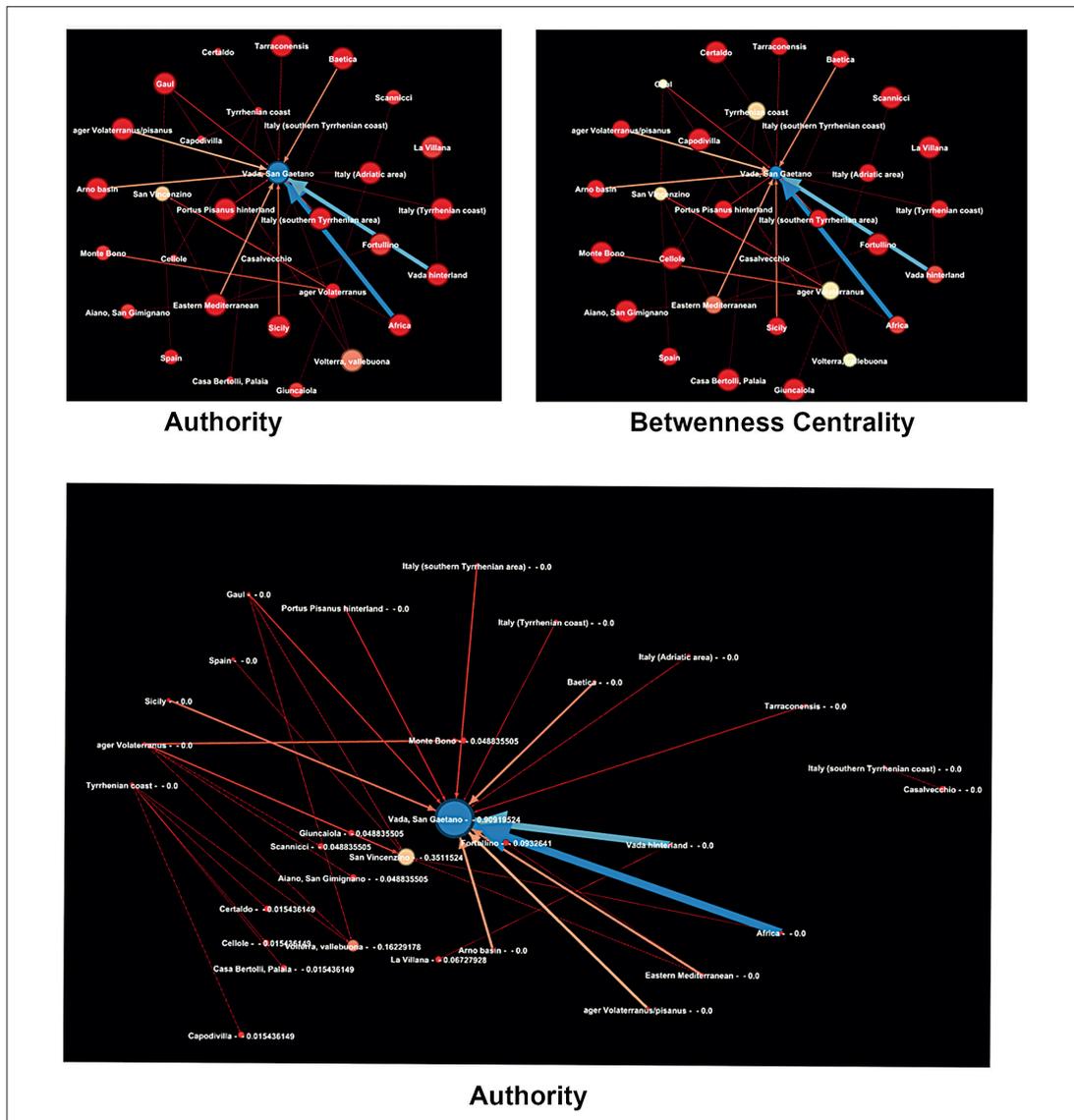


Fig. 5 Visualization of quantitative data on local and imported wine amphorae in Gephi graph (V. Limina)

ferent percentages had the power to threaten the whole network proportional to their importance. The scenario reproduces what we know from the historical context: the city centre, the central hub of its harbour system and the villa owned by the leader family of the district, the *Cecinae*⁴⁹, had adequate power in the wine trade, production, and consumption both influencing requests and supply over the *longue-durée*.

This preliminary attempt to test an SNA approach to the case study should be calibrated and improved. However, it seems significant to put quantitative data related to

49 Further consideration about the Cecina family in Limina 2021.

archaeological materials and network analysis for historical reconstruction. The villa of San Vincenzino and the city centre were two fundamental nodes of ancient local policies. The influence of powerful friendships, such as those between the Cecina family and the Gaulish elites⁵⁰, could have influenced or oriented in a relevant way also the wine trade and the local economies. Another emerging point to stress is the essential ambivalence between local productions and imports (mainly from Africa) until the Late Antiquity. This data should be considered as proof of diversified economic strategies played by those families managing such productive activities and for which the political offices retained abroad reasonably had a relevant role. In any case, it should be kept in mind that at the same time, the strength nodes in the network affect the system both positively and negatively, meaning that they could trigger the district economy, that is to say, that the poor presence of weak ties in the Volterrano case made it ‘weak’ in some aspects, or better, too much dependent on its vital nodes (actors).

Rethinking ancient landscapes through connectivity: remarks and future perspectives

The new data about wine production and consumption from San Gaetano *horrea* and the villa at Aiano allow us to deepen our understanding of ancient landscapes in the *ager Volaterranus* complementing and enriching the previous research. If the wine *torcularia* in Pieve Vecchia (Casale Marittimo) and San Vincenzino were already known, the new data from Aiano would confirm the agricultural vocation of a site in the inner part of Volterrano territory where, reasonably, managerial networks could have benefitted from a strategic position near the Elsa river and the terrestrial communication system for local and supra-local trade. An SNA approach could be helpful for a better understanding of the network structures relating to wine production/consumption. However, there is still a need for good-quality data sampling and the possibility to merge and compare datasets. Moreover, it is necessary to remember that any analysis based on quality/quantitative data from archaeological records should consider the object’s function. For example, amphorae were not the only containers to trade wine. *Cadi*, *urcei*, *cupae*, *utres* were used for transporting wine, as attested by literary and iconographic sources; nevertheless, they are merely ‘invisible’ at the archaeological level⁵¹. Not only the massive use of barrels or *cupae* attested to the 3rd and the 4th centuries AD could have impacted the variation in the use of wine amphorae, such as attested in Rome and Ostia stratigraphy, but also the possibility of trade in different unclassified vessels should be considered to reconstruct regional and Mediterranean economies⁵². Another consideration that should be made when dealing with archaeological materials concerns the objects’ lives. The re-use of African amphorae for *en-*

50 Limina 2021, 47–50.

51 About ‘invisible containers’ for wine trade, see Menchelli 2022, 315–323.

52 On this topic: Menchelli 2022.

chytrismos, a burial type very common in Tuscany from the 3rd century AD onwards, is an excellent example for understanding that a distinction between an object's primary and secondary life should always be considered. Moreover, as Aiano shows, the recycling process could have impacted the whole context and implied managerial control, or trade of resources, and different use of previous structures⁵³. Thus, an insightful reflection on objects, the availability of archaeometry data on fabrics, and the comparison of regional data would allow a deeper understanding of local economies and their role in the broader Mediterranean networks. Also, prosopography could be helpful to improve data in an SNA approach related to wine production/consumption in the *ager Volaterranus*.

Prosopography allows the reconstruction of power networks and highlights the pivotal role of local elites in transforming Tuscan landscapes. It is interesting to stress that the direct involvement of the Volterranean *gentes* in entrepreneurship/manufactures related to the wine economy, an additional income within broader family strategies, is attested by stamps on amphorae, *tituli picti*, literary sources and iconography. A graffito in Etruscan letters, carved before baking on a Greco-Italic amphora dating to the mid-2nd century BC, found in a tomb at Scannicci (Terricciola, Pisa)⁵⁴, attests the involvement of the *Lecu* family in the wine economy; significantly, the 1st century BC alabaster funerary urn of the *haruspex Aule Lecu*⁵⁵, confirms the economic (and religious) power of this family within the territory of Volterra. At the same time, the correlation between wine-religion offices should be considered⁵⁶. The shipwrecks found near the Fine foci dating to the end of the 2nd century BC to the 1st century AD prove the involvement in the wine/amphorae trade of *Manius Rufius*⁵⁷. Placenames around Montecatini Val di Cecina could indicate the presence of family properties in the Volterranean district bordering the Cecina family ones. These bordering estates could have been part of broader family strategies, some traces of which are left in the association of family names during Late Antiquity⁵⁸. The *Venuleii* were a powerful family whose main power bases were in the *ager Pisanus* but retaining properties in the *ager Volaterranus*. The family fortune probably originated in the Late Republic from the involvement of *L. Venulei* in the wine economy attested by stamps on amphorae found at *Ampurias* (Spain)⁵⁹. Thus, it is unsurprising that involvement in the wine economy

53 Some general considerations in Munro 2011. Concerning the control of recycling process at Aiano, Cavalieri 2023, pp. 122–131.

54 Bruni 1997, 170–171.

55 The funerary urn MG 136 is visible at the archaeological museum Guarnacci in Volterra.

56 Limina 2021, 35.

57 Genovesi et al. 2014.

58 The *gens Rufia* is attested among the most important families in southern Etruria. Ties with the Volterranean territory are confirmed by a later *Aulus Rufius*, a pretorian in the 1st cent. AD. On this topic: Limina 2021, 35–36.

59 Shepherd 1985, 184–185 and related references. About the family and the involvement in the management of local resources and manufactures see Limina 2022, 60–63.

could have been essential to the family's rising power and that professional identities were often proudly displayed in specific contexts such as family graves⁶⁰.

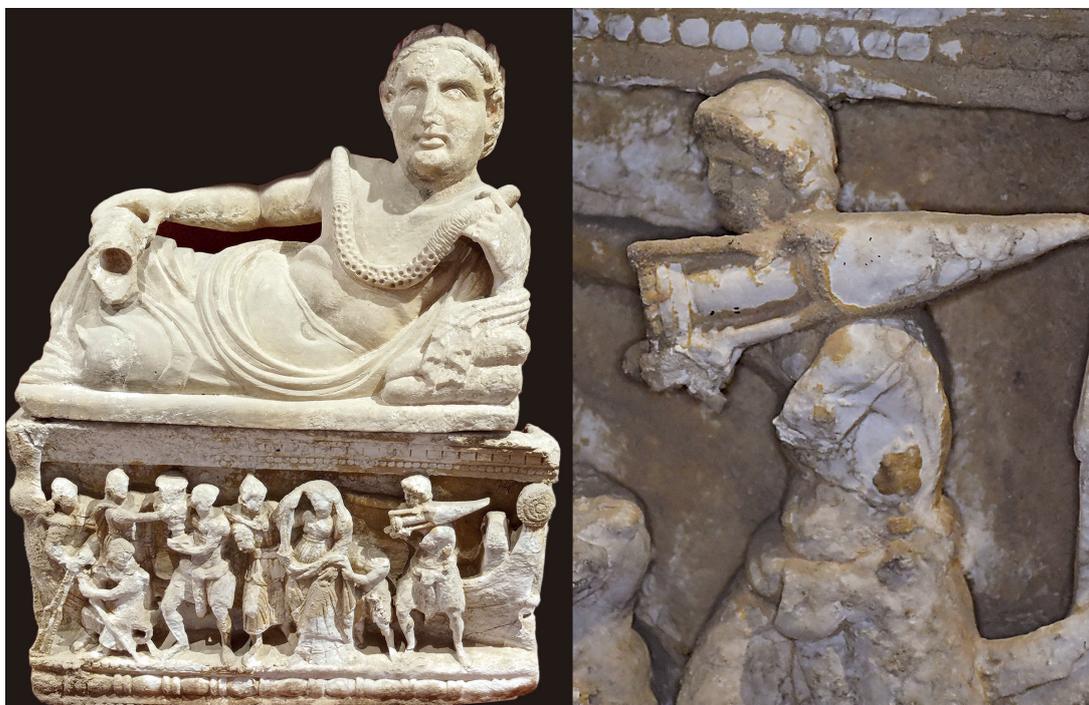


Fig. 6 Alabaster funerary urn MG 248 (and detail of the wine amphora), Volterra, Museo Guarnacci (Museo Etrusco Mario Guarnacci, Volterra/PI)

Interestingly, a detail was inserted in the mythological relief of a Volterran funerary urn now in the Guarnacci Museum (MG 248) (Fig. 6). The theme represented is interpreted as Helen's kidnapping by Paris or Helen's return from Troy with Menelaus, a myth reproduced several times in Volterran urns where men were carrying on the ship vessels in the shape of craters⁶¹. The peculiarity of urn MG 248 is the presence of a fourth male figure carrying on his shoulder a wine amphora that, for its shape, could be identified with a Dressel 1⁶². The originality of the iconography and use of alabaster could prove the 'reinterpretation' of the scene to adapt it to a specific need of the client, reasonably an unidentified member of the Volterran elite who maybe wanted to proudly show his involvement in that specific economic activity.

60 Among the several example it is famous the case of the *Peticii* and the dromedary represented on their tomb (Marengo – Taborelli 2013). For a general overview about family and professional identities see Verboven – Laes 2016.

61 For the urn description: BK I, XXII, 11; CUV I.2 120; Ghali-Kahil 1955, 278; Massa Pairault 1972.

62 The identification of the amphora as a wine amphora (without any other consideration of its shape or classification), distinguishing it from the other vessels of the iconography scheme is in BK and Ghali-Kahil 1955.

Members of the *gens* Cecina, reasonably the leading family of Volterra managing the local (and supra-local) networks of power, were involved in several economic activities, among which the production of wine and/or related amphorae as attested by archaeology and literary sources⁶³. Considering the reasonable relation villa-manufacture between the Cecina's villa at San Vincenzino and the Mazzanta workshops, it seems significant that 'FELIX' who stamped his name on the locally produced Dressel 2-4 found elsewhere in Italy, Britain, Carthage and on the Rhine-Danubian limes⁶⁴ was inserted into a broader wine market maybe following the Cecina family interests and political/military offices abroad⁶⁵.

Integrating the quantitative data on amphorae found at San Gaetano, observing the progressive decrease in locally produced wine amphorae and the increase of importations from Africa during the Late Antiquity is significant. This trend, interpreted with prosopography, could reveal some significant aspects of understanding the changing dynamics of the local economy better and in resource management.

Analyzing the list of the nineteen governor's *correctores/consulares Tusciae et Umbriae* between 306–459 AD⁶⁶, seven were linked to the powerful Volterran Cecina family by kinship ties⁶⁷. Two governors had the office probably due to their friendship/kinship ties with Cecina-Ceioni, Vetti, and Symmachi who were also landowners in *Tuscia*⁶⁸. All these families had a pivotal role in managing the local resources and production. Their negotiation with Rome to the benefit of their private interests and their involvement in the economy of wine is proved by the privilege granted to the landowners of *Tuscia* between 344–365 AD: they had the benefit of paying in money the *arca vinaria*, a tax in wine that was due to Rome. Thanks to this privilege, the *Tuscia*'s landowners could insert their wine production within the Mediterranean network, thus increasing their revenues. To confirm the link between policies and personal benefits, the cases of Orphitus, father-in-law of Symmachus and landowner in *Tuscia*, accused of misappropriation of the proceeds of *arca vinaria*, and that of *Turcius Apronianus*, previously *corrector* in *Tuscia* who had burdened the centres of *Italia suburbicaria* to the advantage of its properties in Tuscany⁶⁹. Concerning the increase of importations at San Gaetano from Africa, it could not be by chance that the Cecina family, starting

63 The reference is to the *torcular* found at San Vincenzino, the villa owned by the family along the coast, and Macrobius' mentions about the expertise of the two Cecina brothers and *Rufius Albinus* on Egyptian wine (Mac. sat. 3, 13–17; 7, 7–8). On this topic, Limina 2022.

64 Cherubini – Del Rio 1995, 373 nos. 93–94; Cherubini et al. 2006; Thierrin Michel et al. 2004.

65 Members of the Cecina family had military and political offices in these localities. Further considerations in Limina 2021.

66 Clemente 1969; Chastagnol 1963.

67 C. Vettius Cossinius Rufinus; L. Turcius Apronianus Asterius; Julius Festus Hymetius; Vettius Agorius Pretextatus; Publilius Ceionius Iulianus; Olybrius; Lachanius.

68 *Dynamius* (Amm. 15, 5, 14); *Terentius* (Amm. 17, 3, 2).

69 Amm. 15, 16, 1; 16, 10, 4; 17, 4, 1; 17, 3, 2; 27, 7, 3. The relationship between the office of the regional corrector and the private interests in the same district could be archaeologically proved in the case of *Vettius Agorius Pretextatus*, owner of a villa in Limite (FI). For the archaeological site see Cantini et al. 2021 and related bibliography.

from the beginning of the 4th century AD strengthened its kinship and friendship ties with the governors of *Africa Proconsularis* (members of the Ceioni-Rufi and Symmachi) and finally obtained the office of consular of Numidia, or that Macrobius then refers to members of the family as experts of Egyptian wine⁷⁰. That is to say that friendship and marital strategies were often merged within political and economic strategies. Many entrepreneurs, including those from the highest classes of society, invested considerable capital in commercial traffic using intermediaries. As Broekaert pointed out, it was on trust that any economic and commercial transaction was based⁷¹. Therefore, the construction of a network would have been the safest solution to secure reliable partners for investments and, above all, for the shared management of each business activity's risk. These networks usually brought together individuals who shared the same origins, social background, and culture and often relied on enslaved people and freedmen as agents that settled, even temporarily, in ports or cities that merchants regularly visited to monitor and supervise sales and purchases⁷².

Despite the decrease in the locally produced wine amphorae found at San Gaetano, the *koiné* attested between the 4th and 5th centuries AD in the Pisan-Volterranean manufactures is crucial⁷³ because it could reveal changed dynamics in the control of resources/hubs, maybe a 'resilience' trend facing a sort of 'privatization' of wine networks by the few elite families fronting the challenges of local power structures, as the case of Aiano clearly shows. There is still work to be done, but as we tried to demonstrate, through the progressive integration of different kinds of data and a new approach to 'old' problems, it is possible to advance the understanding of ancient practices by rethinking landscapes through connections between objects, people, networks.

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70 Macr. Sat. 3, 13–17; 7, 7–8.

71 Broekaert 2011.

72 About power, networks and trade see: Verboven 2002; Broekaert 2013; Tran 2015.

73 Different data from the excavation of the Roman villa at Limite, particularly the relationship between the bricks found and their production in the ateliers of coastal *ager Pisanus* and *Volterraneanus* could prove this productive *koiné* in Late Antiquity. For Limite see Cantini et al. 2021, 138–140.

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