

Secondary Publication



Vermeulen, Frank; Neef, Wieke de

Non-invasive investigations of Roman villa sites in the Potenza-valley (Marche, IT)

Date of secondary publication: 10.12.2025

Version of Record (Published Version), Article

Persistent identifier: urn:nbn:de:bvb:473-irb-112102x

Primary publication

Vermeulen, Frank; Neef, Wieke de (2024): Non-invasive investigations of Roman villa sites in the Potenza-valley (Marche, IT), in: Groma : documenting archaeology, Roma: BraDypUS, Vol. 8, Nr. 1, pp. 3–17, doi: 10.32028/groma-issue-8-2023-2839.

Legal Notice

This work is protected by copyright and/or the indication of a licence. You are free to use this work in any way permitted by the copyright and/or the licence that applies to your usage. For other uses, you must obtain permission from the rights-holders.

This document is made available under a Creative Commons license.



The license information is available online:

<https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>

Non-invasive investigations of Roman villa sites in the Potenza-valley (Marche, IT)

Frank Vermeulen

frank.vermeulen@ugent.be - Ghent University (BE), Department of Archaeology

Wieke de Neef

wieke.de-neef@uni-bamberg.de - University of Bamberg (DE),
Institute of Archaeology, Heritage Conservation Studies and Art History

Abstract

Long standing archaeological investigations in a valley of central Adriatic Italy allowed a team of Ghent University, during the past two decades, to apply systematic prospections and monitoring of more than a hundred Roman rural sites. The research presented here concerns a series of rural sites where the integration of data from surface artefact scatters, with results from geophysical prospections and remote sensing, contributes to the understanding of architectural aspects and the typology of Roman villas in this part of ancient *Picenum*.

Keywords

Roman period, villas, aerial photography, geophysical prospection, typology

Introduction

During the past 25 years the full potential of aerial photography for archaeological explorations has been reached in Italian archaeology, and during this period research with this methodology was particularly successful in central Adriatic Italy. In effect, the intensive applications of active aerial prospection using low flying airplanes on a regular basis, especially by university teams from Ghent (e.g., Vermeulen 2011; Verhoeven et al. 2017) and Bologna (e.g. Boschi 2016; Boschi and Silani 2013), have allowed some major contributions to the archaeology of the region. This active aerial photography prospection and monitoring has been a fundamental tool in particular for studying the Roman urban and rural landscape of the fertile valleys between the Apennines and the Adriatic Sea, where such sites are abundantly present in the still mainly agricultural environments. In these past decades, more and more archaeological features have been successfully mapped in all landscape types, also facilitated by technological innovations such as satellite imagery and, more recently, drone applications. Especially the number and quality of freely available aerial and satellite images, at always higher ground resolution has increased exponentially over the years, and this now allows to take a further step in the discovery and exploration of often remote rural sites, especially if these belong to the archaeologically more visible Roman period. These non-destructive sources allow to discover new structures, to enhance the mapping of rural sites in the region, and to shed new light on specific architectural and typological aspects of the phenomenon of farm and villa occupation in this period. Especially the typological details of villas need much more study

as only very few of these higher level rural sites have been excavated in this central Adriatic part of Italy.

Another revolution in the landscape archaeological approach to sites in the central Adriatic region is the more systematic and intensive use of geophysical investigations on archaeological sites, again in particular of the Roman period. Geophysical methods, based on physical properties of the Earth and their local variations, are widely applied in archaeology for the detection of buried features, and increasingly so on a large scale (Kvamme 2003; Campana and Piro 2009). Their advantage over excavation is that they are fast and non-destructive, yet their success rate depends on local circumstances and the right choice of method. The increasing incorporation of different geophysical technologies into survey programs allows more and more to produce multiple spatial data layers of subsurface features that can be integrated with the results from more traditional approaches, such as artefact surveys, and the above mentioned oblique aerial photography for archaeological purposes. As such, a more detailed and accurate mapping – and thus a more reliable interpretation – of these contexts comes within reach, without the absolute need for invasive and thus partially destructive field operations such as excavation. In particular for research on Roman rural sites of the more tangible ‘villa-type’ there is a great potential in the application and spatial integration of these non-invasive approaches, which are more and more part of the basic toolkit of field archaeologists. Especially in regions of Italy where excavations of Roman rural and villa sites remain rare, the wider implementation of these non-invasive methods will allow to catch up somewhat with the general study of this important facet of settlement dynamics and the rural economy in Roman times. Our examples here from research in one of the central Adriatic valleys can be illustrations of this potential for further research.

Investigating Roman villas in a valley of northern *Picenum*

During the Potenza Valley Survey (PVS) project by Ghent University, which started in 2000 and achieved its final field operations in 2021 (Vermeulen et al. 2017), a multidisciplinary team has looked intensively at a specific valley in the ancient region of *Picenum*, with a focus on settlement typology and dynamics in the protohistoric and Roman periods. The multi-method and predominantly non-invasive approach in this project, merging advanced geoarchaeological and more traditional studies of sites and landscape forms, enabled the Belgian team to study diachronic patterns of rural habitation and land use with much greater precision than before. For the more or less isolated rural sites of the Roman period, represented at present by over a hundred farms and villas in the hinterlands of the evenly spread Roman cities of this valley (Fig. 1), this approach without excavation not only procured a quite detailed view of their general dispersion, density and chronology, but also a first analysis of site typology and main architectural characteristics. As such it became possible, even without any excavation activity, to identify and characterize a series of rural sites that belong to the well-known category of *villa rustica* sites: essentially defined as more or less isolated rural settlements of the elite or upper segments of society, combining residential and productive functions, with a particular mode of systematic exploitation of the land, and in early phases sometimes clear indicators of ‘Romanization’ and/or ‘Hellenisation’ of former non-Roman territories in this part of Italy (Verdonck and Vermeulen 2004).

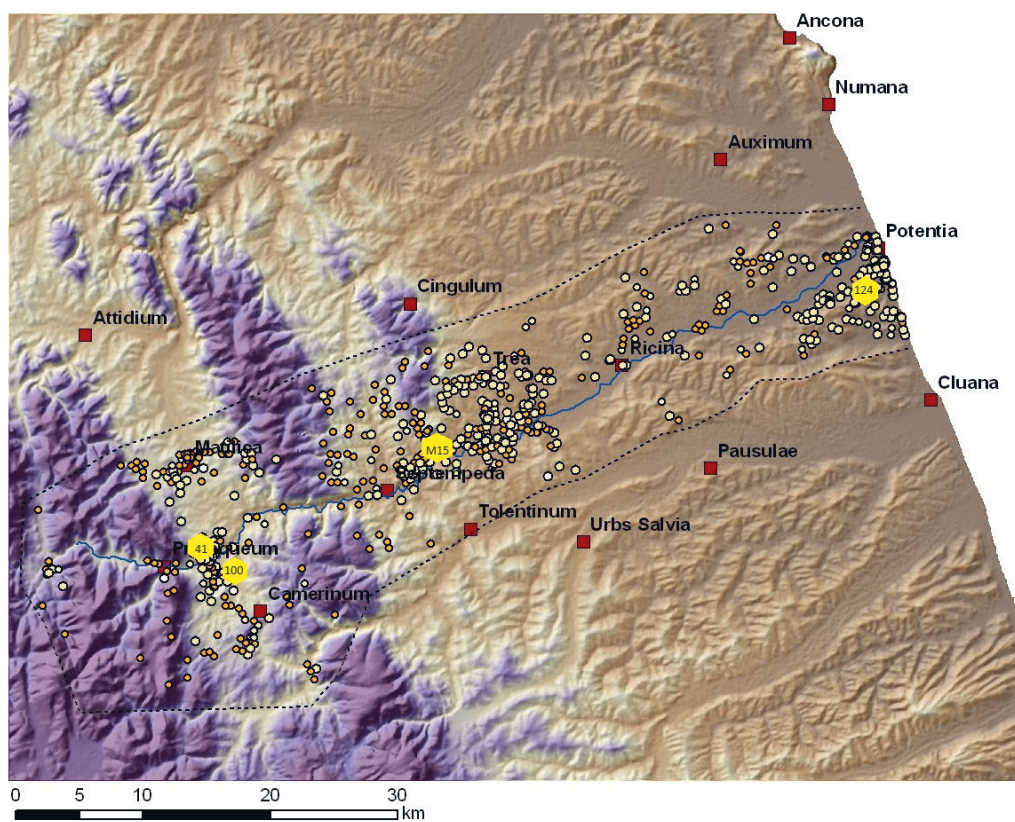


Figure 1 - Roman sites and findsspots in the valley of the River Potenza (Marche, IT) with location of the known Roman cities in and near the valley corridor and of the four villa sites discussed in this paper (image D. Mlekuz and F. Vermeulen).

Although at any given period between their appearance in later Republican times and disappearance in Late Antiquity these sites probably never represented more than 15 to 20 % of all rural sites identified and dated so far with certainty in the valley, their typical material features allow us in a number of cases to distinguish them from the larger group of simpler farms. Based on the evidence from surface archaeology on arable land they are often (but not always) easily identified thanks to somewhat larger surface concentrations of Roman pottery and building materials (often between 2,500 and 6,000 m²). Typically, the surface scatters show the presence of several functional units and/or buildings, signs of luxury in architectural decoration (*crustae* and *tesserae* of fine flooring, fragments of columns, *tubuli* for heating systems...), a greater variety of pottery (including a significant number of fine and/or imported products), and not seldom a dominant or special position in the landscape, such as on a hillcrest or hillside near the river or with attractive views on the valley landscape. There is of course an evolution in the size and architecture of these higher ranked rural sites throughout the period of Roman dominance in the area. More modest sizes and architectural features of such sites occur during the first phase leading up to the reign of Augustus (essentially the first century BCE), and presumably less continuity of villa-type characteristics of some of these settlements in late Antiquity, as has been well observed elsewhere in central Italy (Marzano 2007).

Repeated aerial photography flights by the PVS team over all Roman rural sites in the valley between 2000 and 2012, during different seasons, resulted on most locations in the observation of discolorations in the ploughed soil. These probably stem from a combination of ploughed up occupation layers, zones with locally more organic substance in the upper layers and humidity traces caused by differential drying of the soil in certain archaeological zones. In only a few cases however, on less than 10% of all rural sites, our aerial photography spotted clear crop marks indicating the presence of subsoil remains of building structures, such as houses, and of secondary structures, such as pits, ditches and terracing walls.

Such traces indicating architectural and other relevant anomalies in the soil were for instance observed on site PVS 100, probably a large Roman farm or simple villa, located in the territory of ancient *Camerinum* (Fig. 2). The rural site, with a well-chosen location on a natural gravel terrace at a few meters south of the river Potenza, reveals the presence of a rectangular building (circa 20x10m), divided in several spaces, and close to other architectural structures with probably underground rooms, cellars or cisterns. Close examination in the field on two occasions (in 2003 and 2015) showed the presence in the area of the observed crop marks of dense concentrations of Roman pottery fragments (e.g., table ware, dolia, amphorae,...) and building material (bricks, floor slabs, lumps of concrete,...) in a total area of circa 0.8



Figure 2 - Crop marks of site PVS 100, probably a Roman farm or small villa, photographed during prospection flights over Camerino in 2002. The presence of a rectangular building (circa 20x10m), divided in several spaces (nr. 1) and other architectural structures with underground rooms, cellars or cisterns nearby (nr. 2) can be well distinguished (photo F. Vermeulen).

hectare. The archaeological surface materials suggest that the settlement area was divided in a residential and a productive zone, and the finds suggest occupation of the site at least during the first and second centuries CE (Vermeulen et al. 2017, 229).

On a few occasions we had the opportunity to supplement the convincing evidence of a villa occupation from our artefact surveys and from some architectural traces seen from the air, with results from geophysical prospection of the site (Fig. 3). This was the case at San Gيرو in Potenza Picena, where the villa owners chose a fine mid-slope location in the lower Potenza valley, south of the river and some 40 meters above sea level, with a view on the coast (site PVS 124). The magnetometer survey undertaken here in 2013 revealed the quite detailed plan of a Roman *villa rustica*, which according to the datable surface artefacts had a long-term occupation from the second century BCE to the fifth century CE (Vermeulen et al. 2017, 240). Important elements that came to light were walls of the main and very large rectangular

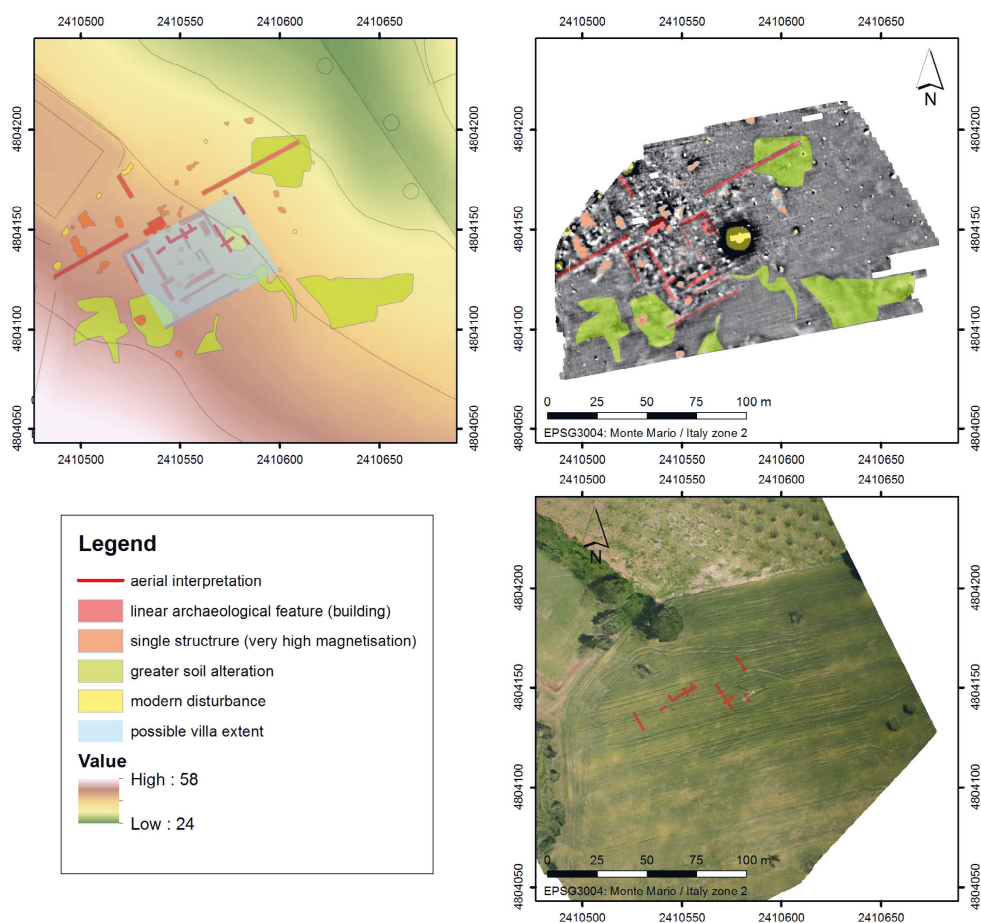


Figure 3 - The villa site at Potenza Picena (PVS 124) with structural traces of walls, floors and other anomalies, as revealed by magnetic survey (upper R), oblique aerial photography (lower R), and their integrated interpretation (upper L) (image D. Taelman).

building (min. 65x45m), a separate bathing facility provisioned by a local water source, and an artificial min. 125m long terrace wall, supporting the main building but possibly also a colonnade or ambulatory. Many fragments of *tesserae*, *crustae*, and painted stucco attest to rich architectural finishing at this property.

Continued monitoring of the many Roman rural sites identified in the Potenza valley over time, discovered by way of earlier research and chance finds, as well as within the systematic prospections of the PVS project, has allowed in recent years to reveal some more elements that contribute to typological studies of *villae*. As mentioned above, especially the use of always higher resolution aerial and satellite imagery, made available on commercial sites such as Google Earth and Bing, behold a great potential for enhancing knowledge. Such is the case for a clear villa site whose location in frazione Rocchetta of San Severino Marche was first noted by Umberto Moscatelli within the framework of his *Forma Italiae* prospections during the 1980's (Moscatelli 1988, site nr. M15). The site near the northern bank of the river Potenza and probably at only 250m north of the Roman valley floor road between the cities of *Septempeda* and *Ricina* was until recently only known for a surface concentration of mostly Roman Imperial pottery and building materials. On recent satellite images, uploaded on Google Earth between 2017 and 2021, the very distinct cropmarks of a villa appeared (Fig. 4).¹ The rectangular building with a NW-SE orientation and an entrance directed towards the mentioned river and road has an estimated size of 39x33m. Its perfectly symmetrical plan with presumably two axially oriented *peristilia* surrounded by regular symmetrical rooms and leading to a main apsidal reception or dining room shows that this villa structure had mostly a residential and possibly even a semi-public function. Roman pottery finds on the fields west of this site, found during our artefact prospections in 2019, seem to confirm the essentially Imperial date and might indicate that other buildings or activity zones (for production?) are located nearby the main building. As with the example of a site in Castelraimondo, whose investigation we would like to discuss and illustrate more in detail, this site shows well that continued monitoring of rural Roman farms and villas remains a crucial task for archaeologists in this and other regions of Italy. A site once known only summarily by way of a surface scatter of Roman artefacts, has now provided us with an amazingly complete plan, without invasive field operations.

Survey and monitoring of a small riverside villa in Castelraimondo

In September 2000, during the initial year of systematic artefact surveys in the PVS project, our team discovered a small but dense surface concentration of Roman pottery and building materials on a field in Castelraimondo, located on a flat river terrace bordering the northern banks of the river Potenza (site 41, Vermeulen et al. 2017, 212). In an area of some 50 by 35m we found large fragments of roof tiles and limestone building blocks, as well as some datable pottery (terra sigillata, Augustan/Tiberian cooking ware, Dressel 2-4 and 6A/6B amphorae, and early Imperial *dolia*). The materials suggested the presence of a rural settlement of Early to Mid-Imperial date, with well-attested occupation in the first half of the first century CE. We can assume that this settlement was located in the ancient territory of the Roman town of *Matilica*.

¹ We are grateful to Dott. Tommaso Casci Ceccacci for signaling us this imagery.



Figure 4 - Satellite image from 31.8.2017 on Google Earth showing the full plan of the pars urbana of a villa in San Severino Marche (fraz. Rocchetta; site M15), situated four km NE from the Roman town of Septempeda.

Our aerial photography monitoring of all known sites in this upper part of the Potenza valley revealed in 2003 distinct linear crop marks of a rectangular building of circa 25x20m at exactly the same spot where the artefact concentration had indicated the presence of the Roman rural settlement (Fig. 5 and 6). It showed a rectangular building with NE/SW orientation, more or less parallel with the river Potenza, containing a central courtyard surrounded by regularly spaced rooms. The crop marks were less clear towards the east and south and, therefore, a full plan of the building could not be proposed yet.

Further monitoring of the site on commercially available satellite imagery was again productive here, as a very clear and high-resolution image showing crop marks, taken in April 2022 and uploaded on Google Earth, added further details to our understanding of the building (Fig. 7 and 8). The full rectangular building plan of what is clearly a small villa was available, as the negative crop marks of walls showed a very symmetrical structure with a central courtyard, surrounded by probably five rooms on each long side and one or two rooms on each short side. The building seems prolonged towards the SE where possibly a porch provided nice views over the river and its surrounding valley landscape. If this interpretation is correct, the villa



Figure 5 - Crop marks of site PVS 41 photographed during prospection flights over Castelraimondo in 2003 (photo F. Vermeulen).



Figure 6 - Location of the artefact scatter and first interpretation of the crop marks shown in Figure 5 on a vertical image of the site (image W. de Neef).



Figure 7 - Satellite image from April 2022 on Google Earth showing the full plan of the small villa at Castelraimondo.



Figure 8 - Interpretation of the crop marks in Figure 7.

had a more or less quadrangular plan of circa 25m side. The central room on the NW long side can be interpreted as the *vestibulum* or entrance room allowing access to the building from the Roman road, a *diverticulum* from the Via Flaminia linking Nocera Umbra to Ancona through the Potenza valley. According to our earlier aerial photography observations the Roman road deck lies only some 120m north of the discovered rural building. A series of broad elongated positive and negative crop marks visible on the satellite image south and west of the rectangular building indicated possible features connected with this Roman occupation. To obtain more information about the site we decided to add a layer of geophysical data to our already quite good information.

For the non-invasive geophysical work at this site PVS 41 we conducted a magnetometer survey applying gradiometry. We chose this method as we expected it to be successful in detecting a broad range of archaeological features, primarily the (lime-)stone walls, which showed up so well in the satellite imagery, but also pits, ditches, kilns and other traces relevant for a Roman villa site. Elsewhere in the Potenza Valley, such as during the intensive geophysical surveys of the above-mentioned villa of San Girio (Fig. 3, top right) and the four abandoned Roman town sites of *Potentia*, *Ricina*, *Trea* and *Septempeda*, Roman walls were successfully detected due to their generally weakly magnetic to diamagnetic properties, causing a contrast with the surroundings soils (Vermeulen et al. 2017). Moreover, we decided against a ground penetrating radar survey, potentially a suitable technique to map buried stone structures. Repeated attempts with this method at various locations in the valley had proven unsuccessful, due to the strong attenuation of electromagnetic energy in the clay-rich soils of this part of Marche. We expected this to be the case too at Castelraimondo.

Magnetic gradiometry is suitable for mapping near-surface features with a contrast in the magnetic properties and visualizing them in a 2D map. Features are typically detected up to depths of 1-2 meters, depending on local soils and geology, the dimension and depth of buried objects, and the contrasts between the surrounding natural soils and magnetic objects. For the magnetometry surveys at site PVS 41 we used a mobile cart array with four Sensys FM650 fluxgate gradiometer probes mounted on a light and flexible fiberglass frame (LEA MINI system, Eastern Atlas). Each probe holds two sensors, one at each end of the probe: one close to the ground surface, and the other further away. Each sensor measures the vertical component of the Earth magnetic field with a sensitivity of 0.1nT (nanoTesla). With a datalogger the difference between the two sensors in each probe is measured and the data subsequently used to map local variations. This difference thus records the vertical difference in the vertical component of Earth's magnetic field, often simply called the 'gradient', and is insensitive to the background fluctuations in the Earth magnetic field.

The probes are mounted on the cart at 0.5 m distance and data is collected at 0.05 m point distance. The data is positioned using a Leica GS15 GNSS antenna mounted on the cart, receiving RTK corrections via the Italpos network resulting in a positioning accuracy of ca. 2 cm. Data processing consisted of normalization, drift- and offset correction per profile, and gridding using a kriging routine with a search radius of 0.5 m. The data were plotted at a resolution of 0.10 m.

At site PVS 41 we covered a small area of ca. 65 x 60 m, targeting the features visible in the aerial photos and the satellite imagery (Fig. 9 and 10). The field conditions were favourable,



Figure 9 - Image from the magnetometry at Castelraimondo, positioned on the satellite view of the site.



Figure 10 - Superposition of the interpretation of the crop marks on the magnetometry data in Figure 9.

with dry, warm weather and fallow terrain with low vegetation. Still, there were considerable disturbances from fences and buildings on either side of the field, as well as scrap metal on the field, resulting in strong measurement effects. This may have obscured archaeological traces at the borders of the survey area, most notably in the east.

The results of the survey indicate a progressive degradation of the site, resulting in the ploughing out and mixing of materials near the surface. Strikingly, the rectangular lay-out of the cropmark traces are poorly recognizable in the magnetometer data. This appears to be an effect of the presence of near-surface features with strong magnetic amplitudes, which we tentatively ascribe to strongly burnt or ferromagnetic materials. These are situated inside the central courtyard of the villa, but also in the southern and southwestern rooms, one of which lying centrally in the southern aisle of the building might have given access to the porch. These locations suggest that these materials are archaeologically relevant, but it is difficult to say what they are and how they relate to the use, abandonment or reuse of the building.

A remarkable magnetic feature is the large semi-circular anomaly in the southern end of the field. It is also visible as a large positive cropmark feature in the satellite imagery. It consists of a cluster of oval features with diameters up to 4 m and positive magnetic amplitudes up to 25nT above the general background, and is demarcated in the north and south by curvilinear features with negative magnetic amplitudes. Its association with the nearby Roman site is still unclear.

Discussion

As one of us stated in a paper two decades ago (Verdonck and Vermeulen 2004), the systematic archaeological study of *villae rusticae* and other upscale types of Roman farms in Marche is still at its beginning. Fully informative and well-published excavations on villa sites in the region before 2000 are limited to a handful of villas, such as at Osimo-Monte Torto (Pignocchi 2001), Moscosi di Cingoli (Percossi Serenelli 1998), Santa Lucia di Pollenza (Percossi Serenelli 2005) and Colombarone (Dall’Aglia *et al.* 1997). Also, since the beginning of the current century stratigraphical excavation of complete villa sites was limited to only very few locations, such as at Villa Magna in Urbisaglia (Paci and Perna 2016). As other recent invasive interventions most often only revealed small parts of such villa complexes, the state of research prevented thus far a comprehensive typological investigation into villa architecture in the region. It is not the place here to discuss in detail our own results in the Potenza valley when it comes to the general reconstruction of rural (and urban) settlement dynamics during the Roman era, but we can summarize some of the main evolutions that allow us to at least contextualize somewhat the few finds of *villae rusticae* presented above.

Data from several surveys and investigations on rural sites seem to indicate that the final Roman takeover of this central Adriatic area between the Apennines and the sea in 268 BC does not bring a strong break with the general rural settlement pattern of pre-Roman times (e.g., Verdonck and Vermeulen 2004, table 1; Perna and Capponi 2012; Ciuccarelli 2012; De Neef 2020). It is probable that a number of new rural establishments came into being after the founding of a series of coastal and near-coastal Roman and Latin colonies, and especially from the later third century BCE onwards, when individual Roman citizens were granted land in the best parts of the newly conquered landscape, as a result of the *Lex Flaminia de agro gallico et*

piceno viritim dividundo (232 BCE). It is however unlikely that these new farms could already be called villas, as this wave of colonisation was probably not yet supported by serious financial and market-oriented investments. Only after the mid-second century BCE, when a general economic expansion in this part of Adriatic Italy followed the trends in the Tyrrhenian part of the peninsula, a fertile base was laid here for real villa development. In the Potenza valley it is likely that the above discussed site of San Girio (Potenza Picena), falls into that trend. Its perfect hillslope location in the hinterland of the coastal colony of Potentia and with regards to the well exploitable valley landscape laid the base for an initially wine producing domain with a long survival rate into Late Antiquity. The supposed typology of an imposing terrace villa with great valley and sea views, and possibly later attached bath complex, probably indicates a site with a still humble late Republican and a more sumptuous Imperial history.

Data from several valleys in Marche indicate that smaller villas tend to be built in the inland areas from the later second century BCE onwards. These are first often located at good positions on the slopes and were probably more connected with extensive agriculture. On the hill terraces of second and third order appear mostly smaller farms, in places already occupied before the Romans (for instance at Monte Franco near Passo di Treia; De Neef 2020). The valley floors are seldom used before the first century BCE, as they stayed probably longer occupied by woodland, marshes and common land for grazing (*saltus*), until more measures are taken for drainage and land division. The latter is surely the case during the Triumviral and Augustan periods, which brings centuriation in the valley floors and the assignation of land to veterans of the armies of Caesar, Marc Anthony, and later Augustus. Especially also the processes of municipalisation affecting many village-like settlements and helping them to become fully monumentalized towns, together with a better structuring of the road system and the involvement of financing external and internal elites, must have had a serious impact on villa development along the valley corridors. It is likely that all three other sites discussed here (at Camerino, Castelraimondo and San Severino Marche) belong to this wave of villa building, which gains momentum during the final decades of the Republic and the first decades of the Empire. The more modest looking site at Camerino could well have grown out of an existing farm, while the two villas at Castelraimondo and San Severino Marche, with their strict symmetrical planning copying examples from Tyrrhenian Italy, were most likely built by newcomers or at least influenced by them. Especially the latter villa, with its more intricate plan with two peristyles and an apsidal room for receptions, might well be the seat of a local elite family with some public role in the nearby town of *Septempeda*.

The results of the non-invasive prospections and the monitoring of a handful of villas in the Potenza valley is only a small contribution to the debate about further villa evolution during the Mid- and Late Imperial periods. As we know from many examples elsewhere these phases show a significant decline during the third and fourth centuries CE, but also an increasing concentration of land in the hands of fewer owners, and thus the relative growth of certain villa domains (Launaro 2011, 171). This evolution must be read as the gradual reorganization of the rural landscape under different socio-economic conditions (Banaji 2002, 16) with a particular impact on villa estates. Even if it is unlikely that the central Adriatic area ever saw the rise of proper *latifundia* such as in southern Italy (Vera 2001, 627; Verreyke and Vermeulen 2009, 114), we can only hope that the non-invasive discovery of the architecture and typology of many more villa sites in the region incites researchers to focus future excavation work on a good selection of diagnostic sites.

Bibliography

- Banaji, J. 2002. *Agrarian change in late antiquity: gold, labour and aristocratic dominance*, Oxford: Oxford Classical Monographs.
- Boschi, F. 2016. "Reading ancient cities. The contribution of the non-invasive techniques". In *Looking to the future, caring for the past. Preventive archaeology in theory and practice*, edited by F. Boschi, 85–100. Bologna: Bologna University Press.
- Boschi, F. and M. Silani. 2013. "Aerofotografia e geofisica nella Valle del Misa (Ancona): nuovi dati per la topografia urbana di Ostra", *Rivista di topografia antica* XXII: 69 – 82.
- Campana, S. and S. Piro (eds.) 2008. *Seeing the unseen. Geophysics and landscape archaeology*. Boca Raton: CRC Press.
- Ciuccarelli, M.C. 2012. *Inter duos fluvios. Il popolamento del Piceno tra Tenna e Tronto dal V al I sec.a.C.* BAR International Series 2435. Oxford.
- Dall'Aglio, P.L., G. Trovabene, M. Destro and M. Vergari. 1997. "Colombarone (PS)". In *Scavi e ricerche del dipartimento di archeologia: mostra fotografica: Complesso monumentale di San Giovanni in Monte, ottobre-novembre 1997*, edited by M.T. Guaitoli, 79-88. Bologna: Bologna University Press.
- De Neef, W. 2020. "A crossroads in the central Potenza Valley: non-invasive research of settlement (dis-) continuity at Monte Franco (Pollenza, Marche, Italy)". In *Picenum and the Ager Gallicus at the Dawn of the Roman Conquest: Topography and Material Culture*, edited by F. Boschi, E. Giorgi and F. Vermeulen, 133-141. Oxford: Archaeopress.
- Kvamme, K. L. 2003. "Geophysical surveys as landscape archaeology", *American Antiquity* 68(3): 435-457.
- Launaro, A. 2011. *Peasants and Slaves. The Rural Population of Roman Italy (200 BC – AD 100)*, Cambridge: Cambridge University Press.
- Marzano, A., 2007. *Roman Villas in Central Italy. A Social and Economic History*. Leiden and Boston: Brill.
- Moscatelli, U. 1988. *Trea, (Forma Italiae)*. Firenze: Leo S. Olschki Editore.
- Paci, G. and R. Perna. 2016. "Una villa romana nel territorio di Pollentia-Urbs Salvia: note preliminari sulle indagini archeologiche condotte presso Villamagna (Urbisaglia – MC)", *FOLD&R. FastiOnLine documents & research* 371: 1-14.
- Percossi Serenelli, E. (ed.) 1998. *Guida del Museo Archeologico Statale di Cingoli*, Ancona.
- Percossi Serenelli, E. 2005. "La villa romana di Santa Lucia di Pollenza". In *Archeologia nel Maceratese. Nuovi Acquisizioni*, edited by G. de Marinis, G. Paci, E. Percossi Serenelli and M. Silvestrini, 210-221. Macerata: Fondazione Cassa di Risparmio della Provincia di Macerata.
- Perna, R., C. Capponi. 2012. "Città e campagna nella valle del Chienti in età repubblicana ed imperiale. La carta archeologica della provincia di Macerata". In *I Processi formativi ed evolutivi della città in area adriatica*, edited by G. de Marinis, G.M. Fabrini, G. Paci, R. Perna and M. Silvestrini, 149-164. Oxford: Archaeopress.
- Pignocchi, G. 2001. *Monte Torto di Osimo: l'impianto produttivo*, Ancona: Servizio editoria della Soprintendenza archeologica per le Marche.
- Vera, D. 2001, "Sulla (ri)organizzazione agraria dell'Italia meridionale in età imperiale: origini, forme e funzioni della massa fundorum". In *Modalità insediative e strutture agrarie nell'Italia meridionale in età romana*, edited by E. Lo Cascio and A. Storchi Marino, 613-633. Bari: Edipuglia.
- Verdonck, L. and F. Vermeulen. 2004. "A contribution to the study of Roman rural settlement in Marche", *Picus* XXIV: 161-229.

- Verhoeven, G., F. Vermeulen, D. Taelman and L. Verdonck. 2017, "Taking vegetation marks into the next dimension(s) – Mapping the hilltop settlement of Montarice (central Adriatic Italy) by a multi-dimensional analysis of aerial imagery", *Archeologia Aerea* 11: 79-84.
- Vermeulen, F. 2011. "Reviewing 10 years of aerial photography in the valley of the River Potenza (Le Marche)", *Archeologia aerea* 4-5: 257-266.
- Vermeulen, F. 2017. *From the Mountains to the Sea. The Roman Colonisation and Urbanisation of Central Adriatic Italy*, Babesch Supplement 30, Leuven – Paris – Bristol: Peeters Publishers.
- Vermeulen, F., D. Van Limbergen, P. Monsieur and D. Taelman. 2017. *The Potenza Valley Survey (Marche, Italy). Settlement dynamics and changing material culture in an Adriatic valley between Iron Age and Late Antiquity*, Roma: Academia Belgica. *Studia Archaeologica* 1.
- Verreyke, H. and F. Vermeulen. 2009. "Tracing Late Roman Rural Occupation in Adriatic Central Italy", *American Journal of Archaeology* 113: 103-120.