

The Organisation of Cereal Production in *Britannia*: Grain-drying Ovens as Evidence for Agricultural Integration

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Introduction

Cereal production in Roman Britain has been marginal to empire-wide discussions of the Roman agricultural economy. Rural modes of production and the integration of the agricultural economy have received research focus in the Mediterranean world, informed by the ancient sources, extensive rural survey data, and, more recently, an increase in excavations, especially of non-villa sites.¹ Away from the Mediterranean, agriculture was also a key aspect of the economies of the north-western provinces. Whilst previous models have downplayed the levels of economic production along the frontiers, decades of excavation in this region, combined with the recent synthesis of projects such as the RurLand project in north-east Gaul and the Roman Rural Settlement Project (RRSP) in Britain, have mustered large quantities of excavation data to portray the economic complexity of these regions.²

The main areas of production in the economy of Roman Britain can be identified as cereals (wheat and barley), animals (cattle, sheep, pig) and their secondary products (leather, wool), iron, lead, precious metals, salt, bricks, pottery, and timber/charcoal. The economy is considered to have been structured in three sectors: the imperial economy, the provincial economy, and the extra-provincial economy.³ There is good evidence that the majority of rural settlements were involved in cereal production, with widespread evidence for consumption, traceable through a number of site based (ovens, granaries), artefactual (querns, tools), and archaeobotanical evidence.⁴ Furthermore, in the 4th century AD, Zosimus and Ammianus Marcellinus describe the supply of grain to the garrisons on the German Limes, indicating the potential for the large-scale production of cereals in Roman Britain.⁵

In terms of addressing how the production of cereals was organised, a long focus has been on the study of villa sites, especially in the third quarter of the 20th century, with attempts to model the economic basis of several villa estates at Bignor Villa and Barton Court Farm. Analyses were based on estimates of estate size, modern day crop yields, production numbers from agronomic writers, calculations of building size, and environmental archaeology.⁶ Such approaches were summarised in *Villa Economies* by Branigan and Miles.⁷ The long-standing notion of the villa as a rural farming estate was disrupted in 1990 when Millett reformulated the villas as a social phenomenon.⁸ Since then, the focus of discourse on Roman Britain has shifted towards the study of identity, local agency, and material culture,⁹ with the study of the rural agricultural economy receiving limited attention.

The RRSP (2012-2017) produced a database of excavated rural settlements in Roman Britain, containing 2627 excavated rural settlements, and analysed this data to identify key patterns in rural settlement and economy.¹⁰ Contrary to earlier studies focused on villas, the project has shown unequivocally that the rural landscape of Roman Britain was dominated by farms, with settlement form and chronological patterns varying regionally. However, the question of how the rural economy was articulated remains open.¹¹ For instance, while regional variations in cereal crops have been established, generally speaking, all sites were growing the same range of cereal crops. We have some understanding of cultivation practices and crop processing, but are unable to propose quantitative levels of production and thus infer the movement of crops between settlements.¹²

The difficulty of undertaking quantitative studies of cereals has been acknowledged elsewhere, with Bowman and Wilson writing that: “Recent decades have seen considerable intensification of quantified studies of various aspects of Mediterranean agriculture, particularly olive oil and wine, whereas the third member of the triad has proved generally more intractable.”¹³ In reference to Roman Britain, Gerrard has commented that there is an “absence of meaningful statistical data” on food production.¹⁴ There are several options for quantifying past cereal production including: extrapolating yields from modern land use and ancient sources, calculating arable pasture ratios in insect assemblages, using the densities of charred cereal remains, and from archaeological finds of querns and mill stones.¹⁵ However these evidence forms are limited by their uneven distribution across archaeological sites, and their representation of different stages of cereal production. An alternative form of evidence, which can inform upon the scale of production and the integration of different settlement types within the economy, is a particular type of agricultural processing structure known as the corn-drying or grain-drying oven.

Corn-Drying or Grain-Drying Ovens

The corn-drying or grain-drying oven (*Getreidedarre/Structures de sechage et de fumage*) is well known in Roman Britain but absent from many discussions of the Roman agricultural economy and agricultural processing.¹⁶ The structure consists of a stoking hole and fire place, a subterranean flue overlain by a drying floor to hold cereals, and, in some cases, the remains of a superstructure. Construction materials include flint, limestone, brick, clay, and wattle and daub. A range of oven structures has been recorded, which have been grouped into single and multiple flue forms (Fig. 1a–b).¹⁷

These structures are archaeologically easily identifiable as the flues survive well, but are only revealed through excavation (Fig. 2). In Britain, grain-drying

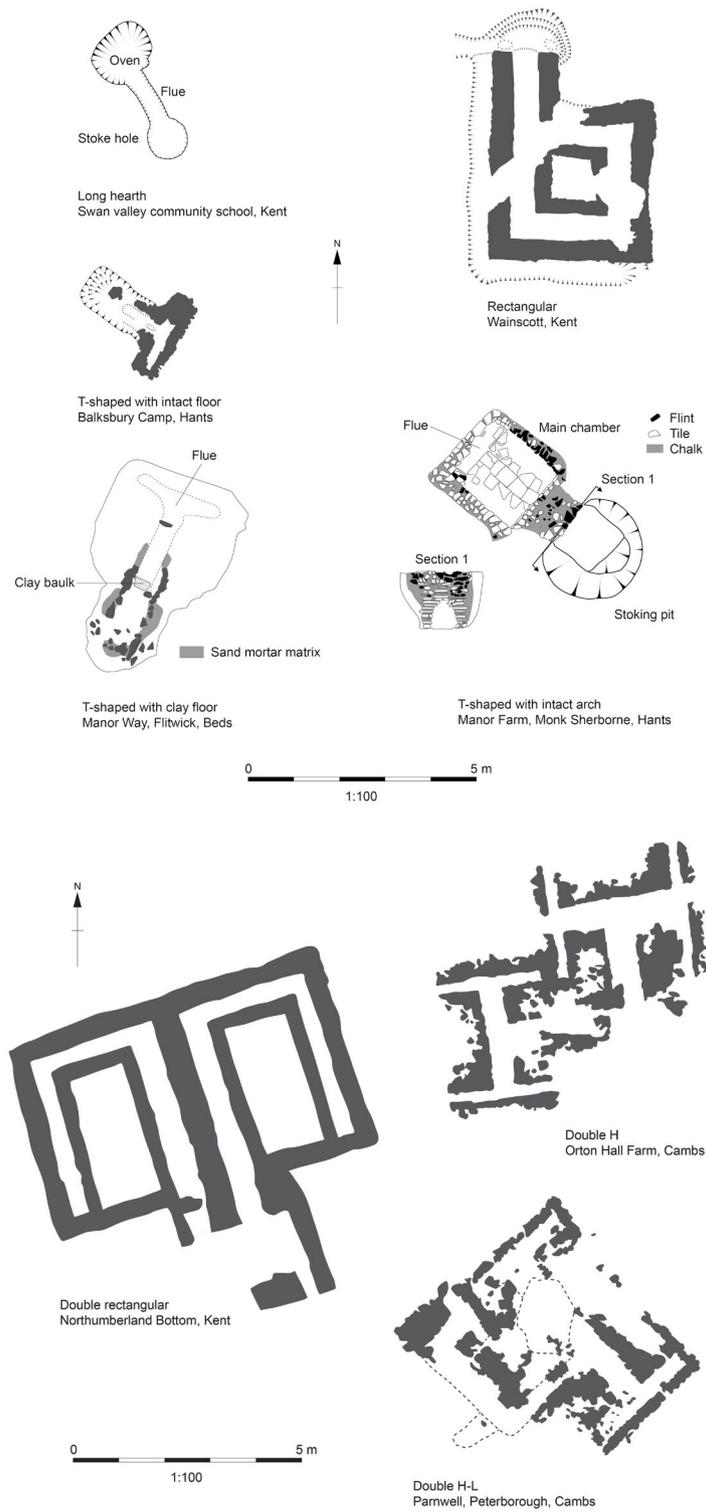


Fig. 1a-b: Plans of grain-drying ovens



Fig. 2: Grain-drying oven from Marnel Park, Popley.

ovens are often the most characteristic aspect of rural settlements where we may normally find limited architecture. Antiquarian excavations of such structures identified them as hypocausts or subways, but the structures were first defined archaeologically as a grain oven by Gowland in 1912, based on examples from the villa at Hambleton in the Thames Valley.¹⁸ Writing in the late 1970s, Morris was able to compile a catalogue of 60 examples of grain-drying ovens, and a decade later, Van der Veen provided an overview of archaeobotanical evidence for their use.¹⁹ The function of these structures has been debated over the last few decades, and is still unclear.²⁰ Some ovens were clearly used in brewing, to parch germinated grain in order to arrest the germination process so that this material could be turned into malt. Alternatively, the ovens could be used to parch cereals in preparation for de-husking or milling, or prior to storage. Early studies identified grain-drying as the main function based on the recovery of charred cereal grains from flues. Following the experiments at Butser Farm in the late 1970s, malting was also considered as a possible function.²¹ At some sites it has been possible to distinguish these functions. For instance, at Northfleet

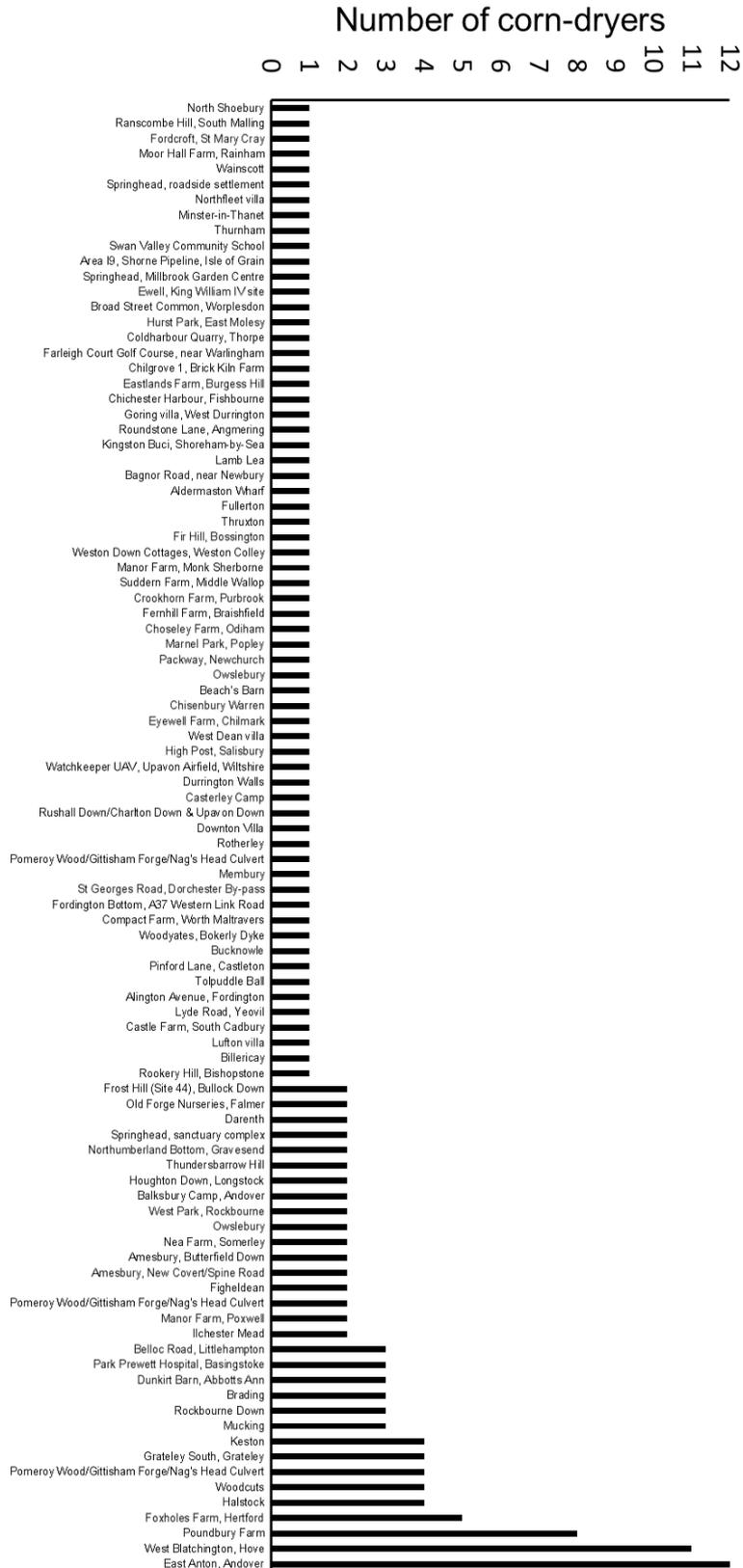


Fig. 3: Bar chart showing the number of grain-drying ovens at individual sites in the south. Bibliographic information on each site can be found in the RRSP online database (Allen et al. 2018).

villa in Kent in south-east Britain, a rectangular oven was located adjacent to a malting cistern, and archaeobotanical samples were full of charred germinated cereals and detached cereal sprouts.²²

Beyond the specific function, the motivations behind the widespread construction of these ovens has also been debated. Construction has been linked to climatic shifts, with Applebaum linking the proliferation of grain-drying ovens with wetter periods of climate and the export of cereals. However, the dating of many of these structures to the 2nd century AD invalidates links with the climatic shifts of the late antique period.²³ Morris interpreted them as indicators of capital investment and large-scale production, which continues to be the consensus. Most recently, Gerrard has suggested that the insertion of drying ovens within high status buildings in the 4th century indicates the need for social elites to supervise production.²⁴

The origin of these structures appears to lie in the 2nd century AD. Ovens recorded at Iron Age settlements in Britain are very different in character. At Danebury hillfort in south-central Britain, ovens consisted of a simple undivided ceramic chamber, whereby the fire would be raked-out before the bread was baked.²⁵ Grain-drying ovens are much more substantial in nature, often with mortared stonework, are larger in size, and, crucially, have a drying floor.

The location where this innovation in the use of heated air to dry or parch cereals first took place is unclear. Grain-drying ovens also appear at villas in Gaul, Germania Inferior, Germania Superior and Raetia, such as at Weitersbach and Dietikon.²⁶ The only previous overview by Van Ossel identified 29 such structures in northern France dated to the 3rd–5th centuries AD. Whilst currently no 1st- or 2nd-century AD structures are known of, there is early evidence for large-scale malting from a mid-1st century AD structure in Xanten identified as a brewery, and a similar find in early-Roman Zurich;²⁷ malting may therefore be the source of grain-drying oven development. In Britain, the earliest evidence for large-scale malting is currently dated to the 2nd century, with examples such as Northfleet villa, and farmsteads at Whitelands Farm and Weedon Hill.²⁸ Evidence from the 1st-century AD consists of a structure associated with malting through archaeobotanical finds at Nonnington, Kent, and written accounts relating to beer production on the Bloomberg tablets from Roman London.²⁹ Malting for beer production is occasionally evidenced in Iron-Age western Europe,³⁰ but the only evidence in Britain is artefactual, in the form of tankards first occurring in the Late Iron Age period.³¹

Hence, there is currently a separation between the earliest evidence for malting and the earliest evidence for distinct grain-drying structures. This suggests either there was a lag time between the practice of malting and the construction of grain-drying ovens, or that grain-drying ovens originate from a separate need to dry or parch cereals. Whilst the development and function of grain-drying ovens requires further exploration, these structures can be used as a quantifiable proxy for cereal production, in similar ways that olive- and wine- presses have been utilised in the Mediterranean world.

Patterns across *Britannia*

A recent review has summarised the distribution of grain-drying ovens across *Britannia* on the basis of the RRSP database.³² Grain-drying ovens have been recorded at 358 excavated rural settlements in most areas of Roman Britain, indicating a wide region engaged in large-scale cereal production, but are very rare in Wales, the south-west and the north-west.³³ In terms of the chronological distribution, few grain-dryers date to the second half of the 1st century AD, with the only distinctive T-shaped structure at Springhead in Kent. However, the numbers peak in the 2nd century AD in the east, 3rd century AD in the north-east and central belt, and 4th century AD in the south. In terms of their socio-economic distribution, grain-dryers are most common in each region at nucleated settlements: roadside settlements in the central belt and east, villages in the south, and complex farmsteads in the north-east. Grain-drying ovens also occur in urban centres in the late 4th and 5th century AD, such as Silchester and Verulamium.³⁴

Grain-Drying Ovens in the South

Such a broad review enables us to identify regions of large-scale processing, but does not provide a quantitative assessment of how much cereal production these structures indicate, and how this varied between settlement types. A preliminary case study region of the south is presented here to illustrate initial patterns in these structures. The south region was defined by the RRSP as a region mainly of upland chalk landscape, stretching from Kent to Somerset, which encompasses several towns including *Calleva Atrebatum*, *Londinium*, and *Venta Belgarum*. Settlement pattern in this area was a mix of villas, farmsteads, and some roadside settlements.³⁵ Building from the work of the RRSP, this study has returned to the primary archaeological reports for additional detail on grain-drying structures. 97 sites are included here which are part of the RRSP database, are located in the south, and have a grain-drying oven present.

Firstly, we can consider the number of grain-drying ovens recorded at individual sites. Figure 3 indicates that most sites only have one or two grain-drying ovens, with 54 sites having a single drying structure, and 13 sites having two drying structures. However, there are several rural sites with large numbers of T-shaped ovens. One example comes from East Anton, Hampshire, a roadside settlement close to the junction between the roads leading to *Calleva Atrebatum*, *Venta Belgarum*, and *Corinium*. The majority of activity at the sites was dated to c. AD 240–400, including the construction of at least 12 mainly T-shaped ovens amongst an area of field systems of 1.6 ha. Similar rural agglomerations of drying-ovens have been excavated at: a farmstead at Poundbury Farm, Dorset, where eight grain-drying ovens were recorded consisting of a mix of simple, T-shaped and rectangular ovens dating to the mid-late Roman period; an unenclosed farmstead at Foxholes Farm, Hertfordshire, where five grain-dryers were

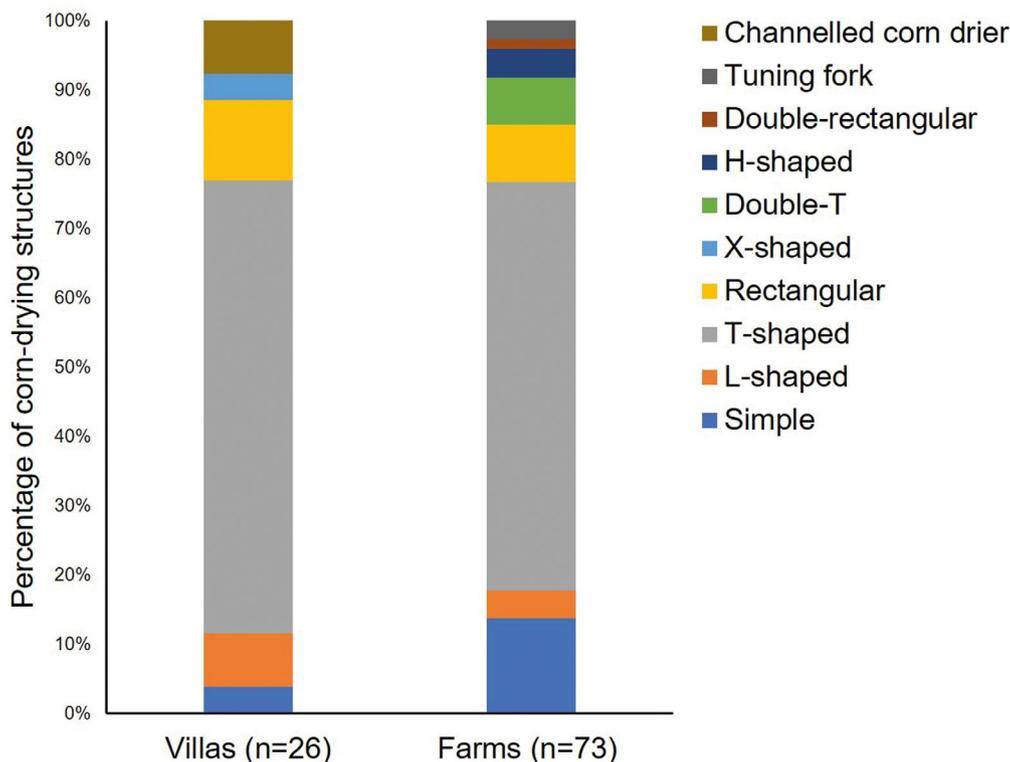


Fig. 4: Bar chart showing the proportion of grain-drying ovens at farmsteads and villas in the south.

recorded dating to the 4th century AD; and at a farmstead at West Blatchington, Hove, where 11 structures were found that dated to the mid-2nd and 3rd century AD.³⁶ Hence, there is an emerging pattern of sites with large numbers of ovens, and hence cereal-processing capacity in the countryside. To what extent this pattern is the product of excavation bias is unclear. Many excavations are often too small to characterise rural settlement form and villa excavations have focused on the central residential buildings themselves rather than the surrounding area.³⁷ Sites with grain-drying ovens may well have been connected to larger estates, but we cannot presume unitary land holdings around a villa.³⁸

A range of grain-dryer forms are found at villas and farms, ranging from single flues to multi-flues. Comparing the proportion of grain-dryer types recorded at site types across the South (Fig. 4), overall a similar proportion of single flues (simple, L-shaped, T-shaped) are present at both site types, making up just under 80% of structures. Within the range of dryer types, a slightly wider range is found at farmsteads, consisting of rectangular, double-T, H-shaped, double-rectangular, and tuning-fork structures. Rectangular structures were also found at villas, with the addition of channelled grain-driers and an x-shaped structure at Fullerton villa.

Hence, villas are not the centres of diversity in grain-dryer forms. In fact, some forms are only present at rural farmsteads. For instance, a tuning-fork structure was recorded at Manor Farm, Poxwell, Dorset, and at Compact Farm, Worth Maltravers, Dorset. Beyond the South, this grain-dryer structure is also found at a farmstead at Hinkley Point, Somerset, but also appears also at Yewden villa in the Central Belt region.³⁹ Other rare structures have been found at farmsteads, for instance a triangular oven at Broughton Manor Farm, Buckinghamshire and around 10 km away at a farmstead at Windmill Hill, Buckinghamshire.⁴⁰ Experiments in grain-dryer form were most likely a way to increase the surface area of the drying floor and to enable a larger heated area with one fire setting, meaning a more efficient use of fuel and labour. Ethnographic observations have shown that constant observation of drying ovens is needed to ensure that the grain does not catch fire, which did happen at Grateley villa, Hampshire.⁴¹

It has been suggested that villas were the centres of processing and storage of cereals in the rural landscape in the third and fourth centuries. The preliminary results of this study on grain-dryers contrast with this suggestion, indicating the importance of other settlement forms in both the quantity and diversity of grain-dryer forms.⁴² However, it is unclear whether farmsteads and villas within a region were distinct economic entities. As previously argued by Taylor, there is an overlap in the distribution of grain-dryers and villas indicating landscapes of agricultural investment,⁴³ but the extent to which different settlements forms were economically integrated within these landscapes requires further research.

Conclusions

Grain-drying ovens are overlooked agricultural structures that have the potential to provide quantifiable insights into cereal production and the integration of the rural agricultural economy in Britannia and beyond. A recent review of the national evidence for rural settlement has indicated that grain-drying ovens are widely distributed from the 2nd century AD onwards and occur at a range of site types. This preliminary analysis indicates that further insights can be made by considering the number and form of grain-drying ovens. A key conclusion of this initial analysis is that atypical clusters of grain-drying ovens occur at farmsteads across the south, often lying close to the road network. Furthermore, innovative forms of grain-drying ovens have been recorded at rural farms and villas, indicating the adoption of technological innovations linked to increased agricultural-processing capacity. In order to illuminate the process and spread of innovation and technology the evidence from rural Roman Britain must be integrated with that from the continent. Furthermore, in order to utilise grain-drying ovens as a proxy for cereal production, detailed consideration of the function, processing capacity, and seasonality of use is required, and these topics will be subjects of future study.

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Notes

¹ De Haas – Tol 2017; Erdkamp et al. 2015.

² Whittaker 1994. – RurLand project: Reddé 2017.

³ Mattingly 2007, 491–502.

⁴ Lodwick 2017, 12.

⁵ Zos. 3, 5, 2; Amm. 28, 2, 3.

⁶ Applebaum 1975.

⁷ Jones 1984; Branigan – Miles 1989.

⁸ Millett 1990; Taylor 2011.

⁹ See contributions in Millett et al. 2016.

¹⁰ Database: Allen et al 2018. Publications: Smith et al. 2016; Allen et al. 2017; Smith et al. 2018.

¹¹ Fulford 2017.

¹² Allen – Lodwick 2017, 173–177.

¹³ Bowman – Wilson 2013a, 3.

¹⁴ Gerrard 2013, 97.

¹⁵ Yields: Shaw 2015, 19. Arable/Pastoral ratios in insect assemblages: Robinson 1983. Densities of charred plant remains: Lodwick 2017. Mill stones: Shaffrey 2015.

¹⁶ Absent from White 1970; Bowman – Wilson 2013b; Thurmond 2006.

¹⁷ Lodwick 2017.

¹⁸ Hypocausts: Collingwood 1930. Subways: Cocks 1921; Corder 1940.

¹⁹ Morris 1979.

²⁰ Van der Veen 1989.

²¹ Goodchild 1943; Reynolds – Langley 1979.

²² Andrews et al. 2011, 224–226.

²³ Lodwick 2017.

²⁴ Climate change: Applebaum 1958, 81. Social control: Gerrard 2013, 255–259. Large-scale production: Morris 1979; Van der Veen 2016.

²⁵ Cunliffe – Poole 1991, 145–151.

²⁶ Weitersbach: Wightman 1970, 142. 185. Dietikon: Ebnöther – Béarat 1995.

²⁷ Van Ossel 1992; Bridger 2017.

²⁸ Lodwick 2017, 62–66.

²⁹ Helm – Carruthers 2011; Tomlin 2016.

³⁰ Stika 2011.

³¹ Horn 2015.

³² Lodwick 2017.

³³ See Lodwick 2017, 55–61 for a review of grain-drying ovens in Roman Britain.

³⁴ Morris 1979, 20.

³⁵ Allen 2016.

³⁶ East Anton: Firth 2011. Poundbury Farm: Dinwiddy – Bradley 2011. Foxholes Farm: Partridge 1989. West Blatchington: Norris – Burstow 1950, 1952. Note: site classified as a farm on the RRSP database but multi-roomed aisled building in use in the 3rd century AD.

³⁷ Allen – Smith 2016, 19–20.

³⁸ Todd 1989.

³⁹ Manor Farm: Hurst – Wachter 1986. Compact Farm: Graham et al. 2002. Hinkley Point: Saunders 2010. Yewden: Evers 2011.

⁴⁰ Atkins et al. 2014; Mynard 1987. Villa sites: Morris 1979, 97–98.

⁴¹ Fenton 1978, 387; Campbell 2008.

⁴² Fulford 2017.

⁴³ Taylor 2011, 190.

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