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## Agricultural production in Roman Italy

### Robert Witcher

**Abstract:** This chapter considers the practice and organisation of agricultural production in Roman Italy drawing on textual, archaeological and ethnoarchaeological evidence. As well as reviewing the types of crops cultivated and animals husbanded, it considers broader questions about the scale of production and the social organisation of labour (e.g. peasants, slaves, tenants). The chapter outlines the significance of critical new approaches to ancient texts and recent archaeological discoveries for established narratives of agricultural production and agrarian relations. This includes questioning the extent to which peasant farmers were systematically pushed from the land and the significance of oil and wine production in the economic fortunes of the republican aristocracy. Throughout, examples are used to demonstrate how powerful ancient and modern assumptions (e.g. the self-sufficient peasant, 'decline', etc.) shape interpretation of texts and archaeological evidence.

**Keywords:** animal husbandry; wine/oil production; cereal cultivation; peasantry; agrarian relations; villas; markets; diet; archaeobotany; zooarchaeology.

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### Introduction

Some beliefs about the ancient world are so commonplace that they appear unquestionable, and beliefs about agricultural production in Roman Italy are no exception: farming formed the principal source of wealth; the countryside produced whilst the cities consumed; the majority of the population lived in the countryside; peasant farmers worked on family farms. This

chapter discusses the character, organisation and scale of agricultural production in Roman Italy, drawing on new approaches to texts and recent archaeological discoveries in order to demonstrate some of the challenges to these widespread beliefs. It is impossible to encompass the full breadth and complexity of Roman agricultural production in the space available; recent contributions by Becker (2013), Goodchild (2013) and Kron (2012) provide wide-ranging and complementary overviews of agriculture in Roman Italy; this chapter takes a selective sample of material to provide a flavour of recent and emerging debates.

## **Ancient texts & archaeology**

Until quite recently, textual evidence was the dominant source of information about agriculture in the ancient world. Authors such as Cato, Varro, Columella and Pliny the Younger were mined for details of the practice of plant and animal husbandry; broader agrarian relations were illuminated through the works of historians such as Livy and Appian. Together, these texts have been used to create powerful narratives about the significance and organisation of agriculture in Roman Italy. For example, a key theme is agrarian crisis in the form of access to land: during the second century BC, the great influx of wealth, ideas, and slaves from Rome's East Mediterranean conquests led to a radical transformation of agriculture. Roman aristocrats invested their new wealth by buying land (including *ager publicus*) and developing commercial farms based on the intensive application of slave labour for the production of wine and oil to feed expanding urban markets. The cumulative effects of continual overseas warfare and the growth of slave estates came at the expense of the small farms of Roman citizens; these peasant families were pushed from the land, into the growing towns, helping to further expand the market for the produce of the aristocrats' estates (Hopkins 1978).

The component parts of this interpretation draw in particular, on the text of Cato for details of these new aristocratic farming methods and on Appian for the tensions between aristocratic slave estates and peasant farmers. This chapter will touch on some of the many debates which have developed around this traditional text-based narrative. A key part of its reassessment has been critical new approaches to the texts and, in particular, to the works of the so-called agronomists: Cato, Varro, and Columella. Most scholars have rejected the idea that these texts can be treated as farming manuals or descriptions of actual agricultural practice. Instead, these works are now generally approached as literature, and attention has turned to the motives of the authors and consideration of their intended audiences (e.g. Doody 2007; Reay 2005; Terrenato 2001; 2012).

Varro's *de Re Rustica* provides an example. This text has been widely cited as illustrative and supportive of the development of a 'modern' or 'rational' approach to agriculture in late Republican Italy, striving above all for the best yields at the least cost. But what was Varro's purpose in writing? He clearly states that his aim is to provide a manual for his wife, so that she may continue to manage the farm after his death (*Rust.* 1.1.1-2). But how else might his work have been intended or have been understood? The text takes the form of a dialogue between the agronomist Scrofa, arguing for a new approach to agriculture, and the more traditional Stolo. The advice of Scrofa, a figure also mentioned by Columella and Pliny the Elder, has often been accepted as evidence for the sophistication of agricultural theory and its practical application. Kronenberg (2009, 76ff), however, argues that rather than accepting Scrofa as an historical figure and taking his advice at face-value, he can be re-read as a fictionalised character engaging in, and satirising, Ciceronian-style debate: *Scrofa/ratio* versus *Stolo/consuetudo*. She suggests that Varro's aim was not to promote Scrofa as a progressive model, but to parody both Stolo and Scrofa, who are more concerned with debate than the advance of knowledge – and still less with a description of farming as actually practised. This reminds us of the need for attention to the wider context of the gobbets of agricultural advice gleaned from the historical texts and liberally cited in discussions of Roman agriculture.

For a long time, archaeological evidence was cast in the role of providing the material evidence with which to demonstrate the veracity of the agricultural details derived from these texts. For example, White's (1970) important volume on Roman farming is based primarily on historical texts and, though it makes frequent reference to the excavation of Pompeian villas, this evidence is conceived largely in terms of the support it can provide for a predetermined textual narrative. This approach is problematical for a number of reasons. For example, isolating snippets of agricultural advice and successfully 'testing' their authenticity against the archaeological (or ethnoarchaeological) record has sometimes been taken to imply that the wider interpretation of these texts as manuals for progressive agriculture should be accepted. For example, Spurr (1986) stresses the reliability of Varro on points of agricultural detail. However, demonstrating that specific examples of arable cultivation were practical, does not mean that Scrofa's advice was implemented, let alone universally.

Another reason why testing the texts against the archaeological record can be problematical is because the texts have often exerted a strong influence on the collection and interpretation of the archaeological evidence. For example, Terrenato (2001; 2012) has argued forcefully that these texts have been used to create idealised villa types – Catonian, Varronian, Columellan – which have then profoundly influenced the way in which archaeologists have gone about selecting sites to excavate and how they have interpreted their findings (**FIGURE 1**). He argues that the interpretation of a villa as 'Catonian' represents an *a priori* reading of the archaeology; once the label has been applied, understanding of the site is then guided by a predetermined interpretation (see also Witcher 2012). As a result, testing the reliability of the texts against this archaeological evidence becomes an exercise in circular reasoning. Terrenato presents a critical re-assessment of the archaeological evidence for Republican villas demonstrating the lack of known sites of the appropriate date or form to be associated with the 'Catonian' ideal. Although some newly discovered sites in the *suburbium* of Rome might buck this trend (see below), the broad pattern is clear. Further, it is important to note that villa buildings are primarily evidence for the consumption rather than the production of wealth; the growing luxury of residential buildings is only indirectly linked to the agricultural output of an estate; the production and consumption of *amphorae*, which receive limited attention in the texts, are a better indicator of the intensification of agricultural production than mosaic floors (though see below for caveats).

In sum, although the texts remain central to the interpretation of rural sites in Italy (e.g. Villa of the Auditorium, Carandini *et al.* 2006; Villa della Piscina, Gioia & Volpe 2004; Volpe 2007), there has been a general shift away from the assumption of any simplistic correlation between texts and archaeological evidence. Still less can the accounts of Cato, Varro and Columella be treated as consecutive snapshots which document the evolution of Italian agriculture. Instead, the most reasonable approach is to accept that the writers had broad familiarity with agricultural practice, and that we can recognise details of specific agricultural tasks, such as vine pruning, but that knowledge of these processes does not imply that they were practised in pursuit of the wider objectives promoted by 'characters' such as Scrofa. Rather, these details are embedded within texts which were written for particular literary and political reasons within specific social and cultural contexts.

If such texts must be subject to such critical re-assessment, it is also important that archaeological evidence is similarly scrutinised. In contrast to the textual evidence, the quantity of archaeological material is constantly expanding and varied techniques (e.g. geophysical survey, archaeobotany, zooarchaeology, isotope analysis) continue to add to our understanding. There is obviously much that does not survive in the archaeological record, such as wooden barrels, sacks and other perishable farm equipment, or that only survives in the rarest of conditions such as at Pompeii and Herculaneum. The archaeological record is therefore no more comprehensive than the textual evidence. In particular, whilst it is very suited to tackling questions about technology, such as olive oil processing, it is less well adapted to address issues concerning the organisation of labour which are often equally

influential on agricultural productivity (see Erdkamp 2005, 7); indeed, a common criticism of archaeology is that it cannot tell us about the social status of sites' inhabitants (though see below).

To some degree, the strengths and weaknesses of the textual and archaeological evidence are complementary: hence Cato's neglect of marketing can be addressed by archaeology's ability to trace *amphorae* distributions; conversely, archaeology's limitations in elucidating labour relations, are mitigated by the textual evidence for slavery and tenancy. The following sections put special emphasis on the archaeological evidence but will also draw attention to some of the difficulties of interpretation which arise; as with the texts discussed above, the archaeological evidence cannot always be taken at face value.

## **Animals: the 'other' Mediterranean Triad**

Nearly all accounts of Greek and Roman agriculture start with discussion of the so-called Mediterranean Triad - cereals, olive trees, and grape-vines - before considering if and how animals were integrated into this primarily arable economy. In recognition of the rapid expansion of zooarchaeological data, this chapter starts with consideration of animal husbandry and then turns to the evidence for the cultivation of crops.

In the pre-industrial economy, animals provided much more than just meat and dairy products; they also supplied traction and manure, as well as products such as wool, leather, horn, and bone which were far more important than today. Compared with the cultivation of crops, much less attention has been devoted to the role of animals in ancient farming, but recently a number of studies have examined the importance of animal husbandry, drawing in particular on the growing body of zooarchaeological evidence. In a synthesis of samples from almost 100 sites, Mackinnon (2004) has demonstrated that, with one or two exceptions, cattle, pigs and sheep/goats comprise the vast majority of animal species (wild and domestic) found on sites of all types across Italy, from the pre-Roman period through to late antiquity; they might therefore be considered the 'other' Mediterranean Triad.

From the perspective of understanding agricultural production, the zooarchaeological data present a challenge because most of these bone assemblages derive from rubbish deposits at urban centres and residential villas, and relate to the consumption of meat and, to a lesser degree, the processing of bone and hides. Our data are therefore biased in composition and most directly informative about meat consumption rather than offering a more rounded understanding of the role of animals on the farm and how they were husbanded before they were eventually consumed. However, embedded within this evidence for meat consumption there are clues about the organisation of the husbandry practices which supplied these consumers.

The percentage of cattle bones represented in samples varies according to region, over time, and by site type; for example, cattle are more abundant in northern Italy compared with the centre and south; they are also much more common at small urban centres than rural sites (MacKinnon 2004, 77-100). There are also differences in the size of cattle; for example, cattle in the north of Italy were consistently smaller than animals in the centre and south. All of this variation notwithstanding, two general trends are a) increased average height of cattle as measured at the withers, and b) the generally mature age of cattle at death.

The increased average height of cattle has been argued to relate to selective breeding to increase body size in order to supply growing urban demand for meat (Kron 2002; but see below). The overall range of animal sizes is also significant, with cattle in late antique central Italy varying in height by up to 35 cm.; this may be partly explained by sexual dimorphism, but MacKinnon (2010) argues it may also indicate the presence of two or more breeds of cattle. Indeed, the ancient texts describe a number of distinct breeds (e.g. Columella, *Rust.* 6.1.1-3). Hence, even if the average height of animals increased, smaller breeds were maintained. In this context, it is worth stressing that bigger is not always better

when it comes to animal husbandry; farmers may prefer smaller animals which mature more rapidly, require less fodder or are easier to handle; or they may breed for characteristics such as milk which are not directly correlated with height.

Of all domestic animals, cattle in particular might also be expected to provide labour before their eventual consumption. The fact that most cattle bones derive from mature animals of three years of age or more, and many over five years, suggests the consumption of former plough animals; similarly, the high ratio of male animals supports the idea that traction was the primary function and that meat and/or milk was only secondary. In turn, such demand for traction is arguably indicative of increased cereal production. These 'second-hand' cattle may be one reason why beef was a relatively inexpensive meat compared with pork (see below). Nonetheless, as the funerary monument of C. Valerius Faustus indicates, there was money and status in the marketing of cattle; the marble tombstone from the *ager Faliscus* north of Rome records that he was a freedman, official of the imperial cult, and a successful cattle merchant (AE 1991, no.682c; Gilliver 1997, 202-03; see also Chioffi 1999).

Pigs receive limited attention from the agricultural writers, but pig bones frequently comprise over half of all mammalian bones in zooarchaeological samples (MacKinnon 2004, 139-62). As with cattle, the percentage of pig bones varies across regions, over time and by site type, with particular abundance on urban sites and, though pig comprises a consistently lower percentage in southern Italy than in the centre and north, during the imperial period there was a universal increase in the percentage of pig bones across the peninsula. MacKinnon (2004, 154) suggests that the significant range of height at the withers might correlate with the two distinct breeds described by the agricultural writers: a smaller bristly dark pig and a larger smooth white pig. The former may have been kept free-range in large herds, whilst the latter may have been selectively bred and stall-fed, perhaps even in urban environments. Pigs breed prolifically and mature quickly and, unlike cattle and sheep/goats, they do not provide any significant secondary products. The only purpose for keeping a pig is to eat it. It is therefore no surprise that most animals were slaughtered young, with only 1% of animals reaching maximum breeding age (MacKinnon 2004). Unlike the cheaper beef from old plough cattle, pork was a premium product. Nonetheless, pigs have the attraction that they can be left to forage on scrubland or in woods, or fed on scraps, and small herds are therefore more easily integrated into arable farms than cattle or sheep. In other words, although pigs did not provide farmers with any additional value beyond their meat, as long as there was a market, raising a few pigs was not a difficult or costly venture.

Completing the trio of principal farm animals, is sheep/goat. Although it is possible to differentiate between the bones of sheep and goats, it is not always easy and many studies do not make a reliable distinction. However, where the difference can be observed in Roman Italy, sheep are always more abundant, often 4:1 or higher (MacKinnon 2004, 104). Unlike pigs, sheep/goats provide not only meat, but also milk, wool, and manure. A high percentage of sheep bones in Roman Italy relate to mature animals, with a high ratio of females, suggesting that it was wool and milk rather than meat which was valued (MacKinnon 2004, 101-138). Indeed, wool remained the most important textile throughout the Roman period. The presence of spindlewhorls and loomweights on rural sites indicates that wool was both spun and woven in the countryside, and Roth (2007) has recently argued that textile production was a core economic activity undertaken by female slaves on commercial farms. As with cattle, therefore, the consumption of sheep may have followed productive earlier lives.

Cato (e.g. *Agr.* 10.1) and Varro (e.g. *Rust.* 1.19.3) provide insights into the importance of sheep for arable practices, especially through grazing stubble and manuring, but flocks of any significant size required the movement of animals during the year to maintain adequate grazing. The existence and organisation of transhumance in Roman Italy is much debated, with discussion heavily informed by comparison with early modern practices and ethnoarchaeological studies of twentieth century shepherds (see Gabba and

Pasquinucci 1979; Pasquinucci 2002). There are two types of transhumance; most attention has concentrated on the long-distance movement of animals over hundreds of kilometres in search of summer grazing in the mountains. For example, Varro (*Rust.* 2.1.17; 2.2.9) describes the annual relocation of his flock of 700 animals from Apulia to Sabina. Such transhumance would have been associated with large-scale, commercial enterprises producing wool and, though economically important, was probably exceptional. Short- to medium-distance movement was probably much more common. It is widely assumed that, during the spring and summer, agricultural communities on the coastal plain and lowland hills would send their flocks up into the mountains. However, analogy to traditional practices in Lazio which continued well into the second half of the twentieth century suggests movement in the opposite direction is also possible; that is, communities in the uplands sent their flocks down to the coastal plain to overwinter before returning home during the spring. These shepherds constructed temporary wooden huts and carried limited material culture (**FIGURE 2**); the chances of detecting these shepherds' ancient predecessors in the archaeological record are therefore low. However, survey of upland landscapes has identified large stone enclosures intended to corral animals (Barker and Grant 1991) and zooarchaeological analysis has begun to provide further insights. For example, MacKinnon (2004, 216) notes that sheep bones from large urban sites cluster in the 7-12 month bracket (lamb) and over 36-48 months (mutton). Such patterns point towards careful control of breeding and the timing of slaughter to provide meat (and dairy products) for urban populations which were concentrated in the lowlands. Isotopic analysis of animal bones promises to add much more detail to understanding of transhumance, such as the timing and the geographical range of seasonal movement.

Cattle, sheep, and, to a lesser extent, pigs all appear to demonstrate increases in average height at the withers during the Roman period. This trend has been taken as evidence for the selective breeding of animals in response to growing market demand for meat (Jongman 2007; Kron 2002; 2004). However, this interpretation is not straightforward. The computation of animal height is complicated by poor publication of both critical base measurements and details of the extrapolation methods used. Moreover, the number of samples is still comparatively limited and coverage is uneven; individual assemblages are also often very small. As the database grows and the standard of publication improves, the scale and significance of increased height will become clearer. A more complex problem is the relationship between animal height and weight; this is not fixed and it is noticeable that those arguing for the importance of meat in animal production (rather than wool or dairying) tend to assume more generous proportional increases in carcass weight (cf. cattle, Kron 2004, 400kg and MacKinnon 2004, 200kg).

If animal height as an indication of increased consumption of meat currently remains unclear, another approach is to assess chronological variation in the number of animal bones in the archaeological record. Jongman (2007, 191-92) provides a graph of the numbers of animal bones deposited between c.500 BC and AD c.100. He argues that a significant increase in the numbers of bones over time reflects a rise in the consumption of meat, resulting from increased economic prosperity and leading to improved nutrition. Convincing though this increase may appear, caution is needed. Firstly, the larger number of bones deposited must to be set against any change in the number of consumers; an increase in population - as suggested independently by census figures - would produce an increase in the number of animal bones with no change in *per capita* consumption, wealth, or health. Secondly, the graph shows numbers of bones deposited over time, but this assumes that archaeologists have excavated a standard number of deposits from each time period; this is probably untrue and the bias is likely to be towards imperial period sites. Not least, the late Republic and early Empire was a time of rapid urbanisation which generated large, well-preserved rubbish deposits of a type which were previously rare. In other words, the graph could simply be demonstrating an increase in the visibility of meat consumption rather than absolute change.

A final approach to the issue of higher *per capita* meat consumption comes through the proxy of increased human stature. Height is closely associated with improved nutrition and Kron (2005; see also Jongman 2007) directly ascribes a 'peak' in the average height of Italian males during the Roman period at 168.3 cm. to increased meat consumption. But yet again, caution is necessary. Firstly, the majority of skeletal samples relate to urban populations whose stature and diet may not be representative of the wider rural population; secondly, it is far from clear that human stature really did increase during the Roman period, and other studies suggest this may not have been the case (see Gowland and Garnsey 2010, 150).

On the basis of the available evidence, it is impossible to be certain that there was *per capita* increase in meat consumption with associated improvements in health and nutrition. More representative samples are required and the data need to be carefully calibrated; isotopic analysis provides another method for assessing meat consumption and its variability (Killgrove 2010; Prowse *et al.* 2004). Nonetheless, one striking result of zooarchaeological studies is that although cattle bones represent on average one-sixth to one-fifth of those identified, when converted into meat weight, the larger size of cattle compared with sheep and pigs means that the relative contribution of beef to the Roman diet rises to as much as one-third; this is emphatically not the impression given by the ancient texts (MacKinnon 2004, 217). Apicius' cookery book may be filled with recipes for pork, but many made do with the cheap beef of old plough animals.

Before turning to crop cultivation, it is important to mention briefly some of the other animal species which were also raised on farms (see also Kron 2008a). Chicken (*Gallus gallus*) and other domestic fowl are well-attested (e.g. Mola di Monte Gelato, West 1997), but as their bones are less robust than those of mammals, and those that survive are more easily missed during excavation, their prevalence is probably underestimated. The bones of smaller songbirds such as thrushes (*Turdus* sp.) are also attested and these may relate to the practice of *pastio villatica*, that is, the intensive production of high value, gourmet foods; Varro (*Rust.* 3.3-5) provides discussion of highly profitable aviaries. Other species raised for market included the dormouse (*Glis glis*; Varro *Rust.* 3.15); bones have been recognised on a number of sites (e.g. Settefinestre and Mola di Monte Gelato; King 1997, 392) as have *gliraria*, the terracotta jars for fattening the animals. By definition, however, such products were restricted to a small and wealthy section of society, and production was highly specialised, often requiring capital investment. This practice is epitomised by fish-farming at villas along the coast of Latium and Campania. Brizzi and Marzano (2009) have quantified the capacity of these installations, arguing that production exceeded the immediate needs of the villa owners and could therefore have been marketed to cities. Certainly tanks could have been used to transport live fish, but it is far from clear that there was significant market demand for such a costly product; aristocratic display may well have been the primary important motivation for such cultivation of fish.

Finally, as noted above, cattle were raised primarily as plough animals, but though oxen are powerful, they are also slower and less sure-footed than donkeys and mules for transporting goods, especially on unpaved or steep roads. Varro (*Rust.* 2.1.17) discusses the breeding of mules on the Reate (Rieti) plain in the mountains north-east of Rome. These animals would have been a common sight on the roads of Roman Italy, transporting agricultural produce to urban centres (Laurence 1999, 123-35). However, equid bones comprise only a small percentage of zooarchaeological samples, probably reflecting the fact that, unlike cattle, their meat was not consumed once their working lives were over.

## **Plants: the original Mediterranean Triad**

Animals were an integral part of the rural economy, but plant crops were the mainstay of agricultural production and diet. This section turns to the 'original' Mediterranean triad of cereals, olives, and vines, before considering the evidence for the wide variety of other plants which added nutritional and culinary diversity. The ancient texts again provide



information about the range of crops and their cultivation (e.g. Plin., *HN* books 12-22). Alongside these texts, the study of botanical remains from archaeological deposits provides an important and rapidly expanding resource. As with animal bones, botanical remains such as charred seeds derive overwhelmingly from contexts associated with consumption (e.g. urban, domestic) rather than production (e.g. rural sites). Conversely, pollen evidence, usually from lakes, is rarely associated with individual sites and tends to provide an indicator of general background flora.

As in all pre-industrial Mediterranean societies, cereals were the dietary mainstay. The significance of grain production, however, has been neglected for a number of reasons. First, drawing on Roman texts, the traditional narrative has emphasised the decline of peasant farmers and the rise of villas producing wine and oil; second, and consequently, the massive importation of grain from the provinces was assumed to have supplied urban demand. However, Spurr's (1986) re-analysis of the texts combined with ethnoarchaeological insights, argued that cereal production remained central to Italian agriculture throughout the Roman period. Nonetheless, a significant problem is that cereals leave few archaeological traces of cultivation, processing or transportation compared with oil and wine, and the evidence we do have is biased to urban contexts, such as granaries and grain mills (on cultivation and harvesting, see Spurr 1986; White 1970, 173-89; on processing, see Thurmond 2006, 20-72).

Pliny (*HN* 18.83) observes that the early Romans ate porridge (*puls*) made of emmer wheat (*Triticum dicoccon*), rather than the bread which was the norm in his own day (Purcell 2003 on social symbolism). Breadmaking requires wheat with high gluten content and we might envisage a shift in production from emmer to common (*Triticum aestivum*) or hard wheats (*Triticum durum*). However, the archaeobotanical evidence does not demonstrate any such simple chronological transition; indeed, most assemblages contain a variety of wheats, as well as other cereals such as six-rowed barley (*Hordeum vulgare*) and common millet (*Panicum miliaceum*).

Alongside rising demand for breadwheats, the strategies used by farmers to decide which cereals to plant will have been influenced by additional considerations, such as soil, rainfall, and reducing the risk of crop failure by sowing a range of different cereals. Rural households may also have grown distinct crops for household consumption and market sale (see below).

The cultivation of olives (*Olea europaea*) and grape vines (*Vitis vinifera*) is archaeologically much more visible than cereals. In particular, the evidence for presses, settling tanks, *dolia* and *amphorae* make it much easier to trace the processing, storage, and distribution of oil and wine (see Thurmond 2006, 73-110, 111-64). Equally, it is important to recognise that the high visibility of these processes is related to the intensification and specialisation of production associated with capital intensive commercial farming. Olive oil and wine can be produced without the need for such elaborate presses and transported without *amphorae*.

In addition to the well-known evidence for the processing of oil and wine, excavation has also revealed details of cultivation. For example, in the area of Centocelle (c.6km. east of the centre of Rome), extensive excavations have identified ten systems of parallel trenches of rectangular profile, c.85-90 cm. wide, spaced c.10 m. apart; these have been interpreted as vine trenches intended to promote root growth (Cato *Agr.* 1; Columella, *Rust.* 3.12.6, 11.2.28). In some areas, new trenches were cut at 90 degrees presumably when the vineyards were replanted. The spacing between the trenches is wide (especially compared with Columella's recommendation of 4-10 feet (1.2-3 m.), though he wrote centuries after the vineyards at Centocelle were laid out). This wide row-spacing points to intercultivation (Italian *coltura promiscua*) with vines interspersed with other crops such as cereals or beans. This method of mixed cultivation diversifies the farmer's produce and reduces the risk associated with specialising in a single crop, though the overall returns are often reduced.

Hence, these farms may have specialised in producing wine (even table grapes) for the market at Republican Rome, but they did not abandon their basic self-sufficiency. Excavation of an urban vineyard at Pompeii (II.v) reveals a different method of cultivation, with 2,014 vines supported on stakes spaced four feet apart (c.1.2 m.; coinciding with Pliny's advice, *HN* 17.171), interspersed with fruit trees, and possibly intercultivated with broad beans (*Vicia faba*) (Jashemski and Meyer 2002, 21-22).

The Republican vineyards at Centocelle also provide a good example of how the high visibility of *amphorae* has encouraged archaeologists to regard them as a direct proxy for wine production, so that their absence can be easily misinterpreted as a lack of production. Volpe (2009, 379-81) notes that *amphorae* at imperial-period Rome regularly comprise 30% or more of the total ceramic assemblage; in contrast, the figure from Republican Rome rarely exceeds one or two percent. She argues that the clear evidence for Republican viticulture at Centocelle and elsewhere around the *suburbium* indicates large-scale production for the market, but that the short distance from the vineyards to the city did not require the wine to be packaged in the heavy *amphorae* required for sea-transportation; instead archaeologically invisible skins or barrels could have been used. Volpe (2009, 380) uses the Centocelle vineyards to estimate the potential wine production of the Republican *suburbium* as a whole, suggesting that it could have met the demand from Rome's population ten times over (see below for discussion of the implications of this and similar estimates of very high Republican agricultural output). The low visibility of local wine production also helps to explain why imported wine dominates *amphorae* assemblages in the northern *suburbium* from as early as the second century BC, when Tunisian amphorae appear in significant numbers (Fontana 2008, 660-62). This dominance does not indicate that local production had already been displaced by imports from an early date, but more probably that local production is under-represented. Similarly, the sharp increase in the percentage of *amphorae* at Rome during the imperial period does not represent new demand for wine, but a switch to provincial imports which were packaged in a more archaeologically visible way. In summary, when markets were in close proximity to production sites, the absence of *amphorae* precludes neither small-scale production (see above) nor commercialised production. *Amphorae* provide unparalleled insights into the complexities of production, exchange, and consumption but like all our sources, their evidence cannot always be taken at face value.

Although the Mediterranean Triad tends to dominate attention, a wide range of other crops were cultivated. Legumes were an important group of plants which provided a significant source of protein for both humans and animals and could be conveniently dried and stored; they were also valued as an integral part of crop rotation because of their nitrogen-fixing qualities. Broad beans (*Vicia faba*) are commonly found in archaeobotanical samples and occur more frequently than any other food plant at Pompeii and Herculaneum (Jashemski and Meyer 2002, 169) though the large seeds are particularly robust and easy to identify (see also Spurr 1986, 105-12). Other common legumes include chickpeas (*Cicer arietinum*) and lentils (*Lens culinaris medikus*).

As well as the olive, a wide range of fruit and nut trees were cultivated. The archaeobotanical evidence suggests the fig (*Ficus carica*) was particularly common; as with legumes, this crop can be dried and stored, providing a significant calorific contribution. Fruit and nut trees might be planted in regular orchards, but also interspersed with other crops; the excavated farmland adjacent to the Villa Regina at Boscoreale has revealed a vineyard dotted with trees such as olive and almond (*Prunus dulcis*; Jashemski and Meyer 2002, 24-25).

Alongside fields, vineyards, and orchards, there is also evidence for intensively-worked vegetable gardens. The Pseudo-Virgilian *Moretum* describes the peasant Symilus working his small but productive plot of beets, parsnips, leeks, and a wide variety of herbs. Pointedly, however, these are crops destined for the market, and Symilus' hunger is sated by a 'pesto' of cheese, garlic, oil and vinegar. A significant difference between urban and

rural diet, and the crops grown for household and market consumption, is entirely plausible (see above) though the simple but honest rustic *Symilus* is also a literary *topos* to be treated with circumspection. Archaeologically, such vegetable plots are almost impossible to document, though the excavation of a market-garden attached to the House of the Ship *Europa* (I.xv) at Pompeii incorporated a vineyard, intercultivated with broad beans, and two small vegetable plots, defined by furrows and interspersed with trees (Jashemski and Meyer 2002, 23-24; **FIGURE 3**).

Field crops in Roman Italy relied on rainfall, but gardens and orchards might also be irrigated. A recent study of water cisterns in the middle Tiber valley identifies twenty-six examples with particularly large capacity (>200m<sup>3</sup>) beyond any individual site's domestic needs; many of these were also open to the sky, making the water unfit for consumption or bathing. Wilson (2008, 735) argues that these cisterns were used to irrigate vegetables, flowers, and fruit trees (**FIGURE 4**).

A specific category of garden cultivation was the tomb garden (Purcell 1987). Funerary enclosures could be planted with fruit trees and utilised as vegetable plots. Some, though certainly not all, of the burnt fruits and nuts offered at Pompeian tombs might have derived from such planting (Matterne and Derreumaux 2008). Such small tomb gardens, located in the immediate vicinity of the city, could have provided urban families with welcome dietary variety or income. They were also integrated into the productive landscape of rural estates (*CIL* IX 3895 = *ILS* 8347; **FIGURE 5**).

As well as plant cultivation, gathering or foraging for wild fruits, nuts, herbs, vegetables, and fungi on common and uncultivated land may have been a significant activity (e.g. Evans 1980, 138-39; Frayn 1979, 57-72). Peasants may have collected plants such as caper, samphire, strawberry, and almond for household consumption, or even for sale at market. Cato (*Agr.* 149.2) and Columella (*Rust.* 12.7.1) discuss a wide range of wild plants such as asparagus, mulberry, fennel, and blackberry in the context of domestication, that is, transplanting and improving wild species. As a result, the distinction between cultivated and wild plants may have been quite blurred in practice, and is often impossible to distinguish via the archaeobotanical record. We therefore have no appreciation of the nutritional contribution of such gathered foods to the peasant diet. Nonetheless, it would be easy for this cornucopia of sustainably foraged plants, alongside cereals, olive oil, and wine, to be seen to reflect the healthy, varied 'Mediterranean diet' we are often encouraged to eat today. However, caution is required before transforming the Roman peasantry and its diet into a paradigm of healthy living, in the same way that the hard toil of the peasant has been repeatedly idealised by political regimes. For example, it is unclear whether the consumption of foraged foods should be understood as the welcome diversification of diet or as a necessity brought about by insufficient farmland or crop failure. Indeed, as with the wider study of the Roman peasantry, interpretation of the evidence is informed by powerful prior assumptions about whether peasants were impoverished rustics on the threshold of starvation due to their risk-averse strategies and under constant threat of eviction from the land or, conversely, resilient yeomen able to adapt their strategies to the prevailing economic and political environment, and to benefit accordingly. In short, were they stuffed or starved? Are they to be pitied or admired?

An example of how such assumptions can influence the interpretation of the archaeobotanical evidence is provided by the suggestion that an assemblage of grass pea (*Lathyrus sativus*), broad bean, barley, and acorns (*Quercus* sp.) from a reoccupation phase at an earlier villa near Rome is indicative of a sharply reduced standard of living during late antiquity (Sadori and Susanna 2005). However, the association of such 'famine foods' and socio-economic decline is far from straightforward. Firstly, there is no assemblage from the site's earlier phase against which to assess any reduction in the standard of living. Secondly, the character of occupation during late antiquity (a wooden lean-to) clearly indicates inhabitants of very modest status compared with the site's previous residents. Even if the late antique inhabitants did eat grass peas, it is not clear that their ancestors, who

presumably lived elsewhere, did not share the same diet; without samples from earlier sites of comparable socio-economic status, we are not comparing like with like. Finally, the overwhelming dominance of one species (grass pea) may suggest that we are not looking at a representative cross section of diet, but one particular store of food. Perhaps this cache was one of several stores of different foodstuffs, or was intended for emergency rations, or even for animal feed. The archaeobotanical sample from this site raises interesting questions, but in isolation it cannot be taken to support a prior assumption about the declining standard of living in late antique Italy.

Finally, although all the crops discussed above relate to consumption by either humans or animals, plants were also grown and used for many other purposes. Such plants would have included willow for basketry (*Salix* sp.; Cato *Agr.* 31.1) and flowers for religious festivals. Such cultivation has left limited traces, but a couple of archaeological examples point to the scale and variety to be expected. Recent work at Lakes Albano and Nemi, south of Rome, has identified very high levels of hemp (*Cannabis sativa*) pollen which may indicate the cultivation and processing ('retting') of hemp fibres for textile production (Mercuri *et al.* 2002). Meanwhile, it has been suggested that the ton of unripe pomegranates, rich in tannin, discovered at the villa of L. Crassus Tertius at Oplontis was intended for use in leather tanning (Jashemski and Meyer 2002, 153-54). This was a manufacturing process which was concentrated in towns (Flohr, 2012), but which made use of another agricultural product, animal hides; the higher than expected percentage of 'extremities' (e.g. foot bones) in zooarchaeological assemblages from urban sites points towards the importation of animal hides, feet still attached, for central processing (MacKinnon 2004, 244).

## **Aristocrats and agrobusiness**

The final two sections turn from the products of agricultural estates to the agrarian relations within which they were produced. The first section examines the involvement of aristocrats in commercial agriculture; the second considers smallholder farming. Both aim to question some of the key assumptions which underpin widespread beliefs about social and economic relations.

As noted above, a central tenet of the traditional narrative of Roman agricultural production is the development of intensively-farmed villa estates producing food for urban populations. There has been much debate about the origins of the villa and the associated new methods of farming: there is a general presumption that the concept, along with many of the slaves used for labour, was imported from the Hellenistic East, though influence has also been identified in archaic Etruria (Terrenato 2001) and North Africa and Sicily (Fentress 2003). In contrast to origins, however, there has been less critical attention to the centrality of these agrobusinesses to the achievement and maintenance of aristocratic wealth and status. In particular, was agriculture as profitable as Cato and Varro suggest, and as the traditional narrative assumes?

One problem in assessing this question, as Rosenstein (2008) has recently argued, is the lack of attention to demand. There is an assumption that the market would buy whatever these estates could produce, thus guaranteeing large profits for their aristocratic owners and promoting their increasingly lavish lifestyles. However, production and supply can only be understood in the context of demand; to evaluate the scale and profitability of agriculture it is necessary to understand the size and nature of the market. Rosenstein therefore estimates the number of potential urban consumers and their demand for cereals, oil, and wine, sharing the resulting market between the number of producers (senators, equestrians and decurions). The model makes generous assumptions: large urban populations with high *per capita* consumption and few producers with no competition from peasant farmers (i.e. maximum demand and the fewest suppliers). The resulting average market shares are, nonetheless, extremely modest (Rosenstein 2008, table 1). For example, c.200 BC, the average market share per producer would be just 6,867 l. of wine and 1,288 l. of oil, quantities which could be produced on just 26 *iugera* (6.5 ha.) of land in total. This is

far smaller, for example, than Cato's model 240-*iugera* oliveyard or 100-*iugera* vineyard (*Agr.* 10-11).

Mid Republican prices are poorly documented, but Rosenstein calculates that 1,288 l. of oil might be sold for HS 215-1,796 (54-449 *denarii*). This is an extremely modest figure, which is even further reduced once production costs are considered. In reality, prices will have varied across time and space, but even if the figure is multiplied several times, the average market share does not appear to have provided great profits for producers. The average share of the wheat market was more significant at 8,600-11,400 kg., equivalent to 85-114 *iugera* (21.25-28.5 ha.) of land. However, the profit margin on cereals was much lower than that on wine or oil; indeed, it is precisely wine and oil production which supposedly underwent radical transformation through capital investment in technology (e.g. presses) and labour (i.e. slaves). By c.50 BC, population had risen, so the market was larger, but Rosenstein's estimates suggest the average market share was still comparatively low at 14,531 l. of wine and 2,725 l. of oil, the equivalent of 54 *iugera* (13.5 ha.). Late Republican wine prices suggest an average gross income of HS 4,769-8,416, still far short of the enormous profits assumed by the traditional narrative. Obviously some producers may have cornered a larger market share, especially those close to the cities, but assuming these figures are of the correct order of magnitude, total market demand was insufficient to sustain the economic fortunes of the mid and late republican aristocracy as a whole.

This conclusion is in line with a number of other studies which have questioned the extent to which commercial agriculture spread across Republican Italy. For example, it is widely assumed that these estates were formed through the purchase or confiscation of extensive swathes of *ager publicus*, but Roselaar (2010) concludes that the availability of this public land was much more limited than commonly believed. Further, re-evaluation of the distribution of villas and the evidence for wine and oil production demonstrates distinct concentrations, notably along the coast, especially of western central Italy, in the *suburbium* of Rome, and in areas of former colonisation (e.g. Marzano 2007; Witcher 2006). Indeed, rather than the norm, Terrenato (1998a) has characterised these areas as "pockets of hyperactive economic activity" which existed alongside more traditional, peasant agriculture.

The implications of Rosenstein's analysis extend beyond balancing the supply and demand equation, and stress the necessity of relating agricultural innovations to their wider social and cultural context. Discussing olive oil production in the Greek world, Foxhall (2007) has stressed that this context is vital for understanding changing production strategies. Technology such as the oil press was not adopted because its higher productivity was superior, but because it was (or was not) useful for achieving wider social and economic objectives. So, if the market in Republican Italy was too small to provide significant profit for the Republic's aristocrats, their ownership of land and participation in agriculture point to reasons other than purely economic. The social, political, and cultural centrality of land and agriculture to aristocratic identity has long been recognised and perhaps the powerful aristocratic insistence on landownership and agriculture as the only appropriate means of producing wealth belies the fact that income increasingly came from other sources such as urban rents or money-lending. Even later emperors maintained this ideology; recent excavations at the site of Villa Magna, south of Rome, may have identified the villa described by the young Marcus Aurelius in a letter to Fronto (Fentress and Mauero 2011). A wine-pressing installation with a vat for treading grapes, *dolia* and an *opus spicatum* floor extravagantly and uniquely finished in white and coloured marble may have been where the future emperor joined the vintage, having read Cato's *de Agricultura* the previous night (Fronto, *Ep.* 4.6). Just as Marie-Antoinette played at being a milkmaid, in many pre-industrial societies the relationship between aristocrats and agriculture was richly symbolic.

Rosenstein's calculations notwithstanding, those estates which did manage to compete effectively are likely to have been those which were located close to their markets. New evidence from the *suburbium* of Rome adds to the debate. The area of Centocelle,

already mentioned above, was well placed to respond to urban demand. During the third century BC, the plain was comprehensively reorganised; new sites were founded and new agricultural practices introduced (Volpe 2004, 447-60). Later phases of Roman construction over these sites have made it difficult to establish the exact character of the earlier structures, but the stone (*tufo*) walled structure beneath the later Villa della Piscina covered c.900 m.<sup>2</sup> with rooms arranged around a central courtyard. These sites were associated with estates of c.50-70 *iugera* (12-18 ha.) and practised mixed agriculture including vine cultivation (see above). At the end of the second century, these sites were rebuilt and greatly increased in size and comfort; for example, the Villa *ad duas Lauros* now comprised an *atrium*/peristyle complex with mosaic floors. Although estate sizes must have remained broadly stable, there were some changes in agricultural organisation; for example, at the Villa della Piscina, a large new water tank possibly associated with irrigation was installed and the vineyard was reoriented and extended in size from 1.6 *iugera* to 8.8 *iugera* (0.39-2.2 ha. cf. Rosenstein's hypothetical estate sizes, above).

Volpe (2004) suggests that the evidence for modest third-century BC farms evolving into luxurious rural palaces provides new support for the reality of the 'Catonian' villa; specifically, it provides the missing evidence for the existence of 'transitional villas' which bridge the problematic gap – identified by Terrenato (2001) – between small yeoman farms of the archaic period and Republican slave-based villas. The evidence is particularly interesting because of the association of increased agricultural production (e.g. larger vineyards) with more elaborate villa architecture. Nonetheless, this model still requires significant assumptions about the association between the architecture of residential buildings and the organisation of labour, specifically the use of slaves, which ultimately rests on Cato and Varro. Moreover, even if we accept these villas as examples of successful agrobusinesses growing rich on profits from the Roman market, their proximity to the city means they are probably not representative of the organisation of Republican agriculture in general.

By the imperial period, the villas at Centocelle had been transformed again, developing into substantial rural palaces (Volpe 2007). Even though market demand from Rome was higher than ever, land was taken out of cultivation and covered by luxurious residential structures. A reduction in agricultural output and an increase in the consumption of wealth may be another indicator that social and cultural considerations might take priority over the economic. Indeed, the proliferation of wealthy villa buildings on such small estates, particularly to the south and east of Rome, raises the question of whether the agricultural output of individual properties could have funded the construction of the associated buildings and maintained their owners' extravagant lifestyles. Put simply, did these villa estates come to consume more than they produced? Arguably, these villa buildings were not solely funded by their surrounding estates, but also drew on wealth derived from their owners' provincial properties and other investments. Proximity to Rome meant that the suburban villa was well positioned to corner the market during the Republican period, but by the time of the Principate the social and political importance of owning an appropriate rural retreat close to Rome exerted such a powerful influence that parts of the countryside began to consume more than they produced.

## **On the family farm**

Under the influence of the historical texts and a heavy bias towards the excavation of villas, studies of Roman agriculture have been dominated by discussion of large, slave-based estates, rather than small family farms. Drawing in particular on Appian and Plutarch's biography of Tiberius Gracchus, the traditional narrative has cast these modest family farms as victims of aristocratic monopolisation of land, being comprehensively wiped out by the expansion of large estates during the second century BC. One of the key achievements of the many survey projects conducted across Italy since the 1960s has been the demonstration that small farm sites were not only ubiquitous but also, in contrast to the

narrative of peasant decline, persisted throughout the Roman period, with the usual caveat of regional and chronological variation. Indeed, Launaro (2011) demonstrates that, in many areas, the number of small peasant farms actually increased during the early imperial period indicating an expanding free rural population.

Nonetheless, there is increasing consensus that such surveys may miss a significant percentage of sites, and hence, a large part of the rural population (Witcher, 2011). This problem is particularly clear in colonial contexts, where the historical texts provide a guide to the likely number of small farm sites. Only a minority of colonists could have been based in the new urban centres of the middle Republic, but surveys have consistently struggled to find evidence for sufficient numbers of contemporary farms to accommodate these rural colonists. This is often explained by the reduced archaeological visibility of early colonists due to their low standard of living. However, Pelgrom (2008, 348-54) has recently argued that this interpretation is based on the assumption that the colonists were settled as individual families in dispersed farms on individual plots of land; instead, he argues that early colonists were based in village settlements. In other words, small colonial farms are not archaeologically invisible; they did not exist in first place. The presumption that colonists, like peasant farmers more generally, would live in dispersed farms has a powerful influence on the narrative of Roman agriculture and its archaeological investigation. Villages, for example, remain a highly neglected category of settlement (though for recent work, Il Monte; Schörner in press; and Falacrinae; Coarelli *et al.* 2008).

A number of similar powerful assumptions still colour the way in which the Roman peasantry and its agricultural strategies are interpreted. These assumptions are related to wider beliefs about the ancient economy as primitive or modern and concepts such as progress and decline (see above). Discussion of Roman peasants is particularly influenced by three key beliefs which have dominated the study of Mediterranean smallholders through history: self-sufficiency, self-determination, and immemorial stability (Horden and Purcell 2000, 270-78; Roman Italy specifically, Witcher 2007). Each of these is closely tied to issues of agricultural production and agrarian relations. For example, the belief that the wider political and economic developments of history washed over peasant communities with limited impact on their traditional lifestyles can predispose interpretation of agricultural strategies, social relations, and cultural identities towards a static vision, where any change is dismissed as a superficial 'veneer', leaving the Roman countryside little different from its Iron Age predecessor (e.g. Frederiksen and Ward-Perkins 1957, 117; Terrenato 2007). However, this makes it difficult to explain developments such as tenancy, and fails to recognise the defining role of markets and social hierarchies in shaping peasant societies (e.g. Erdkamp 2005; Redfield 1955).

The assumption of self-sufficiency has particular implications for understanding agricultural production. The historical texts, especially those deriving from the specific social and political conditions of the late Republic, provide a powerful stereotype of the Roman peasant as a self-contained social and economic unit (Garnsey 1980, 35-36; Horden and Purcell 2000, 270) which has been translated into an assumption of small family farms providing for their own subsistence independently of neighbours and markets. However, this is highly questionable. Horden and Purcell (2000, 271) stress the Mediterranean ecology makes self-sufficiency inherently risky; for example, unpredictable weather can ruin crops. This means that small farms need to produce a good surplus as insurance against bad years and to be more, not less, connected to the wider world through social and economic networks.

Even basic agricultural strategies, such as the decision to use oxen for ploughing, might involve small farms in varied social and economic interactions. Cattle require grazing land and fodder management; a yoke might also provide more capacity than a smallholding required. A farmer might therefore come to an agreement with a neighbour to share a plough-team (cf. Jongman 1988, 152-53 and Lirb 1993). Small numbers of animals also make it difficult to maintain a sustainable population, and new animals might have to be

bought at market or borrowed from neighbours. Social and economic independence (*autarkeia*) may have been an ancient ideal, but was impractical. Archaeologically, the pottery and other artefacts recovered from small farm sites bear witness to their close connections with urban markets.

Far from being isolated from and unaffected by the wider world, peasants are defined by these relations. Erdkamp (2005, 60) demonstrates that it was the 'imperfect market' conditions of antiquity – the lack of credit, volatile prices, inflexible labour – which shaped the peasantry. Further, the regional variability of these market conditions defined different peasantries in different places. Hence, the agricultural strategies of peasants in the more densely urbanised parts of Italy are likely to have differed from those in less urbanised areas (for the example of Etruria, see Witcher 2006); as noted above, this might involve growing different combinations of crops or, as discussed below, radical shifts in social relations, such as the emergence of tenancy. As a result, there is no such thing as 'the' Roman peasant or a 'typical' Roman farm; peasants and their agricultural strategies existed in complex networks of relations which, alongside the variation caused by the diverse physical geography of the peninsula, were defined by social, political and economic considerations which extended well beyond individual peasant households.

Histories of Roman agriculture also betray a strong presumption that peasant farming was unproductive and therefore vulnerable to failure and replacement with more intensive commercial farming. For example, rather than plough the fields, a peasant farmer might dig them with a spade or hoe. Such reliance on human labour is widely perceived as indicative of the primitive economic behaviour which allowed the more progressive production of villa estates to expand. However, high input of human labour can be seen as logical in the context of large families and an economy which provided few alternatives to agricultural work (see Erdkamp 1999 on structural overmanning). Indeed, the absorption of surplus labour by 'primitive' strategies such as hand-digging and intensive weeding can significantly increase yields and, although productivity may drop (i.e. more labour is used to produce the same amount of food), overall production may rise. Indeed, the ability of peasants to act in 'economically irrational' ways may have allowed them to out-compete larger commercial farms which were more vulnerable to shifts in labour and commodity costs.

Hence, peasant farmers can be remarkably resilient. Indeed, despite the connectivity and technological complexity of the modern world, in the year 2000 just 3% of global wealth was generated by farming, but 22% of the world's population (40% of the labour force) worked in agriculture, many of them as subsistence farmers (Lang 2010, 93). To be sure, they are poor, but they have been able to adapt their agricultural strategies to survive the changing economic and political conditions. As the examples cited throughout this chapter have suggested, the narrative of the noble but vulnerable citizen-farmer, pushed from the land by commercial farms is a simplification, underwritten by the notion of primitive versus progressive farming.

Finally, it is worth cautioning that the rehabilitation of peasant agriculture as resilient and rational within its own terms does not mean that it differed only in scale from the agriculture of larger commercial estates (for such a revisionist approach, see Kron 2008b). Peasant strategies were defined by connections with wider social and economic networks including markets, but this does not mean they aimed to implement the advice of Cato or Varro; for all but a few, the overwhelming objective will have remained the retention of maximum flexibility in order to satisfy household needs rather than the achievement of maximum profit; how those needs were met might have changed, perhaps dramatically, but the objective remained broadly the same.

One example of a radical change in agrarian relations is the emergence of tenancy. It is during the late Republican period that references to tenancy begin to appear in the textual sources (De Neeve 1984a), becoming more common during the early imperial period; Pliny the Younger's letters provide detailed insights into the labour arrangements on his estates,



and are particularly valuable for references to his tenants (for archaeological investigation of Pliny's Umbrian villa, see Branconi and Uroz Sáez 2008). Growth in the use of farm tenants broadly coincides with the so-called 'crisis of the slave mode of production' and the shift away from the use of slave labour. There has been much discussion about why aristocratic landowners would have made the transition from slave to free (dependent) labour, and this has usually concentrated on the spiralling costs of maintaining slaves and the growing competition for urban markets from provinces such as Baetica. However, just as the origins and organisation of the Republican slave estate has been critically re-assessed (see above), so its subsequent decline has been similarly re-evaluated (e.g. Marzano 2007). If these estates were not as numerous and geographically widespread as previously assumed, the explanation for decline and its significance also needs reconsideration. McKeown (2007) reminds us that large-scale chattel slavery is historically unusual and he sees the rise of labour arrangements such as tenancy as a return to the long-term historical norm. Importantly, tenancy was a potentially attractive option for both tenant and landowner. During times of growing population, the balance between land and labour shifts and would-be farmers find it harder to access land, and wages are depressed; tenancy therefore secures land to cultivate. The landowner also had an interest in the success of tenants and might provide patronage and capital. Of course, the landowner can also take advantage of the reduced cost of free labour in order to demand rent and, unlike slaves, tenants have every incentive to work hard (see De Neeve 1984a; Erdkamp 2005, 32-39; Foxhall 1990) and to provide political support to their landlords.

As noted above, it is a truism that archaeology cannot identify the legal status of a site's inhabitants. Establishing whether a particular farm was worked by an owner-occupier or by a tenant on a five-year lease is archaeologically problematical (for an attempt, see Foxhall 1990). A recent synthesis of early imperial settlement patterns across Etruria (Witcher 2006), including the northern *suburbium* of Rome, suggested that the significant rise in the number of small farm sites around Rome at this time cannot be easily explained as tenacious peasant farmers managing against the odds, not only to survive ferocious competition from land-hungry aristocrats, but also to increase in number. Growing demand pushed up the price of property, making it harder than ever to gain access to land; it was therefore argued that these sites might be better considered as farms of dependent labour, or tenants.

Support for this interpretation has emerged using a very different approach, namely the modelling of agricultural production and demography using Geographical Information Systems (GIS). A recent study integrated settlement patterns in the *ager Veientanus* in southern Etruria with ancient and comparative evidence for crop yields to estimate the potential agricultural productivity of Roman estates and the size of population which could be supported (Goodchild and Witcher 2009). It has long been argued that the rise of large villa estates in this area pushed small farms onto the most marginal land (e.g. De Neeve 1984b; Erdkamp 2005, 42). However, the results of the GIS model indicate that, far from occupying the least productive land, newly founded farm sites occupied land which had greater productive potential than the land associated with either existing farms or newly founded villa sites.

One possible explanation for the successful acquisition of the best land by the most modest sites is tenancy. During the Republican period, the landscape was divided into large estates, the full extent of which could not be intensively exploited, but to which others were denied access. By the early imperial period, these estates were divided into smaller properties and rented to tenants who were prepared to pay for access because growing population had reduced their social and economic status. The effect may have been a shift from small pockets of intensive agricultural production towards a more continuous distribution of extensively cultivated farms. Overall production is likely to have increased (perhaps significantly), though productivity may have remained static or even declined because the replacement of slaves with peasant families led to the structural overmanning of agricultural production.

The switch to tenancy might suggest that early imperial landowners traded higher profits for a reliable income; as at Centocelle, they may have placed increasing value on the creation of an appropriate rural retreat than on farming the landscape to its full potential. The *ager Veientanus* study examines only one small area of the *suburbium* and further research is required to establish whether similar patterns can be found elsewhere. However, the GIS methodology illustrates one way in which archaeological data can be used to address not only the scale and organisation of agricultural production, but also wider agrarian relations.

## Conclusions

Interpretations of Roman agricultural production have been too generalised. For too long they relied on literal readings of the ancient writers and on generalising the results of a few well-known sites to the peninsula as whole. In recent years, more critical approaches to the texts and a wealth of new archaeological evidence have emphasised the variability of agricultural strategies as practised over time, in different regions, and by different types of farmer. This wealth of diversity makes it difficult to summarise about Roman agricultural production; should we emphasise the technological and organisational innovations, which were important, but perhaps comparatively unimportant? Or should we focus on adding ever more detail to the mosaic? Should we stress the continuities which characterised agricultural life (e.g. the cycle of seasons; the continuing importance of the Mediterranean Triads)? Or should we stress the changing context in which those farmers worked (e.g. growing urban markets, provincial imports)? There is no simple answer to these questions, but in order to provide a rounded approach, it is important to balance these different perspectives. For example, we must acknowledge the regional variability of agricultural production, but we also need to explore the connections between these regional economies, whether through the movement of people (as labourers), animals (transhumance), or goods (exchange). Agricultural production and agrarian relations lay at the heart of Roman society and were as ideologically potent as they were economically important. Revised understanding of these topics therefore has implications which extend far beyond the farm gate.

## Further reading

The only English language monograph dedicated to agriculture in Roman Italy is White 1970; it is based mainly on texts and obviously lacks insights of the subsequent four decades of archaeological fieldwork. This is a period which has witnessed a major shift in the focus and method of archaeological study to include rural archaeology and techniques designed to illuminate Roman farming practices. In Italian, see Forni and Marcone 2002; Marcone 1997; papers in Carlsen 1994; Carlsen and Lo Cascio 2009).

Papers in Becker & Terrenato (2012) present critical new approaches to Republican villas, building on recent excavations such as the Villa of the Auditorium (Carandini *et al.* 2006). Marzano 2007 presents a comprehensive study of villas in the imperial period. For comparative studies of regional landscape surveys, see Patterson 2006; Witcher 2006. Frayn 1979 addresses subsistence farming; see also Erdkamp 2005 on the relationship between peasant farmers and the grain market.

For the hinterland of Rome, Morley 1996 provides an overview; a sense of the wealth of evidence collected in advance of recent development projects around Rome can be found in volumes such Gioia and Volpe 2004; Musco *et al.* 2000; also conference proceedings such as Jolivet *et al.* 2009. Major projects building on the long traditions of field survey in these areas include Attema *et al.* 2011, and Coarelli and Patterson 2008.

For animal husbandry, MacKinnon 2004 provides a comprehensive study of the zooarchaeological, textual and iconographical evidence. There is no equivalent synthesis of the archaeobotanical evidence; Jashemski and Meyer 2002 on the natural history of Pompeii provides a sense of the richness of data.

Spurr 1986 provides an ethnographically informed interpretation of the texts on arable cultivation. White 1975 provides a study on farm equipment and Rossiter 1978 addresses farm buildings. But all of these are inevitably dated. The wealth of recent archaeological evidence awaits synthesis.

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## List of illustrations

Figure 1: Comparative plans of a rural site types from Roman Italy. A) round, oval and quadrangular early twentieth century shepherd huts from the Roman Campagna (based on Erixon 2001: fig 7); B) Monte Forco, *ager Capenas*, late first century BC (based on Jones 1963: fig. 18); C) San Biagio, near Metaponto, second century AD (based on Carter 2006: fig. 4.8); D) Villa of the Auditorium, Rome, phase 4, second century BC (based on Carandini *et al.* 2006: fig. 138; E) Francolise, Campania, first century BC (based on Cotton & Métraux 1985: fig. 7).

Figure 2: Twentieth century shepherd hut (©BSR).

Figure 3: Market-garden, House of the Ship *Europa* (I.xv), Pompeii (based on Jashemski 2002: 24). Large dots represent trees; small dots represent vines; two sets of furrows indicate vegetable plots, connected by a path.

Figure 4: Double vaulted water cistern at Vicus Matrini, South Etruria (photo: author).

Figure 5: CIL IX.3895.

Lictoriae Chaerusae vixit annis XV / mensibus VII diebus V fecer(unt) L. Veturius Pudens / vir et Lacia Aucta mater. huic monumento / cedit rosarium cum viniola (et) sola(rio) suo, fine viniae, / et e region(e) piscinae et canalis usque ad ariam, et area cum (a)edificiis et horreo, et cisternae in solar(io) et e regione eius usque <at> ad arundinetum cum itin(eribus) qu(a)e sunt determinata; et collige iug(erum).

To Lictoria Chaerusa, who lived 15 years 7 months and 5 days, Lucius Veturius Pudens, her husband, and Larcia Aucta, her mother [made this]. To this monument belongs the rose garden with the little vineyard, and from the area of the pool and channel up to the yard, and the yard with buildings and the granary, and the cisterns on the sun terrace and from the area of it as far as the reed bed with the paths that are marked out; in total, one *iugerum*.

CIL IX.3895 = ILS 8347; translation Wilson 2008: 743.

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