CHAPTER 3

The Augustan 'Horticultural Revolution'

The Augustan period was an era of profound transformations. Rome's political structure changed from within while, on the outside, the Republic was being 'restored' and traditions of old 'revived'. In fact, many had been invented or completely re-elaborated by Augustus. There were changes in the way aristocratic families could manifest their achievements – precluded were military triumphs or large euergetic projects in the city of Rome – changes in the moral values to uphold, in the nature and structure of the army, in how the provinces were administered, in the composition of the senate, and, above all, changes in the citizen body. In the period between the lex Iulia of 90 BC, which extended Roman citizenship to the *socii*, and the end of Augustus' reign in AD 14, 'citizenship had not only expanded, it had changed its nature'.[1] The important period of transition from Republic to empire, when Rome experienced these changes in her culture, society, and identity, has been referred to – ironically and provocatively – as 'revolution' in influential studies. It will not have escaped the reader that the title of this chapter alludes to both Ronald Syme's *Roman Revolution* and Andrew Wallace-Hadrill's *Rome's Cultural Revolution*. The allusion is intentional. These crucial years in Rome's history, normally remembered for the 'fall of the Republic' and the 'birth of the rule of one man', were also the years during which another type of 'revolution' took place: the emergence of large-scale horticulture, with improvements in productivity levels and an increase in the number of varietals available to consumers. The changes were practical and affected the economy – improved irrigation facilities, selection of better cultivars, for instance – but also cultural. As observed by Thibodeau, the available evidence suggests that it was in the Augustan period that the horticulture treatise as a distinct genre first came into existence.[2] In this period, the evolution in Rome's sociopolitical structure also profoundly affected traditional modes of elite

[1] Wallace-Hadrill 2008, 445. [2] Thibodeau 2011, 220.

self-representation. While benefactions in the capital became a de facto imperial monopoly and forced the aristocracy to turn their attention to the towns of Italy, the nature of the elite's intellectual production also changed. Explicit political content in literary works was very problematic and new ways of talking about *romanitas* had to be sought. Didactic manuals on agriculture followed a well-established tradition and conformed to the most traditional of elite values. They were, on the whole, not controversial.[3] As Augustus turned to simplicity and tradition in his household, and used the old metaphor equating the care of plants to the care of the state, so did a number of members of the elite turn to agricultural matters in their intellectual production.[4] However, the emergence of the horticulture treatise in the Augustan era also addressed, on the one hand, the elite landowners' real concerns and interests in the increased role of horticultural cultivations in proximity of the urban centres that had experienced great population growth, and, on the other, the introduction of certain plants in provincial territories where these did not exist before and the search for the best varieties to grow on the farms of colonial settlers and overseas estates of Roman elite owners. The return of stability after the civil wars and the demographic growth seen in Roman Italy and parts of the West, in conjunction with the programme of colonial foundation, were key factors in explaining both the changes in horticultural practices and the elite ideologically charged interest in arboriculture which I shall address in Chapter 4.

Horticulture and the Roman *Suburbium*

Rome, even in the early period of her development and then as a flourishing urban centre later, generated horticultural cultivation in her suburban lands and proximate accessible territories. The city's inhabitants used spaces nearby for burials, manufacturing and, as we have seen in Chapter 1, for the *horti*, the villas-with-gardens of the wealthy, but these uses must have been relatively small in relation to cultivation for meeting the ever-growing needs of the urban population.

The conditions of supplying a concentrated urban population with fresh and even lightly preserved produce in preindustrial times differed little from antiquity until well into the nineteenth century, so it is not surprising

[3] Even though a work like Varro's *de Re Rustica* was not a simple agricultural treatise but had a political and philosophical agenda.

[4] Giesecke 2007, ch. 3; von Stackelberg 2009, 91.

that Rome's *suburbium* had been the place for the small vegetable plots of the people and the rural estates of the rich. In most historical periods (and in many places still today), horticultural production is to be found in close proximity to urban centres or even in towns themselves, as is nicely illustrated in the commercial orchards excavated within the urban perimeter of ancient Pompeii. Perishable fruit and vegetables not suitable for long transport had to be grown near the consumers, unless it was possible to extend their life by drying or liquid storage. In antiquity, fruit was often preserved: it could be dried, a method most often used for figs, but also for apples and pears, which in this form could make up a good share of the peasants' diet in winter.[5] Alternatively, fruit could be preserved in brine, must, or *oxymel*, a mixture of honey and vinegar.[6] Mau reported that in the shops of/near the Macellum of Pompeii charred figs, grape, plums, chestnuts and lentils were discovered, as well as fruit in glass vessels.[7] As has been observed, the large diffusion of glass containers in the years preceding the eruption of AD 79 probably had an impact on food preservation techniques.[8] Columella does indeed refer to the use of glass containers when giving prescriptions on how to preserve vegetables and fruit.[9] But fruit, and especially vegetables, were also consumed fresh, and in the ancient world, with its constraints on the speed of transport and lack of refrigeration, the distance between the place of cultivation and the market was very important to both producers and customers.

The distance from the fields to the market in conditions similar to those of Rome in the early days of urban growth has been calibrated in practical economic terms. The general principle of optimum land use in relation to distance to market was expressed by Johann Heinrich von Thünen in his *The Isolated State* (*Der isolierte Staat*) model of agricultural location in 1826.[10] Von Thünen's model predicts that, other considerations being equal, perishable crops, whose profitability declines with the increasing of the distance from the market, will be cultivated closer to towns. As one moves further away, this model predicts that land will be devoted to silviculture, intensive arable rotation, arable with long ley, and so forth.[11] The further away from the market the land is, the more it will be used for

[5] Columella, *Rust.* 12.14. [6] Columella, *Rust.* 12.10–11 on methods for preserving fruit.
[7] Mau 1907, 96.
[8] Ciarallo 2004, 107. It is believed that plain glass vessels and jars had become very affordable by this time.
[9] Columella, *Rust.* 12.4.4, 12.56.3, 12.58.1. [10] Von Thünen 1826 (1966).
[11] Ley farming consists of alternating cereal cultivation with fallowing the land with restorative green plants such as alfalfa, clover, or using it for hay and pasture.

products that can withstand a longer journey (e.g., cereals, olive oil) and whose prices are thus more resilient to the effects of transport on them over progressively greater distances.

Ancient historians and archaeologists have adopted von Thünen's model, and other theoretical models ultimately deriving from it – among them the central place theory – as a useful way to understand the relationship of the ancient city with its hinterland and with other settlements within a region. The city of Rome, which was a high-consumption metropolis by both ancient reckoning and modern standards, fits von Thünen's model.[12] It was in Rome's *suburbium* that perishable crops for the capital were grown and where the so-called *pastio villatica* – the production of high-quality fresh foods such as game, birds, and fish in the context of the villa estate – boomed. It is not surprising then that, as we shall see in Chapter 5, the earliest archaeological attestation for large-scale fruit cultivation comes from a section of the *suburbium* very close to Rome.

In terms of the surviving ancient writings on agriculture, horticultural production was advised as suitable for properties in proximity of cities and recognized as commercially important as early as Cato. He refers to suburban properties as being well suited for orchards, particularly for the cultivation of apples, pears, pomegranates, and quinces, and advises to grow flowers and vegetables on properties near a city, to be sold on the urban market.[13] Cato's often quoted passage on the hierarchy, in terms of best use, of land in commercial agriculture places the irrigated vegetable garden (*hortus irriguus*) in second position, right after the vineyard.[14] Later on, at the start of the *de Re Rustica* dialogue, Varro's character Cn. Tremellius Scrofa stresses the importance of cultivations that not only aesthetically enhance agricultural land, such as planting fruit and olive trees in rows, but, more importantly, increase the value of the land and give secure profit to the farmer.[15] The passage plays on the semantic

[12] Application of von Thünen's model to the study of Rome's *suburbium*: Carandini 1985; central place theory: Morley 1996.

[13] Cato, *Agr.* 7.1.3–4, 8.1. [14] Cato, *Agr.* 1.7; see also Varro, *Rust.* 1.7.9; Plin. *HN* 18.29.

[15] Varro, *Rust.* 1.4.1–3: *Hinc profecti agricolae ad duas metas dirigere debent, ad utilitatem et voluptatem. Utilitas quaerit fructum, voluptas delectationem; priores partes agit quod utile est, quam quod delectat. Nec non ea, quae faciunt cultura honestiorem agrum, pleraque non solum fructuosiorem eadem faciunt, ut cum in ordinem sunt consita arbusta atque oliveta, sed etiam vendibiliorem atque adiciunt ad fundi pretium. Nemo enim eadem utilitati non formosius quod est emere mavult pluris, quam si est fructuosus turpis* ('Equipped with this knowledge, the farmer should aim at two goals, profit and pleasure; the object of the first is material return, and of the second enjoyment. The profitable plays a more important role than the pleasurable; and yet for the most part the methods of cultivation which improve the aspect of the land, such as the planting of fruit and olive trees in rows, make it not only more profitable but also more saleable, and add to the value of the estate. For any man would rather

ambivalence of *fructus* and its derived adjective *fructuosus*: the words refer to the actual fruit/crop, but also to gain and what is fruitful, both in terms of productivity and financial return.

However, among the three Republican and early imperial agronomists (Cato, Varro, and Columella), Columella is the writer who devotes considerable attention to horticulture. He explicitly states that horticultural produce was more widely consumed at his time and that therefore horticulture had gained greater importance, prompting him to treat the subject in greater detail than the earlier writers. Columella's text has led scholars to claim that market-oriented, large-scale horticultural enterprises only began in the imperial period due to specific socioeconomic changes.[16] This is difficult to believe, because Rome already had a sizeable urban population at the start of the first century BC: 375,000 inhabitants are estimated for 100 BC and, by 50 BC, the city's population had probably reached 600,000, an almost 70 per cent increase in two generations.[17] From those estimates alone, substantial market-oriented horticulture can be posited for this period to satisfy the dietary needs of the capital. It should be noted too that the mid first century BC is also when *agri cultura* as a set linguistic unit is first securely attested;[18] possibly the discourse about farming as an abstract notion was in part a result of the growing demand on agricultural production in connection to demographic changes. The Forum Holitorium, the vegetable market of Rome, which in its maximum extension is thought to have measured *c.*20,000 m^2 (2 ha), existed from the early Republican period, namely before 213 BC when Livy reports its destruction by fire.[19] In addition, growing needs for irrigation and for irrigation infrastructure in some sections of the *suburbium* can be seen already in the second century BC, leading Roman jurists to develop detailed legal solutions to regulate competition for water resources.[20] In Rome, where prices in general were higher for the simple fact that demand greatly exceeded the offer, fruit may have fetched high prices. At the start of the *de Re Rustica*, Varro refers to the shops at the top of the Via Sacra as shops 'where fruit brings its weight in gold'.[21]

pay more for a piece of land which is attractive than for one of the same value which, though profitable, is unsightly', trans. W.D. Hooper, Loeb edn).

[16] Frass 2006, 131; however, she admits that details remain elusive. [17] Hin 2013, 220.

[18] Nelsestuen 2015, 66.

[19] The neighbouring temple of *Spes* and the *Forum Boarium* were also destroyed: *LTUR*, s.v. 'Forum Holitorium' (F. Coarelli).

[20] Ronin 2018; Ronin 2020.

[21] Varro, *Rust.* 1.2.10; the context is the discussion of Scrofa's fruit storerooms; the fruit of the Via Sacra was 'the very picture of his [i.e., Scrofa's] orchard'. For a moral reading of this passage, see

Thus, the spaces for horticulture were, by necessity, an important feature of Rome's *suburbium* (or of the suburban area of any other substantial urban agglomeration); this use of the land predates the imperial era. For example, evidence dating as early as the Archaic period suggests that the area *trans Tiberim* on the western bank of the Tiber was used for horticulture. A sixth-century BC *hortus*, in use until the early third century BC, was discovered in the area of the modern Via Gaetano Sacchi in Rome at the foot of the Janiculum Hill.[22] The vegetable patch had ditches and furrows defining various planting beds, and the presence in them of small ceramic sherds suggests that an effort was made to improve drainage of the soil, using sherds as gravel is used in modern tiling-beds. Sherds may also be an indication of manuring practices (from spoil heaps made of compostable waste, night-soil, and household refuse including broken pottery which were used to enrich the soil), and this would suggest a certain sophistication in agricultural practices. In addition to vegetables, the excavators noted that vines and fruit trees might also have been cultivated here.[23]

The Via Gaetano Sacchi vegetable patch was rather small, but substantial infrastructure destined for horticulture may have already been in place by the late Republic. In fact, it is possible that public aqueducts were built as much for the irrigation of private landholdings in the *suburbium* as for the urban population. A lexical note in Festus reveals that already at the time of Cato, in the first half of the second century BC, a specific watercourse was destined for the irrigation of the *horti* located below the Via Ardeatina and Via Asinaria, as far as the Via Latina.[24] The aqueduct Anio Vetus, built in the third century BC, was, at least at the time of Frontinus, used largely for irrigation and industry because of the poor quality of the water.[25] Later, the Aqua Alsietina or Augusta, the aqueduct built by Augustus in 2 BC to supply the transtiberine regions, carried water that was not suitable for drinking due to its poor quality but that was used

Brown 2019, 327: 'implicit in the casting of the urban market as an *imago* of a *pomarium* is the notion that contemporary Rome is not the "right place" for a real *pomarium*'.

[22] Filippi 2008.

[23] Filippi 2008, 41–2. In at least three of the planting beds defined by the ditches, holes with a diameter of *c*.0.3/0.4 m and in some cases smaller holes in pairs were identified and this could suggest fruit trees and/or vines with supporting stakes.

[24] Purcell 2007, 291. Festus 356 L.: *Retricibus cum ait Cato in ea quam scripsit cum edissertavit Fulvi Nobilioris censuram, significavit aquam eo nomine quae est supra viam Ardeatinam inter lapidem secundam et tertiam, qua inrigantur horti infra viam Ardeatinam et Asinariam usque ad Latinam.*

[25] Frontin. *Aq.* 2.92.

for the irrigation of the area's gardens as well as filling the Naumachia Augusti on occasion of public spectacles with naval displays.[26]

The evidence (archaeological and literary) for *large-scale* horticulture in the mid and late Republic is admittedly scant, but we cannot conclude from such few facts that so large and growing a city did not generate a considerable demand for fresh food from its suburbs. In the case of more durable archaeological evidence related to the processing of grapes and olives such as presses and collection tanks, we do see that Rome's *suburbium* made a notable contribution to the city's needs, even when large-scale imports brought to Rome and environs wine and oil from overseas.[27] It might be impossible to precisely reconstruct the extent to which Rome's *suburbium* was devoted to horticultural and arboricultural cultivations, and trace changes over time, but it is certain that horticulture *was* important in these territories proximate to Rome. The difference drastic changes in communication infrastructure could make for agricultural strategies can be illustrated by the case of the coastal territory of Centumcellae, north of Rome. This area, known for the production of olive oil and mediocre wine,[28] seems to have witnessed a notable shift towards fruit cultivation once Trajan's new harbour was built at Centumcellae.[29] Years ago Maffei hypothesized that the wild pear trees (*perastri*) present in notable concentration in this region are likely descendants of ancient Roman cultivations, since documentary evidence from the Middle Ages onwards does not mention the cultivation of pears in the area. In the case of the wild olive trees, a preliminary study of the DNA of these trees extracted from leaves and fruit of wild olive plants present at various archaeological sites with remains of Roman farms/presses in the Centumcellae area has concluded that these are 'descendants' of plants being cultivated in Roman or possibly even earlier times.[30] In Maffei's view, the wild pear trees possibly attest a shift from olive to fruit orchards.[31] If this is correct, it would be a nice illustration of how improvements in travel time – the idea being that the

[26] Frontin. *Aq.* 1.11. The Naumachia Augusti was a large artificial pond (1,800 × 1,200 feet) used to stage mock naval battles; a navigable channel connected it to the Tiber: Cass. Dio 62.20. According to the *Res Gestae Divi Augusti* 23 the inaugural spectacle featured 30 ships and 3,000 men, in addition to the rowers. See *LTUR*, s.v. 'Naumachia Augusti (A.M. Liberati).

[27] De Sena 2005; Marzano 2013c.

[28] Columella, *Rust.* 3.3.3, 3.9.6; Plin. *HN* 14.67; Mart. 13.124.

[29] Today this area is characterized by many wild olive trees, pear trees, and, in the northern portion of the territory, wild chestnut trees. These plants are considered 'fossils' of earlier cultivated trees: Maffei 1990, 179; recent DNA analysis has confirmed this view (see next footnote).

[30] Baldoni, Mariotti, and Pandolfi 2017, 21: '*Ci troveremmo quindi di fronte a relitti di antichissime coltivazioni o a semenzali di queste.*'

[31] Maffei 1990, 179.

new harbour infrastructure allowed Rome to be reached by sea with ease – could change the distance-to-market size expressed in von Thünen's model.[32]

One issue that we can try to address, however, is at what point we should place the development of fully functional, *large-scale* horticultural activity. The early imperial era was a period of 'acceleration' in many fields, from the volume of trade to building activity, to mention just a few.[33] Was this period the moment of big differentiation also for large-scale horticulture or do we see just a continuation of what went on before? Was the change real or is this the impression we get because of the nature of the surviving evidence?

Horticultural Treatises: Late Republic and Early Empire

While various elements suggest the rising horticultural role of Rome's immediate surroundings already during the late Republic, it is in Columella's work that the growth of the market for foodstuffs and the shift in the supply–demand balance for vegetables and fruit can be most clearly detected. Although Columella depended greatly on Varro's agricultural manual, often repeating information found in the earlier treatise, there are also fundamental differences in the viewpoint taken by these two authors.[34] These differences reflect the historical changes that had occurred between the first century BC and the first century AD, foremost demographic growth and social and political turmoil followed by the emergence of a new political system and societal fabric.[35] Columella explicitly declares that horticulture had gained greater importance at his time because its produce was more widely consumed and that therefore he feels compelled to treat the subject in greater detail than the earlier writers:

> *mox cum sequens et praecipue nostra aetas dapibus libidinosa pretia constituerit cenaeque non naturalibus desideriis, sed censibus aestimentur, plebeia paupertas summota pretiosioribus cibis ad vulgares conpellitur. Quare cultus hortorum, quoniam fructus magis in usu est, diligentius nobis, quam tradiderunt maiores, praecipiendus est.* (*Rust.* 10, *praef.*, 2–3)

[32] Maffei (1990, 179) suggests that the shift occurred sometime in the late Republic / early first century AD, and then fruit cultivation boomed after Trajan completed the harbour. However, if we accept that such a shift in cultivation took place in the Roman era, it seems to me more likely that Trajan's new port was the instigating factor for such change: see Marzano 2013c, 98.

[33] Bowman and Wilson 2009.

[34] Columella was probably born around AD 4 and died *c.* AD 70 (his *floruit* is placed at AD 50, see *CIL* 9.235); Varro lived from 116 to 27 BC.

[35] For instance, on attitude to servile manpower, see Stringer 2017.

> Very soon, when subsequent ages, and particularly our own, set up an extravagant scale of expenditure on the pleasure of the table, and meals were regarded as occasions not for satisfying men's natural desires but for the display of wealth, the poverty of the common people, forced to abstain from the more costly foods, is reduced to an ordinary fare. The cultivation, therefore, of gardens, since their produce is now in greater demand, calls for more careful instruction from us than our forefathers have handed down. (trans. E.S. Forster and E.H. Effner, Loeb edn)

As we have seen in Chapter 1, the Latin term *hortus* can indicate a range of green spaces, from the humble vegetable patch to the elegant suburban residences of the aristocracy. *Hortus* can generically refer to the space where vegetables, flowers, and fruit were cultivated, including vineyards; sometimes it can be accompanied by a modifier, such as *hortus holitorius*, the proper vegetable garden, or *hortus vinearius*, which featured vines.[36] However, the late Republican and early imperial authors tend to make a distinction in their lexical use between *hortus* employed to refer to the vegetable and herb garden, *pomarium* to indicate the fruit orchard, and *vinea* meaning the vineyard as a contained and distinct unit. Such linguistic differentiation in Latin authors represents a clearer formulation than what is attested in the Greek authors, on whom the Latin writers relied as models and sources. In Greek, *kepos*, which simply means garden, can cover all the cultivation possibilities enumerated above. The linguistic differentiation we find in late Republican Latin very likely reflects actual changes in agricultural practices, with commercial agriculture becoming more specialized, and with the use of agricultural land defined according to class of cultivars: fruit trees, vegetables, and vines.[37]

A good degree of specialization in horticulture, with given geographic areas being renowned for a specific type of vegetable or fruit, was well established by the mid first century AD. Literary texts offer some clues. They might not give us the complete panorama as to what customers in the markets were able to choose, but they indicate how specific sites located within Rome's hinterland engaged in commercial horticulture

[36] Columella uses *horti and hortuli* also in the context of vine cultivation, to indicate the spaces devoted to specific kinds of vines, or to vine nurseries or to the subdivision of a vineyard into smaller plots: *Rust.* 3.23; Frass 2006, 10. Lugli in the entry '*horti*' in the *Dizionario Epigrafico di Antichità* notes that *vinia* should be understood as the modern Roman *vigna*, a space where not only the grape vine is grown, but with it also vegetables, fruit trees, and flowers. See *Dig.* 50.16.198 (Ulpian) and 50.16.211 (Florentin.) for *horti olitorii* and *horti vinearii*.

[37] This does not necessarily imply monoculture; Roman agricultural practices always remained polycultural to an extent, and intercropping was common practice, encouraged in all the agricultural manuals; it is the relative proportion among different cultivations that varied.

and arboriculture, and were known for specific horticultural products. So we find that Crustumerium to the north of Rome was known for its pears;[38] Nomentum for fruit;[39] Tibur for various types of fruit, specifically mulberries, figs, and apples;[40] Praeneste for nuts;[41] Aricia for leeks and cabbage;[42] Alba for almonds;[43] Tusculum for onions;[44] Ostia for leeks and mulberries;[45] and Rome herself for turnips, mulberries, and figs.[46] As we will see in Chapter 4, many new varieties of fruit were developed during the first sixty years or so of the first century AD, in contrast to the previous two centuries: whereas Cato names only five types of pear and six of fig, Columella names eighteen types of pear and seventeen of fig, and Pliny the Elder thirty-nine and twenty-nine, respectively. The increase in the number of varietals is impressive. Furthermore, the early first century AD was also the time when two novel fruit trees were cultivated in Italy: the peach and the apricot.[47]

However, while it is impossible to escape the idea that commercial horticulture had existed on a considerable and well-organized scale at least for the whole of the first century BC, it is certainly true that agricultural writers – and we must assume actual growers as well – in the early principate changed gears.[48] For a start, several treatises focusing specifically on horticulture and viticulture were composed in this period, the two top categories in the profit-making use of land that Cato had identified so many years earlier. There was a real spurt of writing about different types of specialized agricultural cultivation. Intellectuals of different backgrounds, many from the circles of Augustan aristocracy,[49] wrote on these agricultural topics, including the medical author Celsus, who wrote a treatise on agriculture.[50]

[38] Columella, *Rust.* 5.10.18; Plin. *HN* 15.53: these and the following references are taken from Morley 1996, 107.
[39] Mart. 13.42. [40] Plin. *HN* 17.120, 15.70, 15.97; Columella, *Rust.* 10.138; Hor. *Sat.* 2.4.70–1.
[41] Cato, *Agr.* 8.2; Plin. *HN* 15.90.
[42] Mart. 11.19; Plin. *HN* 19.110, 19.140; Columella, *Rust.* 10.139. [43] Plin. *HN* 15.90.
[44] Plin. *HN* 19.105. [45] Plin. *HN* 15.97, 19.110.
[46] Plin. *HN* 19.77, 15.97, Ath. *Deipn.* 3.75e.
[47] Landgren 2004, 25; Zohary, Hopf, and Weiss 2012, 7, 145; it seems that the apricot was cultivated also in southern Gaul (plain of Vistre, Gard) in the first century AD, as indicated by the recovery of carbonized wood from this tree: Ruas 1996, 99.
[48] About the focus on Italy and Rome in matters agricultural in literary texts, it has also been observed that 'certain novelties in the area of gardening and garden design can be dated to Augustan time', Landgren 2004, 53.
[49] Thibodeau 2011, 219.
[50] Aulus (or Aurelius) Cornelius Celsus, *fl.* AD 30–50. Celsus' treatise exists only in fragments, though Columella repeatedly refers to him as one of his sources (e.g., *Rust.* 1.1.14, 2.24–5, 3.1.8, 4.8.1).

Columella and Pliny the Elder both cite many writers and itemize numerous treatises on agriculture from the generations fairly proximate to themselves, especially those of the principate of Augustus and his Julio-Claudian successors. These agricultural treatises are lost to us, and in most cases we know only the names of their authors and their titles. The phenomenon raises at least two questions. The *first* is a cultural question: was the interest in the subject of horticulture and specialized market agriculture (arboriculture, viticulture) exemplified by these literary works due to a specific development in elite self-representation caused by the sociopolitical changes and by the ideology of the time, which celebrated peace and the return of the Golden Age? The *second* question might be: were the agricultural treatises in their new abundance the outcome of political stability and favourable economic conditions which allowed technical improvements and development in market-oriented agricultural production and these new profitable enterprises? Or do the two questions represent a historical continuum, with both having one answer?

The scant information on the existence of many of these treatises comes from Pliny's encyclopaedic work, when he lists the sources he had used for the various sections of the *Natural History.* For his discussion of vegetables and horticulture in Book 19, he cites as his sources a number of writers who authored *cepurika*, literally works on 'garden stuff', inspired by the Alexandrian κηπουρικά.[51] A number of these lost authors were writers active in the Augustan period specifically or in the first half of the first century AD more generally. Sabinus Tiro, for instance, is one of Pliny's sources about whom we know next to nothing. Tiro is mentioned only by Pliny as a source, and is said to have written a work on gardening, which he dedicated to Maecenas, the creator, together with Lucullus and Sallust, of one of the most famous *horti* of Rome, whose essential characteristics may have been captured by the verses of the *Elegiae in Maecenatem*.[52] Maecenas' gardens were a symbol of withdrawal from politics but also, to paraphrase Labate, of political ambition of a different nature than occupying public offices.[53]

[51] See list of topics and sources given in *HN* 1, p. 89 of Loeb edn.

[52] Plin. *HN*, 19.57.177. *Eleg. in Maecen.* 1.33–6: *maluit umbrosam quercum nymphasque cadentes / paucaque pomosi iugera certa soli; / Pieridas Phoebumque colens in mollibus hortis / sederat argutas garrulus inter aues* ('He chose rather the shady oak, the falling waters, the few sure acres of fruit-bearing soil. Honouring the Muses and Apollo in luxurious gardens, he reclined, babbling verse, among the tuneful birds', trans. quoted in Labate 2016, 78).

[53] Labate 2016, 78.

There are four authors to whom Pliny attributes works expressly entitled *cepurika* or whose subject matter can be classified under the *cepurika* label: Caesennius, Castritius, Firmus, and Potitus. This last author is Valerius Messalla Potitus, the suffect consul of 29 BC and cousin of Messalla Corvinus, and probably the earliest of the four named by Pliny.[54] Potitus also had a wine named after him; evidently his agricultural interests included also the more traditional and 'aristocratic' viticulture.[55] Castritius or, with alternative spelling, Castricius, may possibly be the C. Castricius Calvus Agricola mentioned in an inscription discovered in Forlì (ancient Forum Livii) in the nineteenth century and dated on the basis of letter forms and *formulae* to the years AD 1–14.[56] The connection between the Castricius, author of a work on horticulture, and the individual of the inscription, suggested by Carandini many years ago,[57] is tempting and almost too good to be true, because the epigraphic text defines the freedmen of C. Castricius Calvus Agricola as those who *agros bene [et strenue colant*] ('those who cultivate the fields well and strenuously'; the integration, as far as the verb is concerned, seems uncontroversial).[58] The additional cognomen 'Agricola' that this Castricius has (or should it be understood as '*agricola*', a qualifier, rather than as part of his name?) may also be relevant, as it may allude to his knowledge and expertise in matters agricultural. Indeed, later the epigraphic text indicates that Castricius had experiential knowledge and had taught his freedmen. To these four authors mentioned by Pliny, the Augustan lexicographer Cloatius Verus can be added: he wrote a catalogue of different types of fruit, quoted much later by Macrobius.[59]

In addition to works on horticulture, the first half of the first century AD also saw the composition of a number of treatises focusing on viticulture specifically. Columella devotes considerable attention to commercial viticulture in his work, stressing its profitability, and Pliny went as far as claiming that profits from viticulture could even exceed those made in the Far East trade.[60] But Columella was not the only one in that period to feel the need to write about viticulture in some detail. One of the lost authors

[54] Thibodeau 2011, 220.
[55] On Roman aristocracy and involvement in viticulture in the Republic: Purcell 1985; Rosenstein 2008 for a minimalist view on the actual profitability of viticulture.
[56] *CIL* 11.600. [57] Carandini 1985, 67.
[58] Later the text indicates: *Haec non a d[octeis vireis institutus, sed] / [n]aṭura sua e[t us]u Agricola / [m]eminisse docet vos.* Corbier accepts that the man of the inscription is the same Castricius who is author of the treatise.
[59] Macrob. *Sat.* 3.18–20. [60] Plin. *HN* 14.47–52.

known to us only by name was a certain Iulius Atticus, who wrote a work on viticulture; in his *de Re Rustica* Columella mentions him as a contemporary in the 40s–50s AD.[61] Iulius Graecinus, the father of Cn. Iulius Agricola, Tacitus' father-in-law, is also mentioned in that same passage as a 'disciple' of Iulius Atticus and someone who wrote two books on viticulture, a more elegant and learned work than that of his predecessor.[62] Both Iulius Graecinus and Iulius Atticus were of Gallic origin and their interest in viticulture was a response to considerable expansion of viticulture in Gaul following the programme of provincial colonial settlements initiated by Caesar and continued by Augustus, a topic further discussed in Chapter 7. There is abundant and widespread evidence from archaeological sites in Gaul about trenches for vineyards, and wine processing facilities attest to a boom in Gallic viticulture in the Roman period.[63] These highly organized initiatives must have stimulated interest in identifying the best cultivars to be successfully grown in the new areas where the new settlers had received a piece of land to farm and where pro-Roman local elites had been building up sizeable landholdings. Within the span of a few years Gaul, which in the Republic had imported large quantities of wine from Italy, became a sizeable wine exporter. Selecting the best type of grape vine to grow in these new farms must have been a primary concern and important decision for the new colonists and aspiring viticulturists. Indeed, an occasion when Columella references Iulius Graecinus is precisely about the need to search for the best vine cuttings and for the best-suited plants for a given location, or when discussing wine yields for different cultivars.[64]

Although he is not among the authors of literary works on horticulture and/or viticulture, in the first century AD the equestrian Caius Matius (Calvena), the son of his homonymous father who had been very close to Caesar, a friend of Cicero,[65] and a supporter and friend of

[61] Columella, *Rust.* 1.1.14.

[62] Not much is known about Agricola's father, who had been a praetor in Rome, had distinguished himself for his pursuits of philosophy and eloquence, and was put to death by Gaius Caligula (see Tac. *Agr.* 1.4; Sen. *de Ben.* 2.21.5).

[63] Brun 2005; Marzano 2013b on capital investment in multiple presses in Gaul; Figueiral *et al.* 2010a on two medium-sized first-century farms devoted to commercial viticulture, with thousands of vine plantation marks.

[64] Columella, *Rust.* 3.3.7, cf. 3.3.4 (vine cuttings), 3.2.31, 3.3.3–11; see also 4.3.6 on the returns one can have when tending the land very well.

[65] Brill's New Pauly lists the existence of two Gaii Matii (see *RE* G. Matius 1 and G. Matius 2), but some scholars think that only one G. Matius existed, who was first friend of Caesar and later of Augustus and by him favoured (Tac. *Ann.* 12.60). For Syme (1939, 71), the Matius creator of the Matian apple was the son of the man that Cicero had defined as a very learned person.

Octavian/Augustus,[66] is remembered for having developed a new variety of apple, the *mala matiana*, which, as we have seen in Chapter 2, may have found particular popularity in the Iberian Peninsula.[67] Matius is remembered also for having 'invented' the art of clipping trees, what we call topiary or, alternatively, the art of hard pruning in order to dwarf trees and control their height and spread.[68] It seems that Matius had landed estates in the north of Italy, where he developed the new varietal. Athenaeus reports appreciation for these types of apples that 'are sold in Rome and said to be imported from a village situated in the Alps near Aquileia'.[69] According to Columella, Matius also wrote giving instructions for urban dinner parties and entertainments, and produced three books entitled, respectively, 'The Cook', 'The Fish-salter', and 'The Pickle-maker'.[70] Columella mentions two otherwise unknown authors who, together with Matius, had written about food processing and food preservation: Maenas Licinius, perhaps to be corrected into Maecenas Licinius and understood as a freedman of Maecenas,[71] and Marcus Ambivius. Food preservation, as shown by the agricultural treatises, was an integral part of the agricultural science; it had been a general topic in Cato's treatise, but almost two centuries later, salting and pickling came into their own as topics of treatises of distinguished authorities.

The content of some of these lost literary works can be partially reconstructed from citations by later writers. In the surviving portion of the third-century AD work *de Hortis* by Gargilius Martialis,[72] in which the quince, peach, almond, and chestnut are discussed, there are a few occasions when Celsus is named as a source for a specific opinion on fruit

[66] Cic. *Fam.* 348 = 11.27); 349 (= 11.28). Cicero in letter 348 calls him *homo doctissimus*.

[67] On the Matian apple: Plin. *HN* 15.49; Columella, *Rust.* 5.10.19; 12.47.5.

[68] Plin. *HN* 12.13: *primus C. Matius ex equestri ordine, divi Augusti amicus, invenit nemora tonsilia intra hos lxxx annos* ('Clipped arbours were invented within the last 80 years by a member of the Equestrian order named Gaius Matius, a friend of his late Majesty Augustus', trans. H. Rackham, Loeb edn). Garden scenes from wall paintings consistently show pruned plants and the technique may refer to dwarfing: Gleason 2019.

[69] Ath. 3.82c: ἐγὼ δ', ἄνδρες φίλοι, πάντων μάλιστα τεθαύμακα τὰ <κατὰ> τὴν Ῥώμην πιπρασκόμενα μῆλα τὰ Ματιανὰ καλούμενα, ἅπερ κομίζεσθαι λέγεται ἀπό τινος κώμης ἱδρυμένης ἐπὶ τῶν πρὸς Ἀκυληίᾳ Ἄλπεων.

[70] Columella, *Rust.* 12.4.2, 12.46.1.

[71] Keyser and Irby-Massie 2009, s.v. 'Maecenas Licinius' (P. Thibodeau); Thibodeau 2011, 219.

[72] We do not actually know the title of Gargilius Martialis' treatise on horticulture and fruit trees: see Mazzini 1978, 16–17. Gargilius was an equestrian, born in Auzia (mod. Sour El-Ghazlane) in Mauretania Caesariensis, who covered the entire *cursus* of the *militia equestris.* He died in AD 260 fighting against the Bavari.

trees.[73] Celsus, who is identified as *italicae disciplinae peritissimus* ('the most skilled in the Italian arts [of agriculture]') at 4.1.264, is, for example, cited as having a distinct opinion, but one different from other sources that Gargilius mentions, about the planting of peach trees. Celsus returns as a source, together with the Carthaginian Mago, about the practicalities of planting almond trees and, later, as a source on when the almonds start to ripen and how to know when they are ready to be picked for long-term storage.[74] Celsus is then mentioned again in the section of Gargilius Martialis' treatise on the chestnut. Gargilius remarks that despite Celsus' great expertise on cultivations in Italy and the need to fill the omissions in Mago's treatise, who, not being familiar with the chestnut, had not much discussed it, he did not provide a detailed discussion of the chestnut tree. By noting Celsus' near silence on the chestnut, Gargilius gives us an historical fact: in Celsus' time, the cultivation of the chestnut for its fruit was not of much interest (as opposed to coppicing to obtain props for vines that is discussed contemporaneously by Columella in the context of viticulture).[75] The chestnut was '*vilissima*' according to Celsus' near contemporary Pliny the Elder,[76] more suited to feed pigs than end up on the tables of the elite to whose circles the writers on agricultural matters belonged and for whom they were writing. It was also a tree that grew on hills and mountainsides at a certain altitude and therefore not suited for the locations occupied by many villa estates. From these later references to Celsus' lost work, it can be inferred that Celsus had treated a number of fruit trees widely cultivated in Italy in the first century AD, of which several varieties existed and new ones were being developed, and also trees such as the peach, which had only recently entered the cultivated landscape of Varro's 'Italian orchard' and were still a novelty (for more on the peach, see Chapter 5).

Moving away from agriculture and horticulture proper, the interest in plants and cultivation that characterizes the Augustan era in both literature and art (e.g., the vegetal motifs on the Ara Pacis; the painted garden from

[73] However, see Mazzini 1978, 34–44 on the irregular way Martialis alludes to his sources and on the probability that he did not directly consult several of the authors he mentions as sources, instead taking the information from a third author, not explicitly mentioned.

[74] 3.1: size of the planting hole; 3.8: how many seeds to place. It is remarkable that Celsus (*fl.* AD 50) and Mago (possibly from the Latin translation of the Punic treatise ordered by the senate in 146 BC), authors separated by at least three centuries, were cited by Gargilius in the third century AD as being still available for consultation and comparison. Agricultural treatises were evidently enduring products.

[75] Columella, *Rust.* 4.33.4; see Chapter 4.

[76] *HN* 15.92.

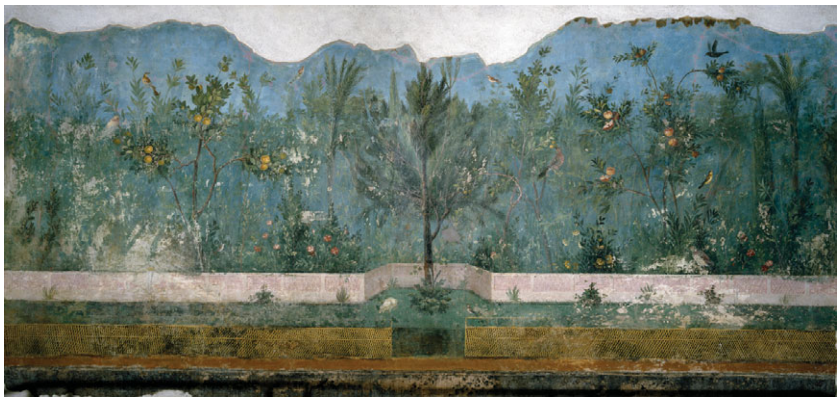

Figure 3.1 The villa of Livia, Prima Porta, Rome: Wall painting with garden scene from one of the walls of the underground *triclinium* of the villa *ad Gallinas Albas*, now in the Museo Nazionale Romano-Palazzo Massimo alle Terme, Rome.
Photo by Leemage / Corbis Historical / Getty Images.

Livia's villa at Prima Porta, Figure 3.1)[77] can also be appreciated in authors such as C. Valgius Rufus (suffect consul in 12 BC), who composed a work on the medicinal properties of plants dedicated to Augustus, the orator Asinius Pollio, who probably commissioned his freedman Asinius Pollio of Tralles to epitomize Diophanes' *Geōrgika*, and more obscure authors such as the Oppius who wrote *On Wild Trees*, a work which also discussed the chestnut and the citron.[78] In sum, works on agriculture became both increasingly numerous and very specialized as to their content. In addition, they were quite obviously not mere elaborations on Cato's old tome or variations on Varro's charming literary presentation, but treatises on new practical techniques and ideas about arboriculture as well as homely advice on pickling. That they are lost to us is a pity, but that they were written and in circulation is enough for our purposes.

It is not hard to know why writers at various social and intellectual levels produced treatises on horticulture and viticulture in the Augustan period: after the unsettled and long years of the civil wars, the idea of prosperity,

[77] Kellum 1994; Caneva 2010 on the identification of the plants depicted on the Ara Pacis and their symbolism.

[78] Valgius: Plin. *HN* 25.4. Oppius: Thibodeau 2011, 219. Keyser and Irby-Massie 2009, s.v. 'Asinius Pollio of Tralles' (P. Thibodeau). Diophanes of Nicaea in Bithynia lived in the first century BC; his agricultural work was an abridged version (in six books) of the agricultural treatise in twenty books by Cassius Dionysius of Utica (88 BC, see *Oxford Classical Dictionary* s.v. 'Cassius Dionysius'). This, in turn, was largely dependent on Mago's Punic treatise: see Columella, *Rust.* 1.1.13.

peace, and the arrival of a new golden age permeated much of the literary and artistic production, both in public and in private architecture.[79] However, the centre stage assumed in the Augustan era by *horti* (as gardens) and *horti* (as vegetable patches), and the art of cultivating fruit trees, was not limited to ideological agendas. Peace, the normalization of the landscape of ownership after proscriptions *and* confiscations of land to satisfy veteran assignments,[80] and various policy reforms and practical initiatives brought in by Augustus such as the standardization of weights and measures across Italian towns, had a positive effect on the new imperial economy. There was no longer the risk of war damaging cultivations and disrupting infrastructure such as irrigation facilities. Decisions which needed medium- to long-term periods in order to be implemented, as might have been the case when committing to planting a new orchard or selecting certain characteristics in a fruit in order to develop a new variety, could be taken, because *planning* and *certainty* were possible again.

In addition, Rome's population growth meant that the demand for fresh produce had also increased, as had, in a society where display and competition were strong motivations, the demand for quality products that somehow differentiated themselves from the others, such as larger cabbages and early- or late-ripening fruits. Big size, new and unusual, out-of-season, and out-of-norm characteristics in vegetables and fruits are always desirable to urban consumers, as are name-branding and assured freshness. The loop between producers and consumers stimulated development, and the aggregate demand these forces generated should not be underestimated. Rome's impact on its hinterland was considerable and multidirectional; Neville Morley aptly remarks: 'the demands of Rome for perishable goods like fruit and vegetables and for luxury foodstuffs supported the development of particular forms of production in the *suburbium*, resulting in increased exploitation of the land and increased prosperity'.[81]

From Vegetable Patches to Garden Tombs

At about the same time as these early first-century agricultural treatises were composed, Romans began to enhance funerary spaces with ornamental and even productive gardens. In the early first century BC the garden

[79] The classic treatment of Augustan ideology is Zanker 1988.
[80] Cf. the notorious land confiscations in northern Italy which also affected Virgil's home region, with demonstrations by the dispossessed in the streets of Rome: App. *BC* 5.12.
[81] Morley 1996, 107.

tomb, named *hortus* along with both grand gardens and vegetable patches, appears first in inscriptions; later, during the second half of the first century AD, a new compound noun, modelled on Greek nomenclature, indicates specifically the garden tombs: *cepotaphium*, from the Greek *kepos* = garden and *taphos* = tomb.[82] It is also from the first century AD onwards that tomb owners 'tried to protect the cultivated lands and other productive properties attached to their monuments by declaring them inalienable from the tomb itself'.[83] Pressure on the land in the immediate vicinity of Rome was high; funerary plots competed, among others, with industrial and manufacturing activities, warehouses, the villas and *horti* of the wealthy, and in such densely occupied space, to use Bodel's words, 'even the smaller enclosed open spaces around tombs may have been pressed into productive service in order to supply the high-volume fruit and vegetable markets of Rome ... but to what extent productivity and profit were systematically pursued at these garden locations is unclear'.[84] Intercultivation of agricultural produce among tombs, creating new mixed-use spaces, was necessitated by the growth of the city itself and the demands of its population.

Close proximity and mixture of different uses of the land could be found outside any town; in Pompeii, for instance, just outside the Herculaneum Gate, a suburban residence, the Villa of the Mosaic Columns, had *tabernae* or shops attached to it as well as an ornamental garden, a tomb garden, a cultivated vegetable plot, and other tombs lining the street.[85] *Horti* and *pomaria* attached to tombs needed to be protected from the encroachment of other tombs, houses, workshops and the like in the suburban environment of any urban agglomeration; the concerns of the tomb owners registered in the formulaic inscriptions are the same when we look at other towns and later periods. A funerary inscription from the necropolis along the Via Campana outside the port town of Puteoli, generically dated to the years AD 150–230 on the basis of letter forms and language, mentions the tomb of a Iulia Benedicta and her husband Aelius Eutychianus, a veteran of the praetorian fleet based at Misenum. The

[82] Bodel 2018, 202.

[83] Bodel 2018, 201; some examples he gives are: *CIL* 6.22518 from Rome, mentioning *hic locus cum hor/tulo suo religioso et aedificiolis suis*, and *CIL* 6.29961 from the Via Latina trying to attach to the tomb a *hortus* of about five twelfths of a *iugerum*.

[84] Bodel 2018, 201.

[85] For a plan, see Jashemski 1979–93, vol. 1, fig. 242. The tomb chamber can be accessed only through the garden of the villa: Campbell 2015, 191.

funerary monument with its small orchard (*pomariolius*)[86] is 'protected' from future unauthorized inhumations or from the alienation of burial spots by placing the monument under the supervision of the town of Puteoli itself, which will be entitled to collect the fine due for such violations.[87]

The phenomenon of garden tombs does not seem to have been fuelled by financial considerations. Productive vegetable patches would most probably not have financed and/or supported the expense of erecting a tomb, though they could have been used for expenses related to the maintenance of the tomb and the recurring celebrations commemorating the dead, to which the produce of the garden tombs was certainly destined.[88] Rather, garden tombs expressed the ideological aspiration to 'cultivate' the tomb in the same manner as the house was cultivated in life, and, above all, to have a *locus amoenus* or pleasant place with all that one desires. These gardens, intended as much for the dead as for the living, were meant to be seen, visited, and used, offering a pleasant venue for the banquets the family held during various celebrations.[89]

This idea of the funerary *locus amoenus* and tomb was evidently important in Roman conceptions, so much so that it could be satirized by a master of social criticism, Petronius (Gaius Petronius 'Arbiter', *c.* AD 27–66). In the *Satyricon*, the rich social-climbing freedman Trimalchio wants to have his ashes encircled by every kind of fruit tree and vine (*omne genus enim poma volo sint circa cineres meos, et vinearum largiter*)[90] on a 100 × 200 feet plot. He proclaims that: 'it is surely wrong to cultivate our homes while we are alive and not to care for those where we will have to dwell longer'.[91] The tomb gardens of the Roman world, attested in many inscriptions and, sometimes and exceptionally, in the archaeological record,[92] are at once a resting place and a symbol of one's achievements

[86] The diminutive does not necessarily imply that the orchard is small; during the second century AD diminutives were often used in reference to real estate as a sort of endearment: see Pliny the Younger's use of *villula* for the farm estate he gifted to his *nutrix*; or *CIL* 14.2139, a funerary text from Lanuvium dated to the first half of the second century AD, which refers to a *hortulus* and an orchard as part of a walled funerary complex measuring 330 × 98 feet.

[87] *CIL* 10.3594; Camodeca *et al.* 2004, 443 (entry by A. Parma). For another orchard attached to a tomb, together with a *taberna* and other unspecified buildings (*aedificiis*) along the same Via Campana outside Puteoli, see *LIKelsey* 161, dated to AD 50–120.

[88] Bodel 2018, 231.

[89] Campbell 2008 on the design and utilization of garden tombs.

[90] Petron. *Sat.* 71.2.

[91] Petron. *Sat.* 71.7: *Valde enim falsum est vivo quidem domos cultas esse, non curare eas, ubi diutius nobis habitandum est.*

[92] See the funerary garden plot discovered in 1964 at Scafati: Jashemski 1979–93, vol. I, 148–50; Bodel 2018, 199–200.

in life, additional elements in the commemoration of the deceased. Garden tombs were the seat of commemorative banquets and other rituals, and often inscriptions detail the deceased's wish to have the produce of the garden/orchard used for such commemorations and festivals.[93] Just as naming the suburban residences-cum-gardens of the wealthy as *horti* reveals the elite aspiration to the ideal of self-sufficiency (despite what happened in reality), the importance of agriculture as an ideal, and the idea of gardens as *loci* for the *cultivation* of the mind and soul, so did the garden tombs represent the final place for cultivation of the soul.

Gardens acquired a specific ideological dimension in the early empire; they could be used, with their plantings, statues, garden architecture and the activities that took place in them, to convey complex meanings, not the least of them being an ideal of simplicity and attachment to a tamed nature that at the same time recalled ancient attachments to the land.[94] In parallel, horticultural and arboricultural spaces became part of the cultural landscape. It is not simply the association mentioned above between tomb and garden – the garden as a place for commemoration – but also perhaps as a specific productive space that could ensure what was needed for the funerary rituals. It is the *hortus* or the *pomarium* conceived as places for mythical associations or for elite practices that had become fashionable: the daily outdoor strolling and exercise in a garden space.[95] An inscription from Rome, documented by the humanist Justus Lipsius in the sixteenth century, recorded a *gestatio* located in an orchard; one needed to walk along the path back and forth for five times to have walked one mile, or one thousand paces, the typical length of *gestationes* often attested in inscriptions.[96] Another epigraphic text inscribed on a headless herm, in all likelihood from a suburban villa located at Le Colonne near Rome, proclaims that *hortulus hic Vari est opus Alcinoi*, 'this little garden of Varus is the work of Alcinoos', a clear literary and mythical allusion to the garden of Alcinoos, ruler of the Phaiacians, and its ideal palace-garden in the *Odyssey*, and perhaps a word play on the (slave) gardener's name.[97]

With the early empire, lifestyle, religion, mythical echoes, aspiration to self-sufficiency, and celebration of *fructus* all came together in the

[93] E.g., *CIL* 5.2176 from Altinum or 5.7454 from Cuneo, N. Italy, dated to AD 1–150: about *rosam in perpetuo* to celebrate the birthday of the deceased from the *hortorum redi/tu*. See Bodel 2018 and his note 79 for bibliographical references to other similar inscriptions.

[94] Giesecke 2007, ch. 3; Von Stackelberg 2009. [95] Marzano 2020a.

[96] *CIL* 9.29775 = *ILS* 6030: *in hoc / pomario / gestationis per circuitum / itum et reditum / quinquiens efficit passus / mille*; cf. *CIL* 6.29776–8.

[97] *ILS* 6029.

discussion and perception of planted spaces, whether ornamental gardens, orchards and vegetable gardens, or garden tombs. The *hortus*, from the name adopted for the luxurious late Republican and early imperial suburban estates, radiated as a persuasive social idea: it became the subject of literary works, and, at another and less elevated level, how ordinary people with some money but little upward access, decided to be commemorated in death. These examples suggest that by the early empire, the idea of productive gardens and orchards, the cultivated space in which different edible plants but also some ornamental plants would be grown for enjoyment, was desired by, and well embedded in, all strata of society. They also suggest that the symbolic role of gardens/*horti* and their plants as a reflection of one's personality and as a metaphor of one's life achievements had trickled down from the higher to lower social strata.[98] At the highest social level, Cicero's public image had been attacked by removing the mature trees from his villa garden in Tusculum. In the grand and symbolic planting-cum-statuary of his Porticus (Chapter 1), Pompey had proudly proclaimed, with trees and 'conquered' plants, his prestige and largesse to the people. But these grand historical examples soon became mere exemplars. By the Augustan age, a freedman and *medicus*, C. Hostius Pamphilus, proudly declared on his epitaph that his tomb was his eternal house, estate (*fundus*), garden (*horti*) *and* monument (*monumentum*).[99] The language of the elite had been appropriated by individuals much lower socially who were confident that the elevated word they used had become common and understood by a wider audience.

Agricultural Techniques, Morality, and Market Forces

I have suggested that the proliferation and specialization of literary works on agricultural matters in the first century AD, and specifically by Augustan authors, could not merely have been an ideological exercise.[100] It must have also been stimulated by socioeconomic changes as well as technical developments. For viticulture, about which a substantially greater amount of information exists in both archaeological and written sources than for other cultivations, certain methods to plant and cultivate the grape vine

[98] For the downwards movement of trends and lifestyles such as in the case of 'villa culture' and Pompeian houses, see Zanker 1979, a theme revisited in Zanker 1988.

[99] *CIL* 6.9583, late Republican in date.

[100] The ideological valence is of course undeniable, as shown also by the interest of other rulers of the time, such as Juba II of Mauretania; Nicolaus of Damascus, who was the tutor of Cleopatra's and Antony's children, also wrote a work on plants, surviving in Arabic and Syriac translations.

seem to have been perfected starting precisely in the Augustan period. This is the case of one of the techniques perfected in extensive (as opposed to intensive) vine cultivation, the *arbustum* technique, in which vines and other crops were grown on the same land. The technique, common in parts of Roman central Italy and northern Italy, involved training the vines on rows of trees and growing them in combination with cereal cultivation.[101] Growing vines by training them on trees is still practised in very specific areas of Italy, such as the Po Valley and the area of Aversa in Campania, a technique currently called *alberata*. Although yields were lower than in the case of low grape vines or vines planted more intensively and supported by posts, the *arbustum* technique required less labour and gave the farmers the possibility to grow a mixed range of other crops on the same land (fruit, fodder, even olives if this tree was used as support for the vines). When the vineyards were grown intensively, supported by artificial props, the vines were on average planted every 3–10 feet.[102] A vineyard so planted required one man for 7–10 *iugera*; in the *arbustum*, however, which had a much lower planting density, one man could take care of 18 *iugera*.[103]

The widespread adoption of the *arbustum* in parts of Roman Italy, where in later historical periods the *alberata* technique became prevalent, has been dated to the early first century AD. While the practice is mentioned by Varro and Cicero,[104] about a century later Columella and Pliny give a much more perfected version of it with specific instructions on the distance between trees that one should allow when planting vines in this manner and wanting to grow cereals in between.[105] The technique evidently caught the attention of farmers and estate owners who perfected it in the Augustan period.[106] While wine (and olive oil) for transmarine markets had flourished in the Republican period, the cereals, fruit, and fresh or pickled olives of *arbustum* plantings may have been developed in response to population growth and increased local demand; recent research in central Adriatic Italy suggests so.[107]

Market forces did not only affect improvements in viticulture and arboriculture. They also affected the cultivation of vegetables. The farmer had a range of cultivation techniques, and expedients to reach wanted

[101] White 1970a, 231–6.
[102] This mode of planting is what the Romans called *vinea*; see Columella, *Rust.* 5.3.1–9.
[103] Duncan-Jones 1982, 39 note 1 and his Appendix 2. [104] Varro, *Rust.* 1.7; Cic. *Cat. Ma.* 59.
[105] Columella, *Rust.* 5.7.3; Plin. *HN* 17.35.202.
[106] Van Limbergen, Monsieur, and Vermeulen 2017, 366.
[107] Van Limbergen, Monsieur, and Vermeulen 2017; Van Limbergen 2020.

results are mentioned in both Columella and Pliny. For instance, for cultivating *cucurbita*, gourds, a distinction in how to plant the seed was made depending on whether the product was destined for consumption within the household of the grower, to use as container for liquid (in this case a greater growth was desirable), or to be sold as food: 'so that the fruit which grows from it may be longer and narrower; this certainly commands a better price than any other'.[108] Much later iconographic evidence, the fifth-century AD mosaic depicting a calendar from the basilica of Thrysos in Tegea, depicts the two shapes the gourd could take: for the month of August we find the depiction of a male figure holding two gourds, one almost perfectly round, the other elongated.[109] In the passage I have quoted earlier (p. 95), Columella's remarks, drawing a contraposition between *pretiosioribus cibis* and *vulgares*, seem to suggest that the increased demand for the produce of the vegetable patches was due to the increased role vegetables had in the daily diet of the ordinary people, who could no longer afford other types of food. A comment like this is ambiguous: did it (and others like it) reflect the reality of the increased pressure on fresh food supply caused by the exponential growth of Rome's population, or is it merely a continuation of a tired topos in the moral discourse about the decline of Rome? Were in fact ordinary people pushed out of the consumer pool for commercial horticulture, with the focus now being on wealthy and demanding consumers? It is undeniable that Columella's interest in including horticulture in his treatise is based on the social changes that have 'transformed opportunities for profitable production' with the implication, to put it as Purcell does, that 'the interest in catering for the new market as well as the demand itself is a matter for plebeian interest'.[110]

Condemnation of the luxury of the table is a feature of moralist writings of the first century AD. The higher demand for improved fruit and vegetables, which commanded much higher prices on the market than their old versions, is a recurrent reason for complaints and criticism of contemporary society on the part of Pliny the Elder. Pliny's remarks are on a new level compared to Columella's just a few years before: for him, even some vegetables have become too expensive and common folk can no longer afford them. Authors such as Pliny the Elder found reasons to

[108] Columella, *Rust.* 11.3.50: *quo prolixior et tenuior fructus eius nascatur, qui scilicet maius ceteris invenit pretium.*

[109] For a drawing of this scene from the calendar, see Farrar 1998, 171.

[110] Purcell 2003, 339.

moralize against the 'excesses' of the time even in the case of the size reached by cultivated cabbage and asparagus.[111]

Vegetables can be rather ambiguous, as we have seen. They are either 'simple and commonplace' or 'rare and luxuriantly delicious'.[112] The humble cabbage, which received considerable attention due to its dietary and medicinal properties in Cato's manual (and in earlier Greek writers), with the additional benefit that 'it is not expensive', was, by the time of Pliny, *no longer cheap*;[113] cabbage had become a new luxury and was now considered among food delicacies.[114] Cabbage larger than 'a poor man's table' or Ravenna's cultivated asparagus weighing just over 100 grams each are probably rhetorical exaggerations.[115] However, Pliny's tirade does suggest that significant improvements – some immoral according to him but real nonetheless – had occurred in recent times also in horticulture, not only in viticulture, cereal culture, and animal breeding, areas in which there had been substantial changes and improvements in the early imperial period.[116] Some of the techniques mentioned by Pliny show a high degree

[111] *HN* 19.54: *in his quoque aliqua sibi nasci tribus negant, caule in tantum saginato ut pauperis mensa non capiat. silvestres fecerat natura corrudas, ut passim quisque demeteret: ecce altiles spectantur asparagi, et Ravenna ternos libris rependit* ('The ordinary public declares that even among vegetables some kinds are grown that are not for them, even a cabbage being fattened up to such a size that it does not fit on a poor man's table. Nature had made asparagus to grow wild, for anybody to gather at random; but lo and behold! Now we see a cultivated variety, and Ravenna produces heads weighing three to a pound', after H. Rackham trans., Loeb edn). Pliny repeatedly laments that the luxurious tastes of the time have transformed even simple things such as bread and vegetables into different-quality products, accessible to different purses.

[112] Purcell 2003, 338. On vegetables' ambiguity, see also Gowers 1993, 96–100 on Plautus.

[113] Cato, *Agr.* 156–7; 157.8 for the comment that *nullus sumptus est, et si sumptus esset, tamen valetudinis causa experires*.

[114] Plin. *HN* 19.139: *Est haec quoque res inter opera ganeae, quapropter non pigebit verbosius persequi* ('Growing cabbages is also one of the ways of supplying table luxuries, so it will not be out of place to pursue the subject at greater length'); a few sections earlier (19.136) Pliny remarked that 'cabbages and kales … now have preeminence in gardens' (*olus caulesque … nunc principatus hortorum*). The *Brassicaceae* group is among the most common archaeobotanical finds at Roman sites.

[115] Pliny writes that a plant like asparagus, which was made by nature to grow wild, was cultivated in Ravenna; three asparagus weighed one pound, suggesting the 'unnatural' status of these cultivations, which in their 'natural', wild status are very thin. A Roman pound = *c.*328.9 g. Some modern commentators take Pliny's figure at face value; e.g., see Davidson 2014, 42 s.v. 'asparagus'. See also Plin. *HN* 19.151 *nullum gratius his* [i.e. the asparagus] *solum quam Ravennatium hortorum indicavimus* ('There is no soil that asparagus likes better than that of the kitchen-gardens at Ravenna, as we have pointed out'); cf. Mart. 13.21; Ath. 62e, commenting on the great size cultivated asparagus could reach, but also on the fact that wild ones were the best.

[116] Crop selection and rotation, manuring, ley farming, increased size of animals due to selective breeding have all been confirmed by archaeological, archaeobotanical, and archaeozoological data: Mackinnon 2004; Mackinnon 2010; Kron 2000; Kron 2008, Kron 2017; Bowes *et al.* 2017; Heinrich 2017.

of specialization and sophistication in agricultural practices, undoubtedly the outcome of much experiential learning, intermixed with magic beliefs and superstitious practices. For instance, in reference to cherry trees, he mentions that applying lime to the roots stimulates precocious fruit production and forces the fruit to mature early, a useful technique with commercial benefits, since early fruits can fetch higher prices.[117] Digging a trench around the roots of a plant to pour hot water in it was also a technique used to force plants, particularly flowers, to bloom early. It is mentioned by Pliny in reference to roses, and probably by Seneca about the *lilium.*[118] Among the horticultural improvements of the period we can also count the use of *lapis specularis* (selenite gypsum or, according to others, muscovite)[119] to create greenhouses or protective screens for plants.[120] In epigram 14 of Book 8 Martial mentions protecting an 'orchard from Cilicia' (possibly a reference to saffron plants, although the use of terms such as *nemus* seems better suited to trees) from the cold in winter by means of *specularia*, while in another epigram he writes of grapes protected from the 'chill frost' by means of transparent panes.[121] As recognized already in 1785, this was also a way to force the grape (or other fruit) to mature earlier.[122] Columella, when talking on methods for having early-ripening *cucumeris*, discusses planters on wheels, protected by sheets of *lapis specularis*, that could be moved between outdoors and indoors according to need, as in the case of Tiberius' famous mobile 'small greenhouses' which supplied him with snake melons for almost the whole year.[123] Other references in Latin literature to forcing concern flowers, such as the mention of glass in both Ovid and Martial to protect/force lilies.[124] Many sheets of *lapis specularis*, once fastened to frames, were recovered in the nineteenth century from a corridor leading to the garden of a luxurious villa near Rome; perhaps some of these frames were used to

[117] Plin. *HN* 17.260, [118] Plin. *HN* 21.21; Sen. *Ep.* 122.8; Landgren 2004, 89–91.
[119] Landgren 2004, 82–3.
[120] A main source of *lapis specularis* in the Roman world was in the province of Cuenca in Spain, to which Pliny refers: Plin. *HN* 36.160–1.
[121] Mart. 8.68.3–6: *invida purpureos urat ne bruma racemos / et gelidum Bacchi munera frigus edat, / condita perspicua vivit vindemia gemma / et tegitur felix nec tamen uva latet* ('Lest envious winter bite the purple clusters, and chill frost devour the gifts of Bacchus, the vintage lives enclosed in transparent glass and the blooming grape is covered, yet not hidden', trans. Shackleton Bailey, Loeb edn).
[122] Barrington 1785, 67. For a discussion of forcing in Roman agricultural practices, Landgren 2004, 84–93.
[123] Columella, *Rust.* 11.3.52; Plin. *HN* 19.23. See Paris and Janick 2008 for *cucumis* being the snake melon and not the cucumber.
[124] Ov. *Met.* 4.354–5; Mart. 4.22.5–6.

protect plants.[125] Besides forcing plants to fruit, and fruit to mature early (or to mature later than usual), techniques were also developed to create surprising and unusual vegetables, probably for show. Well-known cases refer to the gourd and the *cucumis* (the snake melon or, according to an older interpretation, the cucumber), which were made to grow into a variety of shapes by using sheathes of wickerwork or into very long specimens by inserting the flower into a *fistula*.[126] Even in the vegetable patch, the desire to control and tame nature prevailed.

For an author like Pliny, the care of the *hortus* – which should denote the good, simple, and morally sound qualities of the ancestors, tending to the vegetable patch that will provide simple, wholesome fare on the table and the much-desired self-sufficiency – is profoundly ambiguous, an ambiguity born out of the commercial horticulture that was fully developed and normalized by his own time and even before. It was a branch of agriculture where care and ingenuity could bring profit, something Pliny does not seem to disdain completely, although he refers to this profit as *non sine pudore dicenda*, as something that must be mentioned but with some embarrassment.[127] But horticulture also represents subversion of nature and the 'gluttony' of men, as when wild types of plants are selected and turned into desirable plant food. The example of the cardoon well encapsulates this ambivalence, which Pliny spells out unmistakably:

> *Poterant videri dicta omnia quae in pretio sunt, ni restaret res maximi quaestus non sine pudore dicenda. certum est quippe carduos apud Carthaginem magnam Cordubamque praecipue sestertium sena milia e parvis reddere areis, quoniam portenta quoque terrarum in ganeam vertimus, serimusque etiam ea quae refugiunt cunctae quadripedes*. (Plin. *HN* 19.152)
>
> It might be thought that all the vegetables of value had now been mentioned, did not there still remain an extremely profitable article of trade, which must be mentioned not without a feeling of shame. The fact is it is well known that at Carthage and particularly at Cordova crops of cardoon yield a return of 6,000 sesterces from small plots – since we turn even the monstrosities of the earth to purposes of gluttony, and actually grow vegetables which all four-footed beasts without exception shrink from touching. (after Rackham trans., Loeb edn)

[125] Lanciani 1884, 159. [126] Plin. *HN* 19.64–6.

[127] Plin. *HN* 19.152: *Poterant videri dicta omnia quae in pretio sunt, ni restaret res maximi quaestus non sine pudore dicenda* ('it might be thought that all the vegetables of value had now been mentioned, did not there still remain an extremely profitable article of trade, which must be mentioned not without a feeling of shame', trans. H. Rackham, Loeb edn).

One could compare Pliny's attitude towards the cardoon, which probably was slowly being selected into what would become the artichoke,[128] with the regard in which in the Middle Ages the 'novel' aubergine was held: food not liked even by donkeys, as even now some people in the Istanbul area say, although some of the best dishes of Turkish cuisine feature aubergine as the main ingredient.[129] Vegetables, trees, and fruits considered as moral issues, as objects of social disdain, or unwelcome innovation, are hard issues or topics to reconcile or even contrast and compare. The Roman drive to moralize on even the most mundane topics, which Pliny often takes, are conspicuously unconvincing. In the market itself, imported or new varieties will often capture the interest and tastes of householders looking for something special.

Agricultural Productivity

As we have seen, Pliny the Elder's discourse on Rome's excesses and moral decline includes even the 'humble' vegetables, which he describes as having become grossly huge and beyond the reach of the poorer people because of the price their artificially large size fetched. Pliny exaggerates to make his point, but his comments on the new size of cabbages and asparagus imply that he was observing a small 'horticultural revolution': intensive care of crops, constant selection of the desirable characteristics in a plant leading to the creation of different varieties and, we can safely assume, better and more careful irrigation and manuring. The productivity of ancient agriculture – long thought to be quite low – has been calculated as potentially much higher due to the adoption of practices such as crop rotation, manuring, integration of animal husbandry with cultivation of crops, and better understanding of ad hoc irrigation for specific plants.[130] The topic is a very complex one, and no single instance of improvement justifies a general conclusion.

Manuring in the context of cultivating vegetables and fruit trees is important in order to increase production, and this was well understood in the ancient world and incorporated into official documents: a lease contract from 178 BC relating to an estate of the temple of Zeus Temenites on the island of Amorgos includes the contractual obligation for the lessee

[128] A mosaic from Utica, now in the Bardo Museum, depicts a cardoon. Archeaobotoanical finds from the Eastern Desert in Egypt (Van der Veen *et al.* 2018) indicate that the Romans knew the artichoke, *pace* Watson (1983, 64) who believed that only the cardoon was known in the Graeco-Roman world, and that the artichoke was developed in the Islamic world.

[129] E.g., the dish *hünkar beğendi*.

[130] Kron 2008; Kron 2012; Kron 2017.

to provide manure for the orchards.[131] In Roman agriculture, improvements to soil fertility via regular manuring cannot be doubted: in the *Digest*, Ulpian lists amongst the essential equipment of a farm/agricultural estate (the *instrumentum* which must pass to the heir at the death of the owner) *plaustra quibus stercus evehatur*, i.e., 'carts by which manure is carried out'.[132] In Book 19 on vegetables, Pliny the Elder mentions manuring and irrigation more than once, for instance in reference to lettuce that can be sown any time of the year in 'irrigated and well manured soil' (19.130) or, a few lines later, when he observes that *umore omnia hortensia gaudent et stercore* ('all garden plants are fond of moisture and manure').[133] Not only animal manure, but also human excrement collected in cities was used as fertilizer. Varro reports the opinion of Cassius Dionysius of Utica that human excrement was the second-best fertilizer after pigeon dung and Pliny refers to diluted human urine used to water pomegranate trees in order to increase the fruit's sweetness.[134] Since Cassius Dionysius was the translator of Mago's agricultural treatise, this information may go back to Mago himself, and therefore to Punic practices.[135]

Remarks in Pliny when discussing lettuce, endive, vines, and fruit trees point to the integration of horticulture with pig rearing, since he says that some people, in order to increase the size of lettuces and endives, cut the plants back and give 'them a dressing of fresh swine's dung' and that swine dung should be diluted with water to avoid burning the vines.[136] It has been suggested that pigs, since they can be fed on scraps and kept in a relatively confined environment, were regularly raised within large Roman towns, thus in part explaining, in the light of the high urbanization rates seen in the Roman imperial period, the Roman preference for pork meat shown by the archaeofaunal record. An integration of horticulture and pig rearing along the lines suggested by Pliny's passage would make particular sense in the outskirts of large urban centres such as Rome. Manure was also used to induce production of fruit out of season. Pliny reports on the technique, stating that in some provinces like Moesia, fig trees were

[131] Jashemski 2018b, 433.
[132] *Dig.* (Ulpian) 33.7.12.10. At 19.2.19.2 *tympanum* (water wheel) and *cochleae* (a screw press and/or an Archimedean screw used in irrigation) are mentioned as part of the essential *instrumentum*, together with winches. On references to agricultural practices in Roman law, see Buck 1983 (with White 1985, a review of this book).
[133] On manuring of trees and the advice about pomegranate: Plin. *HN* 19, 258–9.
[134] Varro, *Rust.* 1.38.2–3. See also Columella, *Rust.* 10.80–5.
[135] As observed by Wilson: Flohr and Wilson 2011, 147.
[136] *HN* 19.131: *fimoque suillo recenti inlitis*; *HN* 17.258–9.

covered up in manure at the end of autumn, and then when milder weather arrived they were dug up and exposed to light again, thus stimulating early ripening (*precoces*), out of season (*alieno anno*).[137] Pliny labels these figs as the product of art, not nature.

Increasing agricultural productivity by seed or cultivar selection via vegetative propagation and adopting a range of strategies that maximized yield had been part of 'basic' Roman agriculture (by this I mean the cultivation of cereals, olives, and vines, the three major Mediterranean crops) for centuries. The Latin agronomists often remark on these practices and are quite aware of the need to control soil erosion. However, enhancing productivity is different in theory and the written record and in the practices of everyday farming, especially in the case of farmers of small- and medium-sized agricultural units who did not have the same access to capital, manpower, technical skills, and social networks as the big landlords. For authors such as Tchernia and Kron, Columella's estimate of 31.5 to 42 hectolitres per hectare as the *normal* yield for a typical Roman vineyard was based on the reality of Roman agriculture. The fact that these figures were matched in the modern era by the production of French vineyards *only in the 1950s*, when large-scale and regular use of fertilizers began, has, however, left some scholars unconvinced about Roman agricultural productivity.[138]

Was the agriculture practised by the majority of farmers in the Roman world really so effective? The archaeological project 'Excavating the Roman Peasant' has investigated a number of very small rural sites in southern Tuscany with the aim of determining the practices of lower-class rural dwellers. The sites were lower by much – smaller size, cruder dwellings – and in no way comparable, on the settlement hierarchy scale, to the villas and large farms associated with market-oriented agriculture and with the application of the agricultural precepts reported by the agronomists. However, and in the face of their very humble nature, these farms gave compelling evidence for the practice of ley farming, or convertible agriculture, for the period from the first century BC to the first century AD.[139] Ley farming is a sophisticated practice, adapted to more than mere subsistence farming. These sites are small and in a secondary geographic location; if peasants living there applied advanced farming techniques such as

[137] Plin. *HN* 15.73. [138] Tchernia 1986, 359–60; Kron 2012, 159–60.

[139] Bowes *et al.* 2017: pasture and cereal pollen; presence of field drains, fodder crops; evidence for wine production, etc. In convertible agriculture one alternates between crops (such as alternating nitrogen weak crops such as cereals with nitrogen-fixing crops like legumes) and also between periods of land cultivation and of intensively managed pasture.

convertible agriculture, the owners and managers of larger estates must have known them as well. They, of course, would have benefited the most from systematic use of manure and irrigation for those crops produced for profit. Is it just by chance that Tibur, one of the preferred leisure destinations for the Roman moneyed and political elite and where everyone of some distinction owned villas and farms, is also remembered in literary texts for its irrigated orchards and fruit cultivation?[140] There may have been 'trickle-up' of practical knowledge from small farmers, and 'trickle-down' from knowledgeable up-to-date owners of estates.[141]

Irrigation

Andrew Watson, in an influential and controversial book of 1983 on agricultural innovation in the medieval Islamic world, put great emphasis on the fact that the 'agricultural revolution' of the medieval Muslim world, especially in Sicily and the Iberian Peninsula, was possible thanks to the agricultural intensification which complex irrigation systems allowed and to the introduction of key summer crops, such as sorghum, cotton, and sugar cane, which benefited from carefully controlled watering.[142] Watson's argument rested in part on the idea, found in various studies on ancient agriculture, that the Romans essentially practised dry farming and that during the hot and dry Mediterranean summers the land largely lay fallow, with the few plants the Romans knew as summer crops playing a very minor role and even so only in more northern regions.[143] In his reconstruction, 'investment in irrigation works and the spread of irrigation technology endowed the early Islamic world with a gradation of artificially watered lands',[144] which, combined with the new summer crops, profoundly changed the timings of the agricultural year and the level of labour needed both in the creation and maintenance of the irrigation channels and to cultivate the summer crops in a period that, earlier on, had been relatively 'quiet' as to agricultural chores. In turn, among the outcomes of the new agricultural system were greater stability and higher earnings,

[140] Hor. *Carm.* 1.7.13–14.
[141] E.g., see Seneca visiting the freedman and farmer Aegialius (*Ep.* 86), which I discuss in Chapter 6. Cf. Métraux 2014, 34.
[142] Watson 1983 (2008).
[143] Watson 1983 (2008), 123; the summer crops he recognizes the Romans knew, as mentioned in the Latin agricultural treatises, are millet, *trimestre* wheat, sesame, various legumes, and 'a few garden crops'.
[144] Watson 1983 (2008), 126.

justifying its greater labour- and capital-intensive investments.[145] Watson does recognize that, previously, in the various regions that became part of the Islamic world in the early Middle Ages – Egypt, Spain, and North Africa – elaborate irrigation works had existed by the first century AD, but he seems to largely reduce pre-Islamic irrigation to 'temporary trapping of rain water or river floods and the spreading of them by gravity flow over the land . . . little or no irrigation water was provided in summer'.[146] He further states that the 'most efficient of these devices (i.e., water lifting devices), the *noria* was not used widely in pre-Islamic times'[147] and that while cisterns and reservoirs offered perennial storage of water, these were used mainly for domestic water supplies and not much in agriculture.[148]

Watson's poor opinion of Roman irrigation techniques has been, and still is being, re-evaluated.[149] There have been important discoveries, among them a bronze tablet with a Latin inscription from the territory of Agón, *c.*50 km west of Zaragoza in Spain, known as the *Lex Rivi Hiberiensis*.[150] This text preserves the regulation, sanctioned by the Roman authority, governing irrigation communities along the right bank of the middle Ebro River and belonging to two towns founded by Augustus.[151] The Roman legal corpus contains ample references to the importance of water rights in general and to irrigation in particular, including imperial deliberations about specific points of contention.[152] For example, Marcus Aurelius and Lucius Verus were asked to give a pronouncement, certainly in the context of addressing a petition on some dispute, on how to regulate the use of a public river for irrigating fields.[153] The answer, that water 'should be divided in proportion to the property

[145] Watson 1983 (2008), 127. [146] Watson 1983 (2008), 104.

[147] Watson 1983 (2008), 105. The *noria* is an undershoot water wheel using the power of moving water. For abundant documentary evidence related to water-lifting devices from Roman Egypt, see Malouta and Wilson 2013.

[148] Watson 1983 (2008), 105–7. At 108, Watson states that the Islamic contribution was not so much invention of new devices as, rather, the application on a larger scale (and the combination of different techniques into complex systems) of devices that had been very little used in the pre-Islamic period.

[149] Beltrán Lloris and Willi 2011; Beltrán Lloris 2014.

[150] *AE* 1993.1043; Beltrán Lloris 2006; Beltrán Lloris 2014. See also the first-century BC *Tabula Contrebiensis* (*CIL* I^2 2951a, found near Zaragoza, attesting a dispute between two indigenous peoples about a land purchase for the purpose of channelling water) and the irrigation decree from Lamasba in N. Africa (*ILS* 5793).

[151] The rural communities mentioned are the *pagus Gallorum* and the *pagus Segardenensis*, belonging to the *colonia Caesaraugusta* (mod. Zaragoza), and the *Belsinonensis* district belonging to Cascantum (mod. Cascante), a Latin *municipium*.

[152] On water rights, see the important studies by Capogrossi Colognesi 1966 and, more recently, Bannon 2009; Bannon 2017.

[153] *Dig.* 83.17 (Papir. 1 *de Const.*); Bannon 2017.

holdings, unless someone shows that more has been given to him by an individual right', alludes to the need to fairly regulate access to water for irrigation and to the unavoidable disputes that would arise on a regular basis. While it is true that Roman jurisprudence tries to address most eventualities, the extent of the corpus on water rights speaks of the importance and diffusion of irrigation in everyday agricultural practices in the Roman world.[154]

That irrigation technologies in the Iberian Peninsula were the work, by default, of engineers of the Islamic era has been challenged, prompting in some cases more in-depth examination of the archaeological evidence and new dating of irrigation infrastructure to the Roman rather than the Islamic period.[155] The middle Ebro Valley offers several examples of Roman reservoirs and dams, including dams of considerable dimensions which regulated the river and its tributaries and mitigated floods and drought.[156] The reservoirs stored water that could be distributed during the summer months.[157] Among these, the two most important hydraulic complexes, Muel and Almonacid, date to the reign of Augustus.[158] The Muel dam, built near the Colonia Caesaraugusta (mod. Zaragoza), was the object of recent archaeological investigations which have confirmed its impressive size and the involvement of the Roman army in its construction.[159] Today, the area up the river from the Roman dam is a fertile lowland hugged by the eastern bank of La Huerva and occupied by cultivation of fruit and vegetables. The dam wall may have reached 100 m in length and 13 m in height, possibly creating a dam stretching for as much as 80 ha.[160] Besides dams and canal attested by inscriptions, we must mention the Alcanadre-Lodosa canal, possibly dating to the second century AD, although not everyone agrees it is Roman. It diverted two tributaries of the Ebro, the Linares and the Odron, and crossed the Ebro on a series of arches. The size of its specus (1.5 m) and the considerable resulting flow capacity of 2.88 m^3/s (250,000 m^3/day) suggest

[154] On the importance of irrigation and legal and financing solutions, Ronin 2018; Ronin 2020.
[155] Butzer *et al.* 1985.
[156] Arenillas and Castillo 2003; Castillo Barranco 2007; Uribe, Magallón, and Fanlo 2012.
[157] Bannon 2021.
[158] Dating elements include construction marks of the *Legio IIII* and C14 analysis: Uribe, Magallón, and Fanlo 2012, 76; 79.
[159] Legionaries from the three legions settled in Caesaraugusta when the colony was founded also took part in the construction of the Roman road connecting Caesaraugusta to Pompaelo: Uribe, Magallón, and Fanlo 2012, 80, with previous bibliography on the milestones attesting these legions.
[160] Uribe, Magallón, and Fanlo 2012, 77, 79.

it was used for agricultural irrigation.[161] Recent research has also surveyed the aqueducts of Roman Spain to identify possible cases of secondary water derivations used for agricultural irrigation, since these are attested elsewhere.[162] In the case of some aqueducts, such as the Gier aqueduct near Lyon, it seems that water was diverted to irrigation when the aqueduct was running at full capacity, because its inverted siphon system could not accommodate that volume of water.[163] At other times, the main use of an aqueduct for irrigation came subsequently to its initial purpose, as for the famous aqueduct of Nîmes which, in the fourth/fifth century AD, was diverted to irrigate fields.[164]

The existence, and practical applications, of water-lifting technology in antiquity – Spain offers an impressive example in the battery of water wheels and Archimedes' screws discovered in Roman mines – also suggest the possibility that, when necessary, such machines were used for irrigation.[165] Water lifting could be undertaken on a massive scale. Strabo reports the existence of a battery of water wheels and Archimedes' screws operated by 150 prisoners in Egypt, lifting water from the Nile onto a ridge.[166] Even if a water course was not nearby, water-lifting devices were used to aid irrigation from wells. Pliny mentions different water-lifting devices to be used for irrigation of *hortos villae iungendos* (gardens/vegetables gardens adjoining the villa) from a well if no nearby stream was present: the *rota* (pulley, evidently meaning a simple pulley and bucket), the *organis pneumaticis* (force pumps, which have indeed been excavated at the bottom of Roman wells in Italy and the provinces) and the *tollenonum* (a *shaduf*).[167] Columella refers to crops that benefit specifically from irrigation, such as millet and turnips.[168] The Archimedes' screw, although it has a lower lift than other devices, could also be used for irrigation, as suggested by diverse evidence. An inscription from Syria mentions the construction of a *kochlias* (a water screw) on the Euphrates in the early 70s AD, to be used for irrigation.[169] Two wall paintings from Pompeii depict genre scenes with Archimedes' screws being operated: one from the house at I.11.5 and one from the House of the Ephebus in Pompeii (I.7.11), showing a man treading on a screw to irrigate crops. There is also a series of terracottas depicting a man treading on an Archimedes' screw that seems to

[161] See 'Alcanadre (Spain)' at www.romanaqueducts.info/aquasite/index.html (accessed 25 September 2020); Bannon 2021.
[162] Sánchez 2015. [163] Hodge 1993, 249. [164] Leveau 1991, 152.
[165] See Vitruvius' mention of water wheels used to irrigate fields: *Arch* 10.4.1–2.
[166] Strabo 17.1.30. [167] Plin. *HN* 19.60; cf. Oleson 1984, 87–8.
[168] Columella, *Rust.* 2.9.17, 2.10.23. [169] Malouta and Wilson 2013, 292.

refer to irrigation.[170] While summer crops came to dominate Islamic agriculture and had been less grown in Roman agricultural habits,[171] the role irrigation played in Roman agriculture and the sophistication of its crop rotation strategies were clearly greater than Watson had thought from his study of textual sources.

In fact, there is excellent evidence for Roman achievements in irrigation in difficult circumstances from North Africa. The extraordinary second-century AD funerary monument of the Flavii at Cillium, in the Kasserine region (Tunisia), with its 110-line-long metric inscription with some glamorous literary topoi, celebrates a concrete and wholly local achievement: T. Flavius Secundus, a military veteran, had been the first person to plant vines in the area and had established an irrigated orchard.[172] The poem is a celebration of this agricultural achievement in an area known heretofore only for its production and exportation of olive oil. Although mentioned only twice in the text, irrigation is the essential basis of the productive landscape created by Flavius Secundus; in this arid region the grape vine needs irrigation at key moments of the year and fruit trees certainly could not have been grown without irrigation.[173] Surveys carried out in Libya and Tunisia, including in the area around Cillium, have shown how irrigation techniques deriving from indigenous African water-management systems were widely adopted in the Roman period with the increase in the number of rural settlements.[174] Flavius Secundus seems to

[170] Malouta and Wilson 2013, 292; Forbes 1966, 218–19; the House of the Ephebus wall painting is now in the Naples Archaeological Museum. At the time of its discovery, in the late 1920s, it even attracted the attention of the international press because of the depiction of Archimedes' screw. The *NY Times* wrote that 'highly interesting discoveries are being made... The most recent include a mural painting giving the first authentic representation of how the ancient "cochlea" worked...It is a pity that this most interesting painting also contains obscene subjects which prevent it being shown to the general public' (quoted from www.math.nyu.edu/~crorres/Archimedes/Screw/Applications.html, accessed 5 June 2020).

[171] Rice has been found in small quantities at various Roman sites, including the Red Sea ports, but it is considered an import from India and not produced in the Roman world. Watermelon was identified at Myos Hormos and van der Veen thinks it was grown in the Nile Valley (watermelon is also reported from Emilia Romagna in Italy). According to Ciarallo (2004, 124), when Pliny at *HN* 19.67 talks of a new kind of cucumber called *melopepona*, developed in Campania in the round shape of quinces, he is actually referring to watermelons.

[172] *CIL* 8.211–16; A, lines 51–3: *munera Bacchi / multa creat primasque cupit componere vites / et nemus exornat revocatis saepius undis* ('He produced the abundant gifts of Bacchus and wished to plant the first vines and frequently provided the orchard with rerouted streams'). If we take the noun *nemus* at line 53 of the poem in this sense and not to mean 'grove' in general; however, the emphasis on irrigation suggests fruit-bearing trees).

[173] See B line 9 *diximus ... circuitus nemorum, currentes dulciter undas* ('We have said of the surrounding orchards (and) the waters flowing pleasantly').

[174] Barbery and Delhoume 1982; Hitchner 1988; Hitchner 1989; Hitchner 1990; Hitchner 1995. Libya: Gilbertson and Hunt 1996.

have been particularly skilled 'at adapting local farming technologies to new possibilities'.[175] The problems of irrigation in the southern areas of northern Africa are not modern: they evidently began in Roman times, and such a person as Flavius Secundus could make his name and memory for having solved them, if only temporarily.

Irrigation Technologies: Examples

Complex irrigation technologies and the role of water wheels in bringing water to agricultural activities are alluded to in texts such as Vitruvius',[176] and they have now been proven as historical phenomena by the finds from the S. Giovanni in Laterano excavations I discuss in Chapter 5.[177] What remains to be clarified is to what extent the capital and labour investment, exemplified by the irrigation system discovered there, can be taken to be representative of the Roman world at large or to reflect the unique circumstances and market forces generated by a metropolis that, in the early first century AD, counted about 1 million inhabitants, poor for the most part but among the very wealthiest of the empire.

Some 'inventions', such as Tiberius' planters on wheels mentioned earlier, suggest that some innovations were first developed on imperial estates before finding wider diffusion. The enhancement of the irrigation infrastructure available around Rome is certainly an area where the emperor, particularly Augustus, had an impact. The Aqua Alsietina (or Augusta) I mentioned earlier, built by Augustus in 2 BC to provide water for the Naumachia Augusti when in use and for irrigation of properties in the Trastevere area, is one example. Frontinus, as *curator aquarum*, explicitly says that the water of this aqueduct was of poor quality and not suitable for drinking.[178] Secondary branches from the Aqua Alsietina aqueduct were also used for irrigation. The inscription from Casale di

[175] Stone 1998, 109.

[176] When talking of the *tympanum* or water wheel with a compartmental body, driven by men treading the rim, Vitruvius (*Arch* 10.4.1–2) writes: *ita hortis ad irrigandum vel salinis ad temperandum praebetur aquae multitudo* ('in this manner, a large quantity of water is provided for irrigation in gardens or for supplying the needs of salt-works').

[177] For many years the practical application of a number of mechanical devices known theoretically in classical antiquity was doubted (e.g., see the case of the water mill). Water wheels of the *noria* type do not seem to have been very common, but several have been discovered in the last 20 years or so, often associated with bath complexes. To my knowledge, the S. Giovanni in Laterano water wheel is the first such device undoubtedly associated with agricultural irrigation. Abundant documentary evidence about water-lifting devices used in irrigation exists for Roman Egypt: Malouta and Wilson 2013.

[178] Front. *Aq.* 1.11; Wilson 2008, 752.

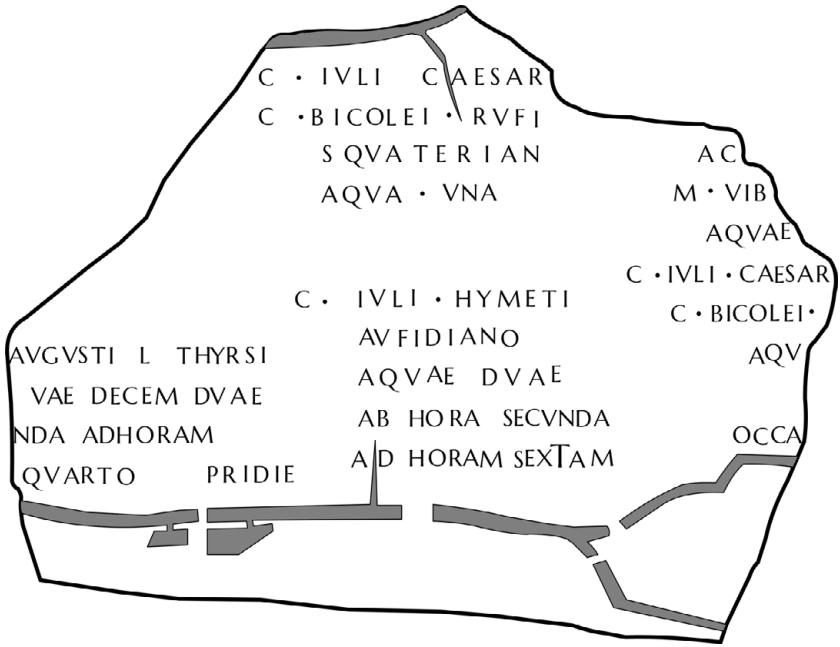

Figure 3.2 Drawing of *CIL* 6.1261, a lost inscription which used to be in the church of S. Maria on the Aventine, Rome. The inscription attests to a public–private agreement for water distribution.
Drawing by Mehmet Deniz Öz.

Galeria on the Via Clodia mentions that Augustus added a derivation called Forma Mentis and refers to *rivalibus*, i.e., neighbouring properties along the channel of the aqueduct (literally, 'people sharing a channel'), which used to draw water at a set signal.[179] The type of arrangement recorded in the Casale di Galeria inscription is confirmed by a now-lost inscription (Figure 3.2) which had a schematic plan of some properties that were allowed to draw water from the aqueduct channel: both represent a complex public–private agreement for water distribution and

[179] *CIL* 6.31566 = 11.3772a = *ILS* 5796, discussed in Wilson 2008, 752; see also Bannon 2009, 76–8. Compare with *CIL* 14.3676, which also has a map and is related to the water supply of Tibur; it lists water recipients, the volume of water they are allowed to draw, and the time of the day when it may be channelled.

management system for the city.[180] The lost inscription is detailed: for each property we have, in good legal wording, the name of the estate and of the owner, the number of water connections, and, in most cases, the *hours* during which the property is allowed to draw water![181] For instance, one of the properties has this annotation:

> C. Iuli Hymeti / Aufidiano / aquae duae / ab hora secunda ad horam sextam
>
> to the Aufidian estate of C. Iulius Hymetius, two water connections from the second hour to the sixth hour.

We do not know whether these water connections were used for the water supply of villas and *horti*, or for irrigation of gardens and/or horticultural properties, or for both. However, it is highly relevant that the landowners listed are a C. Iulius, freedman of Caesar (he co-owns two properties together with C. Bicoleius Rufus), a certain Thyrsus, freedman of Augustus, and the above-mentioned C. Iulius Hymetius, who, from the name, can also be assumed to be a freedman of Caesar. The names of these proprietors give a precise date for the inscription: from about 27 BC to the Tiberian age at the very latest, at the precise time that horticulture near the city was undergoing its particular expansion. While wealthy freedmen certainly owned villas and *horti* (i.e., suburban residences with parks),[182] the lost inscription gives the impression that it refers to horticultural properties, and that therefore the water connections were primarily aimed at irrigating orchards and vegetable patches rather than amenities in luxurious ornamental gardens of the elite. The fact that two properties are co-owned by two individuals seems particularly revealing in this sense: co-ownership involving individuals not from the same family was not unknown among the wealthy for substantial agricultural estates well out in the countryside, but such an arrangement was not common for the regularly used urban or suburban residences.[183] Having more water available for the irrigation of the vegetable patches of suburban Rome may be behind Horace's comments about the tasteless cabbage produced in the

[180] *CIL* 6.1261. This lost inscription, which used to be in the church of S. Maria on the Aventine in Rome, is known from a drawing made by A. Fabretti. It is not known where the inscription originated or to which aqueduct it referred.

[181] Wilson 2008, 752–3.

[182] E.g., see the Horti Demetriou (Plut. *Pomp.* 40.5) belonging to a freedman of Pompey: they were proverbial for their beauty and costliness.

[183] Different is the case of ordinary people, who, via inheritance, may end up owning (and living in) one quarter of a house, as revealed by numerous tax documents from Roman Egypt.

irrigated *horti* of the *suburbium.*[184] Similarly, Pliny observed that cabbage 'has a more agreeable taste if it has not had much moisture or manure, but makes a more abundant growth if they have been plentiful'.[185] Greediness for a good water supply for a suburban garden may lead its inept owner to producing inferior comestibles: big but not toothsome.

Cicero's writings offer insight into the importance irrigation had for commercial production for members of the estate-owning elite. Cicero's favourite villa at Tusculum near Rome had a commercial flower garden (or a vegetable garden) on the property which needed attention.[186] In one letter sent to Tiro, his freedman and secretary, Cicero mentions the letting of this *hortus* to the *holitor* Helico for 1,000 sesterces and refers to improvements made at the property, including an '*emissarius*', which must be understood as an irrigation channel, possibly fed by the *Aqua Crabra*.[187] He clearly expects that such improvements will warrant a higher rent price for the *hortus* than the 1,000 sesterces currently being paid by Helico and urges his secretary to persuade a Parhedrus to lease the garden. While Cicero was away from Rome as proconsul in Cilicia in 51 BC, he wrote more than once to Atticus about the issue of his property's water supply, asking his friend to 'take care of the water and if Philippus does anything [possibly this Philippus was a contractor in charge of some work on the estate], keep an eye on him'.[188] Clearly a functioning irrigation system at this property was so important that Cicero worried about it even when overseas, far from Rome. Water for the irrigation of commercial agricultural properties was also an issue in imperial legislation and legal precedent, particularly in the cases concerning water servitudes and the possible damages awarded by judges to complainants who had been prevented from drawing water. The jurist Julian, in discussing a specific case, wrote an opinion that any loss incurred by the plaintiff from drought because he had been prevented from channelling water by another person, with the result of the parching of his meadows or trees, had to be made good and whole again by that person.[189]

[184] Hor. *Sat.* 2.4.15–16: *caule suburbano qui siccis crevit in agris dulcior; irriguo nihil est elutius horto* ('Cabbage grown on dry fields is sweeter than that from suburban farms; nothing is more tasteless than a watered garden's produce', trans. A. Marzano).

[185] Plin. *HN* 19.138.

[186] Cicero mentions water supply at his properties at *Att.* 5.12.3, 5.13.3, 13.6.1, 15.26.4; *Fam.* 16.18.2–3.

[187] *Fam.* 16.18.2–3; indeed, in this same passage Cicero asks: 'what is happening with the Crabra?'; for a detailed discussion in the context of water servitudes, see Bannon 2009, 137–42; for commercial flower cultivation at villas: Marzano 2007, 73–5.

[188] *Att.* 5.13.3.

[189] *Dig.* 8.5.18, *Iul.* 6 *ex Minucio*; see Bannon 2009, 159–71 for discussion of water servitudes and profit of estates.

Large, well-appointed villas in the extended *suburbium* of Rome had sophisticated systems of water infrastructure such as cisterns which, in their size, capacity, and location, were clearly used for irrigation and not to supply the baths or other parts of the residential quarters.[190] The cisterns are often located on a lower terrace of the villa complex, with no traces of any structures.[191] These raised artificial terraces must have been garden areas, with further planting areas below them. The South Etruria Survey has highlighted the density of rural settlements in the area north of Rome and its conclusions are that high settlement density indicates relatively small estates. It has been suggested that, considering the value of the land in proximity to Rome and the relatively small extension of the estates that were attached to these villas, these must have been used for the cultivation of high-value crops such as fresh fruit and flowers. Perhaps the lower terraces of these villa complexes had ornamental gardens and also market-oriented cultivations. However, these villas were near Rome and within striking distance of roads to the capital and its markets. From what we know of elite mentality, with its preoccupation with display and search for revenues to maintain social standing, and what we know of the Roman villa and its cultural value among the elites looking for good profit from the land as well as prestige, it is not hard to conclude that irrigation infrastructure and its techniques for suburban and rural estates were developed by elite owners for arboriculture and horticulture that were both prestigious and profitable. For Varro and his elite reader, the fruit-galleries called by the stylish Greek name of *oporothecae* and made fashionable by Gn. Tremellius Scrofa were an attraction people went to see, appreciating them more than Lucullus' picture galleries filled with works of art.[192] Fruit orchards were indeed an ornament and pleasure (more than the vegetable patch was), but they could also be a source of good revenue with shrewd financial investment. Pretension and profit may not have been mutually exclusive in Roman times, or any other. The scenario that the archaeological evidence from villas suggests fits well with the interest in arboriculture on the part of prominent Romans; more of this relationship between prestige and fruit trees will be addressed in the next chapter.

Other members of the Julio-Claudian family took an active interest in the provision of irrigation. The example of the Aqua Alsietina to supply both the Naumachia spectacles and the gardens of the transtiberine region has already been discussed. In a more homely venue, an inscription from

[190] Thomas and Wilson 1994; Wilson 2008.
[191] Van Oyen 2020 for socioeconomic considerations on water storage.
[192] Varro, *Rust.* 1.2.10.

the area of Sutrium between Rome and Viterbo commemorated the construction of a rural aqueduct by Augusta Iulia (i.e. Livia, wife of Augustus) for the benefit of the *vicani*, the residents of a *vicus*, probably the Vicus Matrini on the Via Cassia.[193] It does not seem that this aqueduct was providing water to buildings in the *vicus*, such as a bath complex, but that it was rather connected to irrigation. It is extremely likely that this *vicus* was on, or near, estates belonging to Livia, hence her benefaction in building the aqueduct. Such improvements in infrastructure were euergetic, and Livia as the benefactor may or may have not consciously reasoned that providing an aqueduct for the villagers would both increase their agricultural productivity and benefit her own properties. Regardless of her motivations, the rural aqueduct in the well-watered area around Sutrium can be understood only as directed at irrigation for trees and gardens and not, for instance, for growing grape vines, which would have done well naturally. The situation in Italy is quite different from the arid North African landscape and the area of Cillium, where, as we have seen, T. Flavius Secundus introduced viticulture where none had existed before and planted an irrigated orchard. Water is needed to establish a vineyard, but once established, vines do well on their own – over-irrigation of grapes grown for wine making is counterproductive because it dilutes their sugar and thus their alcohol content, lowering the quality of the wine.

Large-scale commercial fruit cultivation appears to have been undertaken primarily on the estates of the wealthy. They had large landholdings that permitted the cultivation of varied crops, marketable at different times of the year, intended for different types of market (e.g., the local, urban market vs. the export market). Landowners of means were able to sustain the long-term investment and planning needed in arboriculture before full production capacity is reached and also had easier access to specialized labour: they could afford to embark on the selection and creation of new fruit cultivars, and they systematically pursued this for both commercial and ideological reasons, as we shall see in the next chapter. On the contrary, growing fresh vegetables for urban markets such as Rome seems to have occurred mostly on smaller plots cultivated by 'ordinary Romans'. This land may have been the property of wealthy individuals, who parcelled it and leased it out, or may have been the garden tombs mentioned above. The above-mentioned letter by Cicero to his secretary about the

[193] *CIL* 11.3322: *[Au]gusta Iuli[a Drusi f. Divi Augusti] [a]quam vicanis [vici Matrini s(ua) p(ecunia)]* (Augusta Iulia, daughter of Drusus, wife of Divus Augustus, (gave) water to the villagers of Vicus Matrini, at her own expense); Wilson 2008; Andreussi 1977.

hortus in his villa estate to be rented out points to this. The names of the current lease holder, of the prospective one, and of another gardener that Cicero says had rented his flower garden in Tusculum are all names of servile origin: Helico, Parhedrus, Motho. The impression we get – I say impression because the evidence in this regard is truly scarce – is that these were middling individuals, former slaves, now engaging in the commercial cultivation of vegetables and flowers (sought after for garlands, perfume making, etc.). Professional associations too could own suburban land around Rome that they leased out for the cultivation of vegetables. In the imperial period, a *collegium* that had received the *ius coeundi*, the right to assemble, could hold collective property.[194] Among the various *horti* and *hortuli* mentioned in the surviving corpus of Latin inscriptions, one text clearly refers to vegetable commercial plots rather than to a productive garden part of a sepulchral complex or an elegant suburban estate.[195] The inscription dates to AD 227 and mentions a tenant farmer (*colonus*) of *horti olitorii* located on the Via Ostiense and owned by the *collegium* of the Foundation of the Divine Faustinas. We do not know the terms of such leases or whether the rent was paid in kind or in cash, as was conventional for farm leases.[196] It is likely that the leases would include an initial evaluation of the value of the market garden being leased, probably detailing the types and numbers of trees and other plants and vegetable already present. It is also possible that, as in the case of the *hortulani* leasing out market gardens in sixth-century Constantinople, at the end of the lease another evaluation was carried out to determine whether the lessee had improved or diminished the value of the land.[197] In the case of late antique Constantinople, Justinian's *Novella* 64 (AD 538) suggests that the tenant-cultivators and the appraisers of values belonging to the association of *hortulani* were a powerful group, frequently guilty of irregularities when evaluating market gardens at the start and end of leases in order to financially disadvantage the landowners. However, in the case of Rome in the late Republic to the mid imperial period, we do not have any indication for a similar lobby.

The interest of Augustan intellectuals in writing works on horticulture, the introduction in the late first century BC / early first century AD of new fruits into Italy, notably the peach and the apricot, the appearance of garden tombs, the wider application of water-lifting technology to irrigation in the context of fruit cultivation, and the investments in irrigation facilities at late Republican or early imperial villas north of Rome, all point

[194] *Dig.* 47.22.3.1. [195] *CIL* 6.33840 = *ILS* 7455. [196] Kehoe 2016, 649. [197] *Nov.* 64.1.

to a considerable development of horticulture and intensification of cultivations in the late first century BC and the early first century AD. This phenomenon, triggered by Rome's population growth, which had gone from *c.*375,000 inhabitants in 100 BC to around 1 million in just 100 years, and by targeting the markets of the capital, could come to fruition because of the return to stable conditions after the cessation of the civil wars. While horticultural exploitation in Rome's *suburbium* changed gear during the early principate, I have posited that further stimulus to write about horticultural matters and invest time and labour in the selection of new varieties of fruit came also from land assignments to veterans in provincial territories and from wealthy landowners who were acquiring an increasing number of properties in overseas territories. Identifying the best varieties to be cultivated commercially in the specific environmental conditions present in the provincial territories must have been of great interest to the farmer-colonists as it was for the Romanized local elites investing in land and in cash-crop cultivations. Columella addresses in his work the issue of choosing plant varieties that are suitable to the local environment and soil conditions; this kind of observation was not a theoretical exercise of the agricultural manuals, but practical consideration aimed at addressing the knowledge needs of the 'gentleman farmer'.

Within horticulture, two separate stories and trajectories can be discerned. On the one hand we have arboriculture, which had profound significance for elite identity and cultural importance and whose developments were primarily driven by elite activity. On the other, we have the cultivation of vegetables, which despite its economic importance did not have, at least in late Republican and early imperial Rome, the same significance as arboriculture in constructing elite identity. On the whole, though, horticultural developments over the first century BC and the first century AD appear to have been instigated by two major drives: elite activities and the consequences of imperialism. As I shall discuss in the following chapters, the available textual and archaeological evidence suggests so.

These societal transformations and the intensification of horticultural endeavours impacted on ideology too. The ideological values attached to domestic garden spaces that I have explored in Chapter 1 were now ready to be fully deployed in the orchard; it is now time to turn to the 'glory' of grafting fruit trees.