CHAPTER 6

Campania and Cisalpine Gaul: Developments in Commercial Arboriculture

A growing body of archaeobotanical evidence throughout Italy and beyond indicates that in the early Roman empire people – 'ordinary' citizens, small and large landowners – were investigating tree cultivation and related processes on their own initiative, not merely following the intellectual fashions of the Julio-Claudian era that I have discussed in Chapter 3. The literary evidence shows the increased number of fruit varieties in circulation between Republican times and the first century AD, and archaeobotanical evidence extends and specifies the literary record. In this chapter, I focus on two Italian regions which seem to have played a significant role in the development of new fruit varieties, in acclimatizing imported plants, and in horticultural production in general: Campania and the eastern part of Cisalpine Gaul. The archaeological and archaeobotanical record of those parts of Campania affected by the eruption(s) of Vesuvius is exceptional, but the region's remarkability and importance in agricultural, and more specifically, horticultural production was real in antiquity because of the fertility of the soil and favourable climate. Good climate, beautiful scenery, and fertile soil were what had brought the very top of Roman society to Campania by the mid Republic: scores of Roman senators and equestrians owned rural estates and luxury maritime villas in Campania, and as I discuss below, the presence of such elite estates and their skilled personnel may have been a crucial factor in horticultural advances. Cisalpine Gaul, on the other hand, comprised the large alluvial plain of the Po River, and was, and still is, the part of the Italian peninsula with the highest agricultural production potential. While the core of Cisalpine's agriculture consisted of cereal culture and sheep rearing, some parts of Cisalpine developed successful viticulture and horticulture in the Roman period, a view inferred from the ancient sources and supported by the relatively abundant archaeobotanical record available for this region.

Campania Felix

> Νώλης δὲ καὶ Νουκερίας καὶ Ἀχερρῶν. . .ἐπίνειόν ἐστιν Πομπαία παρὰ τῷ Σάρνῳ ποταμῷ καὶ δεχομένῳ τὰ φορτία καὶ ἐκπέμποντι. ὑπέρκειται δὲ τῶν τόπων τούτων ὄρος τὸ Οὐεσούιον, ἀγροῖς περιοικούμενον παγκάλοις πλὴν τῆς κορυφῆς (Strabo 5.4.8)
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> Pompaia, on the River Sarnus – a river which both takes the cargoes inland and sends them out to sea – is the port-town of Nola, Nuceria, and Acherrae . . . Above these places lies Mt. Vesuvius, which, save for its summit, has dwellings all round, on farm-lands that are absolutely beautiful. (trans. H.L. Jones, Loeb edn)

When the so-called Villa B or villa of L. Crassius Tertius at Oplontis (mod. Torre Annunziata) came to light in 1974, the investigations revealed surprising and even tragic finds, among them the skeletal remains of fifty-four individuals who had gathered for shelter in one large room during the eruption of AD 79, an exquisite strongbox, jewellery, more than 200 coins, and a seal ring reading '*L.CRAS.TERT*'. Also found were *c.*1,000 kg of charred pomegranates discovered stored between layers of straw and covered by wicker mats. It is these pomegranates that are most interesting in the context of this study, because, as we shall see below, their quantity and secure packing suggest that they were transported from the orchards to Villa B for warehousing before redistribution around the region and possibly beyond.

Much discussion followed the discovery of these pomegranates as to their intended local use: in the leather industry, since the rind of the unripe fruit contains a tannin used in tanning leather; to extract dyeing agent; and as an additive in wine making.[1] They have been reported to be immature fruits, but this is probably incorrect, based on the long-held belief that the eruption of 79 occurred in August and not, as mostly recognized now, in late October.[2] To my knowledge, the possibility that the fruit had been picked and stored because there was interest and value in it *as fruit*, and

[1] Tanning: Jashemski, Meyer and Ricciardi 2002, 154; immature fruit to be used for some industrial process, maybe leather tanning: Pesando 2016, 50; dye: Di Pasquale 2017.

[2] Ciarallo and De Carolis (1998) suggested that the fruits were immature because the peduncle was twisted (twisting the pedicel/peduncle is a traditional agricultural technique to stop the ripening of a fruit when still leaving it on the tree) but Borgongino (2006, 24) observes that the twisting of the peduncle in the pomegranates was simply the result of the action of picking the fruits from the trees. Jashemski, Meyer, and Ricciardi (2002, 154) state that the fruits were immature but do not explain why; I suspect that the belief that the eruption of AD 79 occurred in August prompted the comment, since pomegranates ripen in autumn, around late October/November. For Borgongino, *ibidem*, the fruits were picked in late September/October before the start of seasonal rains, to allow the

that it was in store awaiting commercial distribution, has not been adequately considered.[3] In antiquity, pomegranates (*Punica granatum*) were sought for several medicinal preparations.[4] Its spread in the regions of the western Mediterranean was probably due to the Carthaginians; besides iconographic evidence from funerary and religious contexts, archaeobotanical evidence suggests that it first reached Motya in Sicily in the eighth century BC, at the start of the period of Punic influence.[5] The whole fruits, which would have kept better than the juice, could have been destined for commercialization in regional markets around the Bay of Naples or could even have been intended for export to places where they did not readily grow. The fertility of the Campanian volcanic soil and its favourable climate were well known in ancient and modern times. Strabo, in the passage quoted above, remarks on the beauty, by which he means the productivity, of the fields around Vesuvius. This agricultural productivity was not limited to the famous wines distributed to faraway regions by land and by seaborne trade. The products of Campanian horticulture and arboriculture could end up in the interregional and intraregional trade, especially when they could be preserved (e.g., in brine, in must, or honey) or when they naturally had a good shelf life (like the pomegranate). Indeed, among the cargo recovered from one of the ships excavated at S. Rossore, the Roman port of Pisae, were amphorae containing peaches, cherries, and plums, most probably originating from Campania.[6]

The trading and importation of pomegranates, a fruit typical of the Mediterranean, into northern European regions are attested in archaeological discoveries from Switzerland. Seven charred barrels from a storage area at the military settlement of Vindonissa (mod. Windsch-Breite), dated to the last decade of the first century BC, had contained pomegranates, of which hundreds of grains and pericarps survived.[7] This find, the earliest attestation of this fruit to the north of the Alps, clearly indicates the import

continuation of the ripening process in a protected, indoor area. The use of straw and straw mats to protect the fruits is consistent with this idea.

[3] Borgongino (2006, 24) briefly comments that '*lo stivaggio in tale ambiente-fruttaio fa supporre che esse fossero in attesa di essere commercializzate, viste le funzioni del complesso oplontino*'.

[4] E.g., see Hippocrates, *Epid.* 7.67, 7.80, 7.101; Plin. *HN* 23.106–14. Also Ciarallo (2004, 109) talks of the collection of the fruit in Villa B '*al fine di trasformarlo*' (i.e., in order to process/transform the fruit); at p. 69 she writes that the discovery in the Villa B of amphorae, of resins for their waterproofing, etc. suggests that there was a local production of pomegranate juice, '*considerato uno dei più potenti medicinali del tempo*' ('thought to be one of the most powerful medicines of the time'). Pomegranate juice has mild diuretic and deconstipating properties, can be used topically as a mild disinfectant, has astringent properties, and is a traditional method against tapeworms.

[5] Nigro and Spagnoli 2018, 63–4.

[6] Dressel 6A and Lamboglia 2 amphorae, Bruni 2000, 43.

[7] Jacomet *et al.* 2002; Zech-Matterne *et al.* 2017, 57.

of pomegranates into the camp of the Legio XXI Rapax stationed there at the time, either as 'luxury' food for officers or, more likely, for medicinal purposes.[8] The discovery is also a reminder that many foodstuffs were, for the most part, traded in perishable containers – were it not for charred and waterlogged conditions, the barrels would have disintegrated and their content scattered, leaving not much trace.

I am not suggesting here that the pomegranates that were discovered at Vindonissa came from Campania; many other regions of the Mediterranean could have been their place of origin; the south of France, where cultivation of the plant had probably started already in the archaic period, is a potential source.[9] But it is not inconceivable that, just as barrels of Mediterranean pomegranates ended up in Vindonissa, so too were the pomegranates of Campania/Oplontis Villa B meant to be sold elsewhere. Excavations in the courtyard and ground rooms of Villa B have discovered *c.*600 amphorae[10] – surely a commercial quantity – and a sizeable number of them were found, stacked upside down, in one of the corners of the courtyard, probably rinsed, dried, and ready for reuse.[11] The Oplontis Project team sees confirmation of this interpretation in the fact that a small stone oven containing a pot with pine resin was discovered: the amphorae were being readied for internal recoating to keep them impermeable. As stated on the project's website, 'workers prepared storage amphorae, certainly for wine, and possibly for oil and *garum*'.[12] Strangely, no one seems to have also considered that in antiquity fruit

[8] Waterlogged pomegranate seeds dating to the first century AD have also been found at the *vicus* of Tasgetium / Eschenz in Switzerland: Vandorpe and Jacomet 2011a, 67, note 171. On the medicinal uses of pomegranates, see Dioscorides, *Mat. Med.* 1.151–3; Plin. *HN* 23.106–13, 30.50.

[9] Non-carbonized remains of pomegranates were discovered in fifth-century layers of the Greek colony of Massalia: Bouby and Marinval 2000. In the Iberian Peninsula, Andalusian coastal sites have yielded the earliest evidence (tenth to ninth century BC) for the pomegranate: Pérez-Jordà *et al.* 2021, 3.1. Many pomegranate seeds were found at the harbour of Tossal de las Bassas (Alicante) in phases connected to the period of Punic influence in the area in the fifth to third centuries BC: Nigro and Spagnoli 2018, 61 note 99.

[10] As of 2014, when the Oplontis Project undertook the systematic cataloguing of material recovered in earlier excavations: see Fasti OnLine, http://www.fastionline.org/excavation/micro_view.php?fst_cd=AIAC_334&curcol=sea_cd-AIAC_5748 (accessed November 2018).

[11] Reuse of amphorae occurred all the time, making it difficult to use their shape as a secure guide to content. See the recent results of the analysis conducted on amphorae and other containers from the 'Garum Shop' in Pompeii: an African amphora, which had once held oil, contained lime (Pecci *et al.* 2018, 495), whereas a Dressel 20, a Spanish oil amphora, had several olive stones inside and one sweet cherry pit. In this case several instances of reuse are posited after the amphora arrived in Pompeii transporting oil from Hispania: first to hold cherries and then olives (p. 498). The single cherry stone is taken to be a remnant of the amphora's earlier content.

[12] www.oplontisproject.org/index.php/the-villas/villa-b (accessed August 2018).

was often preserved and transported over long distances in must or brine; the amphorae about to be coated again could well have been destined for the extra-regional transport of pomegranates.

How many fresh pomegranates do *c.*1,000 kg of charred fruit remains represent? It is possible to suggest a very rough estimate for the weight of these fruit when they came to be stored in the room.[13] A modern, medium-sized fresh pomegranate (circumference = 25 cm) weighs *c.*225 g. In this fruit, the outer hard pericarp and the inner, soft mesocarp weigh *c.*88 g, and the arils (that is, the thin membrane containing the juice derived from the epidermal cells of the seeds) weigh *c.*134 g. Once the juice was removed, I was left with 19 g of (fresh) seeds to add to the 88 g of the endocarp + mesocarp; this gave a weight of 107 g. Assuming that during charring in AD 79 and centuries of being buried underground the fresh seeds and endocarps/mesocarps lost *c.*50 per cent of their weight, we are left with *c.*50 g for each originally fresh fruit. This means that 1,000 kg of charred pomegranates equate to about 20,000 fresh pomegranates, a very considerable quantity! Regardless of the intended use and final destination of the pomegranates stored in Villa B, the large quantity suggests either that the fruits came from an estate with monoculture or near-to-monoculture cultivations, or that the purchase and collection of the fruit produced in a number of different orchards had been centrally organized (by a cooperative agreement among producers or farmed out to a broker), and the produce conveyed to the same storage location.[14] Both options speak of market-oriented arboriculture and of well-integrated systems of production and distribution. On the basis of what we know about Roman planting practices and evidence for commercial orchards in Pompeii, it seems more likely that the pomegranates would have come from more than one orchard, as we will see in a moment.

In modern agriculture, a young pomegranate tree (four years old) produces about 20–25 fruits; maximum production capacity is reached in the tenth year, when yield increases to typically between 100 and 150 fruits per tree, equivalent to *c.*22.67 kg or 50 pounds per tree. Modern, well-managed orchards can achieve even higher yields, as many as 200 to 250

[13] The calculations here presented have no pretension of being a scientifically precise assessment of the original weight of the fruits. I have unsuccessfully tried to obtain the actual weight of some of the individual charred fruits recovered from Villa B and contacted Dr Gaetano di Pasquale to this end; I have also contacted Prof. Jacomet who studied the charred pomegranates from Vindonissa in 2002 and conducted an experiment by charring fresh pomegranates, but unfortunately on that occasion the weight of the fruit before and after charring was not recorded.

[14] As suggested in Ciarallo 2004, 109.

fruits per tree.[15] For the purposes of this rough and ready calculation, preferring to err on the low side, I posit that the trees in question were not very young, but had not yet reached their full production capacity either, and had received minimal irrigation. If we assume that each tree would have been able to produce 30 pomegranates, this would mean that the *c.*20,000 fresh pomegranates that had been stored in Villa B just before the eruption of AD 79 were the harvest from about 666 trees. If we posit higher yields per tree, but still lower than modern maximum production capacity, the number of our hypothetical trees would of course be lower; a possible production of 50 fruits per tree, would mean that the *c.*20,000 pomegranates were the produce of 400 trees.

The figure of 666 pomegranate trees can then be used to approximate the size of the orchard or, more probably, the orchards needed to produce the fruit. Columella recommends a spacing of between 3 and 4 m, whereas the spacing of trees in the commercial orchard, measuring *c.*2,100 m^2, which Jashemski excavated between Porta Stabia and Porta Nocera in Pompeii (I.22.2), was every 2–3 m.[16] For the purpose of reconstructing the Villa B store of pomegranates, let us split the difference and assume that the trees on which they were grown had been spaced 3 m apart. We would need a piece of land measuring about 5,600 m^2 (*c.*0.5 hectares or 1.3 acres) to grow 666 trees. This size is not a huge amount – equivalent to about two and a half times the size of the Pompeian commercial orchard just mentioned. However, from both the Pompeian fruit orchard and the large one at Rome at S. Giovanni in Laterano that we have already discussed,[17] it is clear that even the very large orchards would not be planted with only *one* type of tree, but rather with a selection of types alongside vines and nut trees. In the case of the garden of the House of the Ship Europa (I.15.3), which measured about 3,325 m^2 (one-third of a hectare or 0.8 acres), of the 416 root cavities identified by Jashemski, only 31 were fruit trees, while about half of the area of this garden was occupied by vines and by a number of plots separated by furrows, which she interpreted as beds for vegetables.[18] I am therefore of the opinion that

[15] Stein, Kamas, and Nesbitt 2010.

[16] Jashemski 2018a, 140; Columella, *Rust.* 5.10.15: Columella recommends to plant fruit trees every 3 to 4 m, so that there would be sufficient space for the growth of mature trees and for other crops to be planted underneath the trees.

[17] See Chapter 5, p. 189.

[18] Jashemski 1979, 596; Jashemski 1979–93, vol. 1, 233. While botanists have developed a systematic classification and description of plants according to the various parts that grow above ground such as leaves and flowers, root systems have not been meticulously studied and systematized. The identifications of root cavities that Jashemski often presented as secure are, in fact, just likely

the pomegranates found in Villa B came from a number of orchards in the area which were cultivated with other trees and plants. These may have been scattered landholdings belonging to the same proprietor or to different owners.[19] Estates in the Vesuvian region seem to have been rather small on average; estimates for one of the largest villa estates known in this area, the Villa della Pisanella, indicate that the *fundus* could not have been larger than *c.*59 *iugera* (14.8 ha), which is almost half the size of the standard 100-*iugera* estate provided by Columella.[20] Agricultural production on this type of estate would have never tended to monoculture, increasing the risk of crop failure, but, as we have seen in various archaeological examples of commercial gardens from Pompeii, plots largely comprised vines intermixed with fruit trees and vegetable beds. We know that viticulture was a significant component in the agriculture of the Vesuvian area, therefore estates which engaged in commercial fruit cultivation were doing so on a relatively modest scale following mixed cultivation strategies. The *cumulative* arboricultural production of these estates was, nonetheless, a sizeable and significant component of the local agricultural economy.

References to the horticultural cultivations of the Vesuvian plain and Campania more generally are present in the literary texts. Strabo writes that some areas of Campania were so fertile that they were sown twice with spelt, a third time with millet, and a fourth time with *vegetables*.[21] Pliny and the agronomists refer to Campania as the place where specific varieties of fruit and nut had been developed (e.g., the Herculaneum fig; the Plinian cherry; the Falernian pear; the *Corelliana* and the *Tereiana* chestnut varieties), alongside a selection of new types of grape vine, such as the *Horconia* grape (a likely manuscript variant for *Holconia*), named after the

hypotheses put forward by Dr Carlo Fideghelli. He was the director of the Istituto Sperimentale per la Frutticoltura of the Italian Ministry of Agriculture in Rome, president of the Italian Society for Horticulture, and an expert in the disease of trees, especially those attacking the root system. On the basis of this knowledge, he could advance some plausible identifications, but he never presented them as scientifically secure. Currently, there is no one who is able to securely identify trees from root casts, unless it is a plant with a very distinctive root system; I am grateful to Kathryn Gleason for discussing these points with me; see also Gleason 2014, §992.

[19] The pomegranate is easily propagated by cuttings and this plant does not benefit from grafting, although Pliny (*HN* 17.121) notes that pomegranate can be grafted by all grafting methods. See Columella, *Rust.* 5.10.15 for advice on the best time to plant pomegranates; much of this information is repeated in *Arb.* 23.1.

[20] De Simone 2017, 29–30.

[21] Strabo 5.4.3; on the agricultural fertility of Campania, which allowed three crops a year, see also Dion. Hal. 1.37.2.

Pompeian *gens Holconia*.[22] There were also some areas of Campania specializing in a specific type of cultivation, to the point that the 'product' had become more generically known in Latin by the Campanian geographic name: a common name for hazelnuts was *abellana nux* from Abella/Abellinum in Campania, the general area where currently historical terraced hazelnut groves can still be found.[23] Other horticultural products appreciated for their quality include onions from Pompeii, quinces from Neapolis, and cabbages, widely cultivated throughout Campania according to Columella: distinct types of cabbage were grown at Cumae and at Pompeii and were more generally known after the names of these localities.[24] To these products, aromatic plants and flowers used in the manufacturing of perfumes must be added, although some spices used in perfume were also imported from further afield, since Campania had great fame in perfume making: Capua and Puteoli had famous perfume-making workshops, while the quality of the roses of Paestum was renowned.[25] Campania's distinction in arboriculture and specialized cultivation techniques was not limited to fruit and nut trees. Minius Percennius from Nola is mentioned in Cato's manual as an expert in the propagation and planting of the cypress.[26] This tree, of which about 100 planted in a *quincunx* formation that have been dated to the Roman period were discovered along the Sarno River in the early twentieth century, was used to produce stakes and props and also planted as a boundary marker between estates, as Varro himself did in his property on Vesuvius.[27]

Because of the circumstances of their destruction and thus their preservation, Pompeii and other settlements in the Vesuvian region provide us with exceptional archaeological evidence, but Pompeii was a rather ordinary Roman town. It was, however, in an exceptionally fertile region, densely settled, and horticultural activity must have been omnipresent. There are compelling clues about the existence in the region of flourishing commercial arboriculture and about the fact that much experimentation and development of new fruit varieties took place on Campanian estates. It is even possible that some of the modern fruit cultivars typical of

[22] Cato, *Agr.* 8.1; Plin. *HN* 14.35; Columella, *Rust.* 3.2.27. In inland Campania, Abella was known for hazelnuts and, possibly, on the basis of a line in Virgil, also for apples: Verg. *Aen.* 7.740. Campania is also mentioned in the context of cultivation of non-fruit trees such as the elm (Plin. *HN* 17.77), or bush plants such as the myrtle (17.62, specifying that while in Latium it was propagated and grown from cuttings, in Campania it was grown from seed/berries).
[23] Di Gennaro 2013, 443–4. [24] Plin. *HN* 15.37, 19.140; Columella, *Rust.* 10.127–39.
[25] De Simone 2017, 34; Plin. *HN* 13.5, 18.111. Camodeca 2018, 17. [26] Cato, *Agr.* 151.
[27] Varro, *Rust.* 1.15; cf. Plin. *HN* 16.141; Jashemski and Meyer 2002, 105.

Campania are descendants of ancient Roman cultivars, as has been argued for the *annurca* apple or the cherry varieties Somma and S. Anastasia which, according to Ciarallo, have the same shape displayed by the cherries depicted in wall paintings from Pompeii.[28] Cherry trees did grow in some of the gardens of Pompeii, where both cherry stones and wood belonging to the *Prunus* genus were found.[29] The study of historical landscapes in Campania has identified several examples of fruits and nuts and of cultivation techniques which are attested for the region in the Roman period. While documentary evidence for cultivations in these historical landscapes only goes back to the medieval era, certain traditions and a focus on fruit and nut cultivation in mixed agricultural regimes in all likelihood date back to the Roman period and possibly earlier. I have already mentioned above the historical hazelnut groves in an area renowned, since the time of Cato, for the production of hazelnuts. To this example we can add the *vite maritata* vine-growing technique – vines trained high up on poplar trees and in between the trees – typical of Aversa and the Phlegraean area to the north of Naples, a technique mentioned by Pliny in reference to Campania, and, possibly, the terraced fruit orchards on the hills near Naples: Strabo had described the hillsides surrounding Lake Avernus as intensively cultivated.[30] Information in medieval and more recent documentation on the agricultural regimes followed in these historical landscape districts of Campania comprising different types of natural environments (e.g. plain, hill, mountain) is not inconsistent with what we know of Roman agricultural practices and may provide us with some additional guidance, bearing in mind some obvious differences in crops. For instance, the area comprised between the Avella-Partenio massif and the mountains of Lauro and Nola had the following crop sequence: arables, such as wheat, hay, and maize (a New World crop) in the valleys; orchards, vineyards, and hazelnut groves in the foothills; and chestnut and thick coppice woods on the upper mountain slopes/summits.[31] Ancient evidence and archaeobotanically grounded studies such as the study of the fuel economy of Pompeii support the existence of similar agricultural regimes for Roman Campania.[32]

[28] *Annurca* apple and depiction in Pompeian wall paintings: Borgongino 2006, 26. Cherries: Ciarallo 2012, 128. The type of peach depicted in Pompeian wall paintings has also been connected with the modern variety *spiccagnola*, which is cultivated in parts of rural Campania: see Borgongino 2006, 17.

[29] Ciarallo 2012, tab. 1 at 265–8; Jashemski, Meyer, and Ricciardi 2002, 147. [30] Strabo 5.5.

[31] Di Gennaro 2013, 443. [32] E.g., see Veal 2012.

Campania was a great producer of horticultural produce and fruit, but, as mentioned above, this production did not occupy a large part of the cultivated land on any given estate – and indeed, as shown by Jashemski's work, in Pompeii some of it could take place within the city walls. The Pompeian fruit orchard or market garden located between Porta Stabia and Porta Nocera gives an idea of the layout and intensity of planting adopted. As we have seen, Jashemski's investigation of an area that was about 50 per cent of the original garden identified *c.*150 root cavities.[33] The size of the root cavities suggested that about 90 per cent of the trees planted in this orchard were small ones, planted in rows with a spacing of 2 to 3 m.[34] If the unexcavated part of this Pompeian property presented the same planting pattern as the portion excavated by Jashemski, a total of 300 plants can be posited as the tree population of the orchard. Two large clusters of root cavities identified in the southeast corner of this orchard belonged to clusters of smaller trees, possibly hazelnuts with suckers.[35] The orchard had a source of water in the form of a cistern placed in front of the north wall, and Jashemski suggested that the path leading to the garden *triclinium* also served as an irrigation channel.[36] Since the trees in this orchard were relatively young, they still needed irrigation and because the Augustan aqueduct did not serve this part of Pompeii,[37] cisterns collecting rainfall were needed. A cistern might seem insufficient to cover the irrigation needs for 300 trees (especially during the hot summer months), but Jashemski also observed that in modern Pompeii apricot trees grow without any irrigation whereas the town's peaches need irrigation only two or three times per year.[38] Unlike other regions, the Vesuvian area has a very fertile and light soil, allowing tree roots to easily develop in depth and reach water/moisture, and the presence of small pumice particles in the soil creating little pockets allows for good water retention without supplemental irrigation.[39] Jashemski's study of a number of gardens in Pompeii has confirmed both the tree-root development in depth and the presence of the small pumice particles in the archaeological horizons.

[33] Jashemski 1979–93, vol. I, 251–3; the excavated area measured *c.*35 × 60 m = 2,100 m^2.
[34] Jashemski 2018a, 140.
[35] Jashemski 2018a, 141; see also Jashemski 1979–93, vol. I, 261: similar root cavities had been identified in the House of the Ship Europa, and carbonized hazelnuts were subsequently found in close proximity, thus apparently confirming the identification of the plants.
[36] Jashemski 1979–93, vol. I, 253.
[37] Of course, the aqueduct was damaged in the earthquake of AD 62 and did not work properly after this date.
[38] Jashemski 1979–93, vol. I, 246. [39] Jashemski 1979–93, vol. I, 256; Jashemski 2018b, 433.

Still in the same Pompeian orchard, a way of contouring the soil to allow water retention around the roots was effected near the eastern end of the south wall, where undisturbed original soil was preserved; this contouring – Jashemski termed it 'sombrero-shaped' – indicates that the trees were still relatively young plants and not completely established.[40] The contouring into raised mounds around the tree trunks ringed by a shallow ditch a little below grade was intended to slow water run-off. This contouring practice continues in modern orchards of the region. Jashemski could not identify the types of tree that grew in the orchard, but different types of fruit tree, including fig and olive in combination with hazelnut, seem likely.

Commercial orchards, even small ones, often rely on plant nurseries to acquire their fruit trees. In Chapter 4, I have mentioned the archaeological evidence for plant nurseries and the evidence from documentary papyri about the existence of nurseries which supplied agricultural estates. Pompeii, in addition to abundant evidence for orchards, gardens, and vineyards, may also have had a plant nursery growing cherry, other trees of the *Prunus* species (peaches, plums, almonds), olive, grape vine, and hazelnut. It was discovered in 1986, when the large outdoor area at the back of the House of the Floral Lararium (II.9.3–4) along Via Nocera was excavated.[41] A small cultivated area, measuring 420 m^2 and subdivided into eight *porcae* or raised strips of earth separated by shallow ditches oriented east–west, was identified. Numerous small holes measuring *c.*4/8 cm in diameter – single or in groups of three or four – were set at a distance of only 40 cm from one another, indicating that the plants were very small and thus suggesting that the facility was a plant nursery, not a commercial orchard; pottery sherds placed at the bottom of the holes indicate the intention to facilitate water drainage.[42] Judging from their size and spacing, the holes were probably for plants being reproduced by air layering and/or slippage. More than 100 casts of these holes were made,[43] and the carbonized wood found in some of them was analysed, together with pollen samples.

Later analysis by Annamaria Ciarallo seemed to support the interpretation of the evidence for a nursery: she cited as proof that in the middle of the garden a *fagus* (beech tree) and an *alnus* (alder) had been planted,[44]

[40] Jashemski 1979–93, vol. I, 260–1, 382. [41] Ciarallo 2004, 123. [42] Ciarallo 2004, 123.
[43] Ciarallo (2004, 123) talks of 160 casts, whereas in Ciarallo 2012, 463, she gives 180 as the number of the hole-casts.
[44] As revealed by the carbonized wood found in two larger holes, measuring 30 and 49 cm in diameter.

trees that in the literary sources are mentioned as useful to give shade to propagation attempts by air layering.[45] This last detail given by Ciarallo in support of the nursery identification is not very convincing and it must be considered that the planted area was part of a large dwelling created by the annexation of two houses. The property seems to have been frequented by the public, since electoral inscriptions were found in one of the internal rooms; the rooms flanking the garden area had large windows looking onto the garden space, where a large masonry *biclinium* and an *opus signinum* floor with inserted marble fragments were found.[46] These elements of socializing and feasting seem at odds with the garden being used as a plant nursery (but the *biclinium* could belong to an earlier phase of the house than the nursery, which was in existence at the time of the eruption). But if it indeed was a commercial nursery and the *biclinium* was in use at the same time, the presence of a dining area in the garden area is suggestive of the interlinking of commercial and social aspects of public and private functions that so often characterizes the Roman world.

The evidence from Pompeii and Herculaneum pertaining to horticultural cultivations within the town and in its immediate outskirts is complemented by archaeobotanical evidence for the consumption of these products, from the many finds of food in the houses and shops, mineralized remains in latrines and sewers, and in the context of the study of ritual offerings found in gardens and in shrines.[47] Over twenty types of fruits have been identified in the archaeobotanical remains of the two Vesuvian towns, and these include cherries, plums, peaches, apples, pears, figs, olives, grape, blackberries, and mulberries.[48] Attested nuts and herbs include almonds, hazelnuts, fennel, dill, and coriander.[49] Not all of these products were necessarily grown locally[50] – a well-known tablet from the archive of the Sulpicii reminds us that lentils, a well-attested legume in Pompeii's archaeobotanical record, reached Campania from Egypt, and black pepper and dates were also fruits of the long-distance trade[51] – but several almost certainly were, such as mulberries. The results of the twelve-year Anglo-American excavation project of *insula* I in *regio* VI, which

[45] Ciarallo 2004, 123.
[46] Information given on the explicative panel placed in the house by the Parco Archeologico di Pompei.
[47] For a list of archaeobotanical finds see Borgongino 2006 (a summary table derived from this publication is given by De Simone 2017, Table 1.8).
[48] Rowan 2017, 117. [49] Rowan 2017, 117.
[50] See Rowan 2017, 118–29 for considerations on food production and the market.
[51] *TPSulp* 51, dated to AD 37: the security for a loan of 10,000 sesterces consisted of *c.*7,000 modii of Alexandrian wheat and 4,000 modii of lentils, chickpeas, and emmer wheat (Ciaraldi 2007).

included a blanket sampling strategy of all contexts,[52] show that there was no clear-cut distinction between the carbonized assemblages found in first-century BC and earlier levels and those from the first century AD, except in the case of the olive, which was higher in the first century AD.[53] Besides cereals, pulses were a well-attested find, especially from the street shrine they investigated; pulses were a common ritual offering in the Roman world. In this specific case, vetches (*Vicia ervilia* and *Vicia sativa*) were the most common legume recovered, followed by lentils. Among the fruits, the most common, in a number of assemblages, were fig, grape, and olive, with pomegranate, cherry, peach, apple, blackberry, and melon less common.[54]

Increased importance of fruit cultivation in first-century Campania comes also from other, indirect evidence. Research on the fuel economy of Pompeii over a period of *c*.400 years has shown that while fruit trees and nut trees were present in the charcoal record for the first century BC, there was a sudden increase in their frequency in the first century AD.[55] Beech wood, which had dominated the earlier composition of the fuel used in Pompeii, had progressively diminished starting from the third century BC until the first century AD. Then, in the first century AD, the charcoal record in the town of Pompeii shows that the use of cuttings of fruit and nut trees as fuel dramatically increased, indicating that an increase in fruit cultivation and in fruit-bearing trees can be posited for the first-century AD Vesuvian region, and the territory around Pompeii in particular: the product of pruning was put to good use as fuel.

The pollen study from the harbour of Neapolis has revealed other important information about horticultural cultivations in the area of the Bay of Naples, especially vegetables. Cultivated cabbage and/or broccoli (*Brassicaceae*), together with radish, were identified, proving the presence of vegetable patches around the harbour area. *Brassicaceae* pollen in high concentration was also found, for the Roman period, in the coring at Lake Avernus and from a soil sample from the so-called villa of Poppaea at Oplontis. The early Roman imperial period stands out in the pollen record as far as horticulture is concerned: in the third century AD, a drastic decrease in horticultural activities occurred, matched by an increase in the presence of Mediterranean shrubland plants and some elements of the

[52] These included both carbonized and mineralized finds.
[53] Murphy, Thompson, and Fuller 2013, 415–16.
[54] Murphy, Thompson, and Fuller 2013, 415.
[55] Veal 2017, 396; Veal's study examined about 4,000 charcoal fragments coming from different excavations.

deciduous forest.[56] These data suggest a contraction in the amount of land kept under cultivation, followed by a reversion to spontaneous natural vegetation.

Undoubtedly, vegetables must have been grown commercially in parts of Roman Campania alongside fruit varieties. The Pompeian onion (*Pompeiana cepa*) mentioned by Columella is often cited in modern literature, together with the 'tender' Pompeian cabbage,[57] as a typical product of the area, transported on the Sarno River and perhaps depicted in a wall painting from the House of the Lararium (1.14.7) which shows large baskets full of agricultural produce being weighed and loaded on a river boat towed by two mules; the personification of the Sarno River looks over the scene.[58] Onions or not, this painted scene certainly refers to either vegetables or fruit cultivated locally and to the role played by the Sarno in their local transport and commercial distribution; as shown by Strabo's passage quoted at the beginning of this chapter, the river was an important water route for the transport of commercial goods. Local cultivation of onions is, however, attested archaeologically: in the elegant and sophisticated suburban Villa of the Mysteries, Maiuri found the imprint of a thick layer of onions that had been stored in *cubiculum* 16, of which he made a cast, suggesting that onions were one of the crops grown on the villa estate.[59] In other cases, archaeobotany offers just hints for the cultivation of vegetables like the lettuce that must have been very widespread and common but which easily elude recording.[60] In a farm of Pompeii's *suburbium* lettuce seeds were found in a bronze container, in all likelihood stored away to be planted the following spring/summer.[61]

It seems likely that a large part of this horticultural production occurred in medium-sized stand-alone orchards and vegetable patches like the one excavated by Jashemski near Pompeii's amphitheatre or in orchards within larger estates devoted to viticulture. Intercropping of fruit trees and seasonal vegetables is the most likely form of cultivation adopted. Cultivations in antiquity were interspersed: in between the rows of olive trees, vines, or other fruit trees one could grow vegetables, or grain, or legumes. Two

[56] Russo Ermolli *et al.* 2014, 409.
[57] Cf. Plin. *HN* 19.140: the leaves of the Pompeian cabbage are 'prized for their tenderness'.
[58] Columella, *Rust.* 12.10.2. Nappo (2012, 89) tentatively connects the agricultural produce depicted in the wall painting with the Pompeian onion; Borgongino 2006, 69, entry 48. About 30 onions, some garlic heads, and remnants of a basket were discovered in 1983 in Herculaneum, near a boat on the ancient shore in front of the baths: Borgongino 2006, 43, 67 entry 35.
[59] Jashemski, Meyer, and Ricciardi 2002, 87; Stefani 2002, 53.
[60] From written texts, we know that lettuce was commonly eaten: Dalby 2003, 195–6.
[61] Borgongino 2006, 44.

Roman orchards in the south of France identified archaeologically by the excavation of hundreds of rectangular planting pits show a much greater spacing between trees than what was advised in the agronomical texts or observed at Pompeii, 8 m in one case, 15 m in the other. Such spacing can only indicate intercropping or, possibly, integration with animal husbandry.[62] Crops were rotated, and not all the same plants would have occupied the same patch of land during the various seasons. Many of these practices are discussed in the treatises of the agronomists and, sometimes, environmental archaeology can confirm or shed new light on agricultural practices. Returning to Oplontis Villa B, excavators also found abundant remains of carbonized hay in two rooms. Their analysis revealed that many different vegetal species made up the hay, mostly fodder plants such as vetch and clover, but also *graminaceae*, plants from the genus *bromus*, spikelets of quaking grass (*briza maxima* L.), parts of grape vines (leaves, tendrils, and twig fragments), and even the leaves of olive trees.[63] This in all likelihood means that the hay, before being cut, dried, and stored as animal fodder, had been grown in between rows of olive trees and vines.[64] Fodder of similarly mixed composition from the Vesuvian area has been found elsewhere: in the mezzanine of the upper floor of the bakery next to the House of the Chaste Lovers in Pompeii, the fodder was made up of clover, *graminaceae*, and legumes such as field bean.[65]

While some horticultural products of Campania, e.g., dried figs and other preserved fruit, were likely traded outside the immediate region, a good part of the horticultural production was consumed locally. It is worth remembering that, just as today population density in this part of Campania is among the highest in Europe, so too was settlement density in antiquity very high; considering the number and density of towns and villas of different kinds, local demand for fresh fruit and vegetables must have been high.[66] Wilhelmina Jashemski, considering the documentary evidence for fruit-sellers in Pompeii and their electoral notices, thought that the *pomarii* were a relatively strong association in this town, lobbying to have candidates to their liking elected as *aediles* or *duumvir*.[67] The

[62] Discussed in Chapter 7; Figueiral *et al.* 2010b, 410–11. However, the integration between arboriculture and animal husbandry can only occur after the trees have grown sufficiently so that the animals are unable to graze on their leaves/fruit or tender bark.

[63] Jashemski, Meyer, and Ricciardi 2002, 95, 134, 171. [64] Stefani 2002, 22.

[65] Stefani 2002, 45. The field bean is *vicia faba* var. *minor*; *favino* in Italian.

[66] In the 'Introduction' to Flohr and Wilson 2017 (p. 13), these two authors also comment on the links between the high concentration of elite villas near Pompeii and goods available on the market.

[67] Jashemski 1979–93, vol. 1, 265; see, e.g., *CIL* 4.149, 180, 183, 202, 206; Mouritsen 1988, 65–8, 175.

fruit-sellers were not the only sellers of horticultural products in Pompeii attested in electoral graffiti: we have also a lupine-seller (*lupinarius* and, in another graffito, *lupinopolus*), a certain Felicius. Lupine was regarded by the agricultural writers as the best legume to enrich the soil where vineyards grow, and it is thus not a surprise to find reference to its cultivation in the Vesuvian area, where viticulture was practised intensively. It was also an excellent fodder plant, and the legume was eaten by humans too, which may explain having a lupine-seller in Pompeii.[68] Another electoral notice refers to 'farmers', *agricolae*, collectively.[69]

Arboriculture, then as now, needs the help of bees for pollination and the agronomists include instructions on keeping beehives in their treatises, honey and wax being widely used products.[70] Honey and horticulture could be paired in targeted types of production, which clearly had a market: 'Honey of Gavia Severa from bees fed on thyme' is the text of a painted inscription on an amphora fragment from Pompeii.[71] Indeed, Varro mentions that the Veiani brothers in the *ager Faliscus* received good revenues from the honey they produced: their modest villa estate comprised a *hortus*, several apiaries, and plantations of aromatic herbs, including thyme.[72]

Campania, Horticultural Advances, and the Acclimatization of New Plants

To judge from textual references to the varieties of fruits and vegetables developed on Campanian estates – for instance the novel *melopepo* mentioned by Pliny, some kind of melon, possibly watermelon – the region probably played a significant role in improving horticultural techniques and plant varieties.[73] In part this impression could be the result of the

[68] *CIL* 4.3423, 3483; the graffiti were found at v.1.25, aptly named the *taberna* of Felicius and thought by Della Corte to be a shop selling lupines or vegetables in general (Della Corte 1965, 100); Jashemski and Meyer 2002, 123. On lupine to enrich the soil, e.g., Columella, *Rust.* 2.10.1; Plin. *HN* 18.135.36. Another graffito, *CIL* 4.3485 featuring *aliari* possibly mentions garlic-sellers, but not everyone agrees on the reading. See, e.g., Cooley and Cooley 2004, 124, where *aliari* is connected to *alea* = dice and translated as 'the dice-throwers'. Della Corte (1965, 90) had already thought that the graffito attested *aleari* rather than garlic-sellers and had named the space where the graffito was found the *taberna lusoria alearium*.

[69] *CIL* 4.490. [70] Varro, *Rust.* 3.16; Columella, *Rust.* 9.2–16; Palladius 7.

[71] *CIL* 4.5741; Gavia Severa also appears on a *titulus* from an *urceus* attesting *lomentum*, a kind of bean meal used for the skin: *CIL* 4.5737.

[72] Varro, *Rust.* 3.16.10–11.

[73] Plin. *HN* 19.67–8. Pliny talks of a 'round cucumber' (as normally the Latin *Cucumis* is translated, but it seems to have actually been the so-called snake melon, *Cucumis melo* subsp. *melo* Flexuosus Group) as a new shape developed first by chance in Campania, and then established by growing it from seed. On the *melopepo* as some kind of melon: Brothwell and Brothwell 1998, 126–7; Janick, Paris, and Parrish 2007, 1446. The identification with watermelon specifically has also been

writers' bias: elite writers like Pliny were very familiar with that particular area and its agriculture, since they themselves owned estates there.[74] In part it could also reflect the fact that the very presence of *fundi* belonging to the Roman aristocracy and the rest of the moneyed elite, properties managed by their skilled freedmen or slaves, prompted specialized cultivations and interest in developing new types of fruit, especially when experimental grafting and other forms of plant selection would take some years to lead to satisfactory results: an 'ordinary' farmer might have been more risk-averse, or at least have had to plan the use of his land more carefully. As noted by De Simone, the literary attestations about types of cultivations in Campania are not just a random list; they were all distinguished for either quality or quantity and refer to the four environments the region comprises, mountain, hill, plain, and riverside.[75] Elite estates, which relied on considerable economic power, may have been pursuing 'profits on the (Roman) market rather than simply satisfying local demand'.[76] However, we need not think that experimenting with cultivations could occur only on wealthy estates; on the contrary, smaller landowners might have had a stronger incentive to try to cut out a share of the market by creating a new type of fruit or by developing more efficient propagation techniques.

An example of how the Roman intellectual elite had easy opportunities to learn about horticulture and farming on Campanian estates comes from Seneca's letters. As mentioned in Chapter 4, Seneca discusses visiting a certain (Vetulenus) Aegilius, who at this time owned the farm in Liternum that had belonged to the great Scipio nearly three centuries before, in one of his *Epistles to Lucilius*.[77] Aegilius, who according to Pliny was a freedman,[78] is described by Seneca as a *diligentissimus* head of the household and very well versed in the cultivation of trees:

> *didici ab Aegialo, diligentissimo patre familiae, is enim nunc huius agri possessor est, quamvis vetus arbustum posse transferri.* (Sen. *Ep.* 86.14)
>
> I have learned a lesson from Aegialus, a most careful householder and now the owner of this estate; he taught me that a tree can be transplanted, no matter how far gone in years. (trans. R.H. Gummere, Loeb edn)

suggested, e.g., Dalby 2003, 347. On textual evidence for melons and watermelons in classical antiquity: Andrews 1956; see also Maccioni 1936.

[74] Since the mid Republic at least, notable Romans had owned villas and estates in Campania; Varro, for instance, had a villa near Cumae (see Cic. *Acad.* 1.1–2). A classic treatment is D'Arms 2003 (a re-edition of his 1970 seminal study).

[75] De Simone 2017, 34. [76] De Simone 2017, 35.

[77] Sen. *Ep.* 86; for a philosophical and allegorical reading of this letter, see most recently Zainaldin 2019.

[78] Plin. *HN* 14.49.

Although the context of the text is moral and philosophical,[79] and the reference is used allegorically, it is not by chance that Seneca writes to have received a lesson on tree transplantation and propagation from the current owner of the Campanian estate that had belonged to Scipio.[80] The estate was famous because of its past in the life of its illustrious owner, and visiting it was on the road many Roman senators and other wealthy individuals took moving between Rome and their villas on the Bay of Naples. Furthermore, what better to give a lesson in morality to awake Seneca's peers than to use the example of the simple villa and its estate, whose fields had once belonged to and been tilled by the great general, now being so skilfully cultivated by a *freedman*?

The harbour of Puteoli was an important destination and *entrepôt* for shipments arriving from the eastern Mediterranean and Egypt, and because, as we have discussed in Chapter 3, some fruit species and other plants were introduced into Italy from the eastern Mediterranean, we need to consider the possibility that the Vesuvian area was a region where the acclimatization and diffusion of certain types of plants into other parts of Italy took place. As far as the exotic peach is concerned, I have suggested in the previous chapter that the entry route into Italy was actually across the Adriatic into Gallia Cisalpina, but there may have been other contemporaneous entry points. Current available evidence indicates that the peach started to be cultivated in Italy at the end of the first century BC, so by the time of the AD 79 eruption it must have been a well-established fruit tree in Italy. Peaches were grown in Campania: we have seen in Chapter 5 that archaeobotanical finds (peach stones and remnants of wood belonging to the *Prunus* group) from a *villa rustica* in Scafati, near Pompeii, strongly suggest the cultivation of the peach at this site. It is possible that the tree pits in a *quincunx* formation discovered in the excavation all belonged to peach trees.[81] The finds from Naples' harbour attest the continuous

[79] A passage from this letter, very often referred to, concerned the description of the rustic baths that had belonged to Scipio, to overemphasize the luxury and excesses of Seneca's own times.

[80] Sen. *Ep.* 86.14–15: *Haec si tibi nimium tristia videbuntur, villae inputabis, in qua didici ab Aegialo, diligentissimo patre familiae, is enim nunc huius agri possessor est, quamvis vetus arbustum posse transferri. Hoc nobis senibus discere necessarium est, quorum nemo non olivetum alteri ponit. Quod vidi illud arborum trimum et quadrimum fastidiendi fructus aut deponere* ('If what I am saying shall seem to you too pessimistic, charge it up against Scipio's country-house, where I have learned a lesson from Aegialus, a most careful householder and now the owner of this estate; he taught me that a tree can be transplanted, no matter how far gone in years. We old men must learn this precept; for there is none of us who is not planting an olive-yard for his successor. I have seen them bearing fruit in due season after three or four years of unproductiveness', trans. R.M. Gummere, Loeb edn).

[81] Borgongino 2006, 13.

presence of the peach for the period from the early first century AD to the fifth century, and while some of these peaches might have been preserved fruits arriving via transmarine shipment at the port, consumption of fresh fruit is equally, if not more, probable.[82] A peculiar discovery from one of seven *dolia* excavated in a farm at Scafati (it seems not to be the same site as the one mentioned above),[83] thought to be some kind of medicinal or magical concoction, comprised, among other things, several peach stones, peach stalks, and probably peach buds, all elements which clearly point to nearby peach cultivation.[84]

The Bay of Naples may, however, have been the place where citron (*Citrus medica* L.) and lemon (*Citrus x limon* (L.) Osbeck) were first introduced from the East. The cultivation of the citron in the ancient eastern Mediterranean was widespread: a citron fruit, with its seeds still embedded, was discovered in Egypt at Mons Claudianus, in the Eastern Desert;[85] seeds probably of citron were excavated in Roman layers at Quseir al-Qadim on the Red Sea; and at Myos Hormos, another site on the Red Sea, citron fruit is first attested in first- / early second-century AD contexts.[86] It is the westwards transition of citron and lemon that is difficult to untangle, because of the Arab diffusion of other citrus fruits, particularly the orange, in regions such as Sicily and the Iberian Peninsula

[82] Sadori *et al.* 2009, 53. The greatest number of peach stones was found in strata dated to the second half of the second century AD and to the third century AD.

[83] These various excavations have not been fully published yet and the brief references in publications to some aspects of the investigations occurs only by the generic reference to 'a farm near Scafati', so that it is very difficult to understand if and when we are dealing with the same site or not. The territory of the modern municipality of Scafati is quite large, extending between Pompeii and Stabiae, and many Roman farms have been identified there throughout the years, mostly in rescue excavations which remain unpublished. I could not access the archival record of the Parco Archeologico di Pompei (formerly Soprintendenza Speciale per Pompeii, Stabia e Ercolano) because the records are being digitized and are not physically present in the offices of the Parco. However, comments in Borgongino 2006, 13, 17, suggest that it was the same site.

[84] Ciaraldi 2000; Ciaraldi 2007, 61–73; contra the interpretation as magical preparation, Borgongino 2006, 17 note 36.

[85] Van der Veen 2011, 84, fig. 3.5.

[86] Van der Veen 2011, 86. She reports on the recovery of citron remains at two other Roman sites in Egypt: at Mons Porphyrites (second century AD, seeds) and at Kellis in the Western Desert (rind fragments, dated to third/fourth century). Citron was apparently found at Hala Sultan Tekke in Cyprus, dated to 1200 BC, but van der Veen (2011, 86) reports that this identification was not subsequently verified and that no carbon dating was carried out. Andrews 1961, 43 suggests, on linguistic evidence, that the Romans derived the citron from Egypt and that gardeners from Alexandria introduced it to Italy after the Roman annexation of Egypt in 30 BC. See also Bouchaud *et al.* 2017 for an overview of botanical and textual evidence for attestation of the citron in ancient and medieval Egypt, which found no evidence of the citron in Egypt earlier than the first century AD.

in the medieval period.[87] Therefore, the cultivation of the citron and the lemon in Roman Italy is a debated topic. Part of the issue rests on the difficulty in understanding to what exactly the ancient authors referred when they wrote of *citrus/citreum* in Latin and of κίτριον in Greek, and on the terminological confusion between *citrus/cedrus* and κέδρος/κέδριον (= cedar tree / oil or resins from cedar tree). The Latin word could also refer to other citrus fruit besides the citron proper, such as the lemon, but it could also mean the cedar plant *and* cedar wood.[88] That the Romans knew the lemon has been strongly rejected on the basis that in Arabic texts referring to the western regions of the Islamic world lemons, limes, and sour oranges do not appear until the tenth century AD.[89]

Popular literature sometimes reports that Jewish refugees fleeing Judaea in the Flavian period after the conquest of Jerusalem and destruction of the Second Temple in AD 70 brought the lemon and/or the citron to southern Italy.[90] The citron has an important role in Jewish religion, being a crucial element of the Feast of the Tabernacle and one of the Talmudic 'Four Species' (citron, palm and myrtle branches, willow sprig). Nowadays, a particular cultivar of citron called the etrog is sought for the Feast of the Tabernacle. The association between the 'fruit of the goodly tree' mentioned in Leviticus and the citron dates to the second century BC, and the use of citrons in this feast was well established by the time of Josephus, to the point that the cultivation of citrons in Mauretania and the Peloponnese in the first millennium AD has been connected to Jewish communities who lived in the regions.[91]

Jashemski suggested that the *ollae perforatae* placed in protected areas along garden walls that she had excavated were lemons/citrons being propagated by layering.[92] This interpretation is based on Theophrastus,

[87] On the basis of the Pompeian wall paintings Roman knowledge of the orange has also been argued (see Borgongino 2006, 29–35, where he also suggests that the charred portion of a citrus fruit originating from Herculaneum and now in the Archaeological National Museum in Madrid may be an orange), but I find such identification of the pictorial evidence unconvincing.

[88] On the terminological confusion, which perpetuated itself during the Middle Ages, see Athn. *Deipn.* 111.84c–d. As early as 1938 Tolkowsky observed that because the lemon lacked a Latin name it was believed that it had been unknown in antiquity: referenced in Jashemski, Meyer, and Ricciardi 2002, 102. See also Pagnoux 2017.

[89] Watson 1983, 45. At Quseir two Arabic shopping lists mention lemons, which in all likelihood came from the Nile Valley. In medieval times, lemons, likely pickled, were shipped in water-skins or terracotta vessels from India to Egypt and Aden, as attested in the Geniza documents: van der Veen 2011, 88.

[90] E.g., Attlee 2014, 190–1.

[91] Leviticus 23:40; Isaac 1959a; 1959b, referenced in van der Veen 2011, 87; Joseph., *AJ.* 13.13.5.

[92] As in the case of the *ollae* discovered in the House of Polybius, the Garden of Hercules, and the House of the Ship Europa (in this last, 28 pots were found along the four walls, Jashemski 1979–93, vol. II, 598); Jashemski, Meyer, and Ricciardi 2002, 102; Jashemski 1979–93, vol. I, 79, 285, 240.

who reported that the citron or 'Median apple' was grown in pots with a hole in them, information in part reproduced in Pliny's encyclopaedia.[93] Pliny writes that the fruit, called by the Greeks 'Median apple', was named *citreum* in Latin (for the fruit he uses either *malum citreum* or just *citreum*).[94] He also reports that these trees bear fruit during the whole year, that the plant can be propagated from seed or layers, and that, due to its medicinal properties, various countries had tried to acclimatize the plant, 'importing it in earthenware pots provided with breathing holes for the roots . . . but it has refused to grow except in Media and Persia'.[95] It is possible that citron was actually cultivated in orchards outside Carthage already in the fourth century BC, although the archaeobotanical evidence for this consists of only one pollen grain.[96]

The lemon is a hybrid of other citrus fruits.[97] Lemon trees, with the fruit accurately painted, are depicted in two wall paintings from the House of the Fruit Orchard in Pompeii (I.9.5): one appears in the left panel of the east wall in the *cubiculum* off the east side of the atrium, the other is in the middle panel of the south wall of the room off the peristyle.[98] Such naturalistic depictions may reflect the local artists' knowledge of real lemon trees. Outside the Vesuvian area, there is visual evidence that clearly shows that the difference between a citron and a lemon was known: a mosaic now in the Terme Museum in Rome, depicts a basket of fruit with a citron and a lemon clearly differentiated.[99] The counter-argument on the accuracy of these representations of citron and lemon as proof that they were grown in Pompeii at the time of the eruption is that such visual compositions derive from book patterns which had Mediterranean-wide distribution and did not necessarily reflect local flora. By late antiquity, however, the citron and/or the lemon were grown around Naples: Palladius, the author of the

In the Garden of Hercules the cavity of a large root extending from one of the *ollae*, once casted, resembled the root of a citron or lemon tree in the opinion of Dr Fideghelli: see Jashemski 1979–93, vol. II, 602.

[93] Theoph. *Hist. Pl.* 4.4.3. [94] Plin. *HN* 15.47.

[95] Plin. *HN* 12.16, trans. H. Rackham, Loeb edn: *temptavere gentes transferre ad sese propter remedii praestantiam fictilibus in vasis, dato per cavernas radicibus spiramento . . . sed nisi apud Medos et in Perside nasci noluit*.

[96] The one grain of pollen of a citrus species was found in a channel: van Zeist, Bottema, and van der Veen 2001, 32.

[97] See footnote 102 below on the complex taxonomy of citrus fruits. The lemon is either a hybrid of the citron and the sour orange (itself a hybrid of the pomelo and sweet orange) or a hybrid between citron and lime, which is a tri-hybrid of citron, pomelo, and wild species!

[98] Jashemski, Meyer, and Ricciardi 2002, 101.

[99] Inv. No. 58596, photograph in Jashemski, Meyer, and Ricciardi 2002, 102, fig. 84. A citron is clearly depicted together with two quinces also in a mosaic at El-Jem, from the House of the Dionysiac Procession.

agricultural treatise *Opus agriculturae*, mentions that citrons/lemons were produced on his Neapolitan villa estate.[100]

These difficulties of archaeological interpretation and visual representation notwithstanding, archaeobotany suggests, though, that some kind of citrus fruit – either the citron or the lemon, or possibly both – did grow in the Vesuvian area in the first century AD and that these fruit trees may have first arrived in the region sometime in the Republican period. Pollen of the genus *Citrus*, in low percentages, was identified from samples taken during the 1996 excavation at the House of the Wedding of Hercules and Hebes (VII.9.47); this attestation is significant for postulating the presence of a plant of this genus in this garden, despite the low concentrations, because *Citrus* pollen is almost never airborne.[101] Pollen, however, does not allow the secure distinction between citron and lemon.[102] In the case of these pollen samples, Mariotti Lippi very cautiously suggests that it might have been lemon rather than citron, because the reticulum of the pollen sample is similar to those of lemon pollen in reference collections.[103] The presence of cultivated citrus trees on the Bay of Naples is also attested by the identification of pollen of this genus from samples taken from near Lake Avernus.[104] More compelling still is the evidence for carbonized citrus fruits discovered in the Villa of the Papyri, which Ciarallo identifies, with no hesitation, with lemons.[105] Another carbonized fruit of the citrus family

[100] *Op. Agr.* 4.10: also his villa in Sardinia produced citrus fruits, whereas the villa near Rome produced quinces (3.25).

[101] Mariotti Lippi 2000, 206.

[102] The taxonomy and phylogeny of the many kinds of citrus fruit are very complicated and difficult to trace, since the various species are fully sexually compatible (so, besides human intervention, they can naturally cross with each other) and present a high frequency of bud mutations. As observed by van de Veen (2011, 83), this has a bearing on the degree to which archaeobotanical remains can be identified to species level: standard morphological criteria, the identification of different species from seeds or rind, are all very difficult in the case of citrus fruits, due to the high degree of hybridization among compatible varieties/species. Van der Veen reports that some scientists grouped together many citrus types, recognizing only 16 citrus species, while others classified 162 species. Recent studies employing molecular and biochemical techniques have proved that there are only three real species, the citron (*Citrus medica* L.) the mandarin (*Citrus reticulate* Blanco), and the pomelo (*Citrus maxima* Merr.), while all the other cultivated types of citrus fruits are, in fact, hybrids either natural or man-induced.

[103] Mariotti Lippi 2000, 210. Ciaraldi 2007, 113, Fig. 43 for one mineralized seed from the second phase of the House of Hercules and Hebe's Wedding which dates from the first half of the second century BC.

[104] Grüger and Tulin 1998, referenced in Mariotti Lippi 2000, 210.

[105] Ciarallo 2012, 120. However, these should be the same two charred fruits referred to by van der Veen (2011, 86) as not being identifiable at species level, and which Ciaraldi (2007, 139) thinks could have equally been citrons rather than lemons. She also mentions (at p. 113) two mineralized seeds of a citrus fruit recovered in Pompeii.

was discovered in 1831 near Torre del Greco, and subsequently donated by the king of Naples to the Archaeological Museum of Palermo in Sicily, but the find is now lost.[106] A possible lemon plant, as identified by carbonized wood from a tree air-layered in a broken amphora, was excavated near one of the statue bases in the garden of Oplontis villa A.[107] The identification suggested by Jashemski finds support in the more recent identification of pollen of citrus fruit from garden soil of the Oplontis villa.[108] Pollen of citrus from layers dated to the first century AD has also been identified in the cores taken during the excavation of the ancient harbour of Neapolis.[109] Furthermore, the identification of new carpological remains from Rome and Pompeii has offered new exciting data. In Pompeii, seeds of citron have been found in layers securely dated to the third/second century BC, whereas seeds and a rind fragment from a sealed deposit in Rome date to the Augustan period.[110] It has thus been suggested that both citron and lemon were present in Italy by the end of the first century BC.[111] It even seems possible that the citron had first been introduced to Campania by Phoenician traders (and then possibly reintroduced later in the Roman period): pollen of citrus fruit was discovered in the cores taken at Cumae from the ancient lagoon that was at the base of the site and dated to 896–657 (cal.) BC, but there are some issues with this dating and some scholars believe that 'this record cannot be used to accurately date the earliest introduction of citrus fruits into the Mediterranean, other than to say . . . that it was present by the 1st century BC'.[112] To sum up, the cultivation of both the citron and the lemon in Roman Italy looks much more likely than it did years ago. The dating of Rome's new carpological remains to the Augustan era and of the pollen from Naples' ancient harbour to the first century AD fits with the picture of greater importance and diffusion of horticulture and fruit tree cultivation in the early first century AD that I have presented in the previous chapters.

[106] Borgongino 2006, 34. [107] Jashemski, Meyer, and Ricciardi 2002, 101.
[108] Russo Ermolli and Messager 2013. [109] Russo Ermolli *et al.* 2014, 409.
[110] Pagnoux *et al.* 2013: five mineralized seeds and one carbonized seed were recovered in Pompeii from a well, archaeologically dated to the third to second centuries BC levels under the temple of Venus, whereas in Rome a sealed votive deposit under the floor of the Carcer Tullianum contained 13 seeds and a fragment of skin belonging to citrus fruit; these probably date to the Augustan era.
[111] Pagnoux *et al.* 2013, 436; contra this interpretation and expressing caution about other identifications of citrus/lemon: Kiehn 2020, 214.
[112] Pagnoux *et al.* 2013, 425, 435–6; Bouchaud *et al.* 2017, §1.

Gallia Cisalpina

Gallia Cisalpina, particularly the area corresponding to the modern region of Emilia Romagna, appears to have been another region of Italy crucial to fruit cultivation and possibly to the introduction of new types of fruit in the peninsula, as we have seen in the case of the peach. Cisalpine Gaul encompassed the largest alluvial plain of Italy and was obviously a fertile region. In the Roman era, successful vineyards had been established in parts of Cisalpine Gaul, but the area was particularly renowned for animal husbandry – the sheep and wool of Altinum and Mutina were famous[113] – and, of course, for cereal cultivation.[114] Strabo, in commenting on the agricultural fertility and resources of the region, mentions abundant production of wine stored in 'barrels larger than houses', pig rearing, wool, and pitch production.[115] According to Pliny the Elder, a common way of cultivating the grape vine found in parts of Cisalpine was to 'marry' the vines to trees, particularly to the elm, a technique confirmed by archaeobotanical discoveries from the territory of Roman Mutina consisting of remains of vines next to elm trunks.[116] Even marshy areas produced abundant wine yields, like Ravenna's, where the vines produced plentiful grape harvests but, according to Strabo, exhausted their productivity quickly, dying out within four or five years.[117]

If one had to characterize the typical agricultural strategies found on estates of Cisalpine Gaul, mixed agriculture and husbandry were the norm. A letter by Pliny the Younger to his friend Arrianus Maturus, a leading *eques* of Altinum, encapsulates this very well by making reference to the *arbusculae* (small trees), *vinae* (vines), *segetes* (cornfields), and *oves delicatissimae* (softest sheep) which were present on Maturus' rural estate.[118]

[113] Near Mutina, Campi Macri, possibly the modern Magreta locality, had been the seat of a periodic sheep market since the Republican period. Columella, *Rust.* 7.2.3 mentions the high-quality sheep to be found at Campi Macri. Wool and textile production remained an important part of Mutina's economy until late antiquity (see, e.g., the mention in Diocletian's Price Edict of Mutina's wool, gold colour). Associations of wool producers/workers and carders (*lanarii et carminatores*, *AE* 1927.100, 1946.210; *CIL* 11.1031) are known from the area around Mutina. Noteworthy in connection to Mutina's textile industry is also the abundant archaeobotanical evidence (1,625 seeds), from a context dated to the first century AD, for *Reseda luteola* L., a plant used to produce a yellow dye: Rinaldi *et al.* 2012.

[114] Pliny (*HN* 14.39, 35.161) gives as the major productions of Mutina and its territory wool, wine, and pottery.

[115] Strabo 5.1.12. On wool production in the whole of Roman Cisalpine, see Busana *et al.* 2012.

[116] Bosi and Marchesini 2017. See also the webpage on the economy of Mutina by the Musei Civici di Modena: www.mutinaromana.it/it/leconomia-di-mutina (accessed 14 September 2020).

[117] Strabo 5.1.7. [118] Plin. *Ep.* 2.11.25.

https://doi.org/10.1017/9781009121958.008 Published online by Cambridge University Press

This is a picture well confirmed by archaeological data, showing the importance of animal husbandry and cereal cultivation in the region.[119] But just as Pliny's word *arbusculae* hints at arboriculture being one of the things pursued on Maturus' estate, so do we have an indication that some specific areas of Cisalpine Gaul distinguished themselves also for horticulture and fruit tree cultivation. Individual localities came to be known for specific horticultural products, for instance the extraordinarily large asparagus that, according to Pliny the Elder, were grown in Ravenna, and the fine apples cultivated on estates belonging to Gaius Matius near Aquileia and then sold in Rome, which I have mentioned earlier in the book.

A reference to estates of the wealthy engaging in large-scale commercial horticulture/arboriculture can be found in the bronze tablet from Veleia, near Piacenza in Emilia Romagna, dated to AD 112. This famous *Tabula*, which attests Trajan's alimentary scheme, lists the local landowners who were indirectly funding the scheme by taking out loans from the imperial *fiscus*, pledging their properties as securities.[120] The emperor disbursed more than 1 million sesterces in loans at 5 per cent interest; the return on these was then used to support 300 children of the town. Among the wealthiest proprietors, we find a woman, Cornelia Severa, who owned a varied portfolio of properties in the territory of Veleia and of Placentia, valued at a total of 1,158,150 sesterces. Among her properties listed in the inscription there are also the *horti Publiliani Fadiani*, worth 26,000 sesterces. These *horti* were located in one of the *pagi* of Placentia, the *pagus Salutaris*, and in all likelihood need to be understood as fruit orchards and not as the type of luxurious suburban residences we have encountered in Chapter 1.[121] The *Tabula* only broadly defines the types of property, using categories such as *fundus*, *saltus*, and *agellus*, and in the case of *fundi* it is not possible to know what was actually cultivated on these estates. The seventeen properties declared by Cornelia Severa vary in value from 22,000 sesterces, the lowest value given, to 200,000, the highest referring to a *fundus* with *oviles*, sheep pens. Without knowing the actual size of these properties and other details, it is difficult to give a definite assessment, but none of the entries in this important document refer to luxurious suburban properties; they all concern agricultural estates and

[119] For a quick overview, Busana and Forin 2020; see also Busana 2005; Bonetto 2007.
[120] *CIL* 11.1147.
[121] *TV*, v.55–100; Criniti (1991, 151) translates this as *frutteti*, fruit orchards. Unfortunately, the *Tabula*, while it details the monetary value of the properties, what kind of property they were, and how much the owners were receiving as a loan, does not give the dimensions of the properties. The *horti* of Cornelia Severa are the only *horti* listed in the *Tabula*.

pastures, and therefore this fact warrants understanding Cornelia Severa's *horti* as orchards. It is, however, the archaeobotanical evidence from northern Italy that clearly attests the diffusion of horticulture in this region in the Roman era, particularly during the first two centuries AD. Not only does fruit become extremely well attested at all kinds of sites in this period, but a number of fruits/nuts such as mulberry, almond, and peach appear in northern Italy for the first time in the period between the late first century BC and the second century AD.

As explained in the Introduction, carpological remains are best preserved in waterlogged conditions, whereas cereals are mostly attested as charred remains; this different survival rate of the various plant remains depending on the preservation conditions obviously affects recovery rates and means that some types of plant can be underrepresented in a given context. The recovery of waterlogged plant remains is more common in northern Italy than in the southern regions because of environmental differences (in the Padana Plain, ancient layers are commonly found below several meters of alluvial sediments and are often below the water table) and also because archaeological investigations there have given more attention to environmental analysis. Sites in northern Italy have been archaeobotanically studied over several decades, so a relatively large dataset exists.[122]

Survey of the evidence pertaining to northern Italian funerary contexts, particularly burnt offerings at the tomb on the occasion of cremations and commemoration rituals dating from the first century BC to the third century AD, has identified a range of plant remains.[123] Cereals, which survive well in charred conditions, are well represented, together with several pulses (field bean and lentil being the main types), although the authors of the study note that identification of legumes is often difficult due to the fragmentation of the seed. Among the fruit attested there was fruit that was clearly imported, for instance the date (*Phoenix dactylifera*),[124] and types that most probably had local origin, since their

[122] See records in the online database BRAIN = Botanical Record of Archaeological Italian Network.

[123] Rottoli and Castiglioni 2011. Note the authors' important caveat that since the data pertained to different projects carried out by different teams over a long time period, sampling strategies were not uniform and often sampling was manual collection in response to visual recognition (p. 496): this obviously greatly affects recovery rates and recovery bias.

[124] Dates were recorded at 13 sites, and in graves of individuals of higher rank: Rottoli and Castiglioni 2011, 502. The palm can grow in some parts of Italy and it was planted in Roman gardens as attested by wall paintings and archaeological evidence, for instance from the garden of Villa Arianna in Stabiae. However, the date palm will not produce fruits that reach maturity in the Italian climate. On these points and a possible Augustan connection for palms in first-century

cultivation is known from other sources: grape, walnut, hazelnut, pine nut, fig, and peach. Although these imported dates do not seem to have been widely consumed as food, they were relatively frequent as ritual offerings: the only find of dates in a residential context comes from a luxurious *domus* in Cremona which is believed to have belonged to an imperial functionary.[125] The pine nut, fig, and peach could also have been imported from further afield, in preserved form in the case of the perishable fig and peach, whereas pine nuts left in the cone can last for a long time, but as we have seen in the previous chapter, the presence of peach stones at so many sites in eastern Cisalpine Gaul during the imperial era strongly suggests that the peach was cultivated locally.[126]

As remarked by Rottoli and Castiglioni, 'The evidence regarding fruit, given the scarcity of data from contemporary settlements, constitutes a precious source of information about trading and the introduction of several plants into northern Italy, in addition to more strictly symbolic and ritual aspects.'[127] While offering certain fruits during cremation (particularly grape and hazelnut) had been a ritual attested already in the Iron Age period prior to the incorporation of the region into the Roman state, rituals of the Roman period indicate the continuation of these practices but with significant addition of new fruits. These new species indicate that the area witnessed an increase in vegetable and fruit growing and in storage processes in Roman times.[128] Fruit plants and vegetable plants whose cultivation is thought to have been introduced, or become more common, in the Roman age, include olive,[129] grape,[130] the bottle gourd (*Lagenaria siceraria*), pomegranate, plum, melon/cucumber

private and public gardens, see Marzano 2014. According to the data in Bosi *et al.* 2020, remains of dates and pine nuts are attested at both religious sites/cemeteries and inhabited sites but are much more frequent as offerings at tombs and religious sites.

[125] Bosi *et al.* 2020, 688.

[126] Pine nuts in the incubating cone will remain in good condition and last for a long time. Pine cones were traded in the Roman world, and reached regions where *Pinus pinea* did not grow, such as the Egyptian Eastern Desert (whether in the form of wine amphora stoppers or per se, it is not always clear) and Britain: see van der Veen 2011, 156–8; Lodwick 2017a.

[127] Rottoli and Castiglioni 2011, 501.

[128] Rottoli and Castiglioni 2011, 501.

[129] Finds of olives from cremation burials are not very common (attested at only six sites); Rottoli and Castiglioni (2011, 502) report that small olive groves were planted in the Roman period around lakes Garda, Como, and Maggiore; these are areas with a more temperate microclimate than the rest of the region, so where olive could have grown.

[130] Grape was present in the Iron Age, but it became widespread from the early Roman period. Its presence is often indicated by pollen percentages compatible with in loco cultivation: Bosi *et al.* 2020, 691.

(*Cucumis melo/sativus*),[131] peach, and jujube (*Ziziphus jujuba*).[132] Peach, recovered from seven burial sites, has more attestations than jujube, perhaps because the peach stone, being larger than the jujube seed (which is like an olive stone), was more often visually recognized in excavation and manually collected. Both plants, which according to Pliny the Elder were introduced into Italy in the first century AD,[133] are thought to have become rapidly widespread and cultivated in northern Italy.[134] It was not only food plants that became more varied from the late Republic onwards, but also ornamental plants that have become, in Rome herself, staples of Roman gardens such as box and plane. In suburban and urban contexts of Roman Mutina these two ornamental plants are well attested.[135]

A recent, more comprehensive review of the archaeobotanical data for the whole of Roman northern Italy, which has taken into account 114 sites of different types,[136] has confirmed this general picture of increased horticultural variety in the Roman age, adding nuances to the reconstruction by the inclusion of data also from 'habitation' sites, both urban and rural, alongside cemeteries and religious sites. Among the cereals,[137] the most frequent are naked wheats (*Triticum aestivum/durum*) and barley (*Hordeum vulgare*), followed by emmer and millet, but the presence of these last two grains diminishes in the first century AD. As discussed in the next chapter, naked wheats, which are less suitable to long-term storage than husked grains, indicate a market agricultural economy catering to urban centres where the processing into flour and then into bread took place, rather than agricultural strategies more focused on subsistence. Naked wheats are one of the signs for urban aggregate demand for certain types of foodstuff, that same type of aggregate demand that, as we have

[131] About *Cucumis sativus*, the cucumber, according to Janick, Paris, and Parrish (2007), there is no textual or iconographic ancient evidence that corresponds to the cucumber, despite this being the normal translation for the Latin *cucumis*; they believe the term in the existing texts intended to refer to the so-called snake-melon (*Cucumis melo* L. subsp. *melo* Flexuosus Group). See also Paris and Janick 2008.

[132] Outside Cisalpine Gaul, but still in the north of the Italian peninsula, jujube is attested from first-century AD layers from the bottom of a well at Vada Sabatia in Liguria: Arobba, Bulgarelli, and Caramiello 2010, 125. This fruit is not attested in Central Europe and Britain for the Roman era: see Bosi *et al.* 2020, Table 1.

[133] See discussion in Chapters 2 and 5.

[134] Rottoli and Castiglioni 2011, 503.

[135] Bosi *et al.* 2015, 28.

[136] Bosi *et al.* 2020: 114 sites, dating from the third century BC to the sixth century AD and comprising 70 sites in the 'inhabited places and infrastructure' category (group A) and 70 religious or funerary sites (group B; 39 were cemeteries).

[137] Found at 86 per cent of type A sites and 61 per cent of type B sites.

seen in Chapter 3, is the catalyst for the development of large-scale commercial fruit cultivation.

In the case of fruit and nuts, the latest available data show a striking trend: these are the most common archaeobotanical remains recovered. They are present in 91 per cent of the A and 86 per cent of the B sites. The most frequently attested fruits/nuts are walnut, grape, hazelnut, olive, and peach. Other fruits often found at the A sites are sweet/sour cherry, bullace, damson, and sloe, while pears and apples have frequencies of between 6 and 11 per cent at both site types. Melon also seems to have been present in the vegetable gardens of Cisalpine, occurring at 9 per cent of the A type sites, whereas, despite the new data of the last nine years, cucumber and watermelon remain very rare.[138] Watermelon is, in fact, attested only at one site of the imperial age located in Emilia Romagna, probably an import rather than grown locally,[139] but its presence is still noteworthy since not everyone agrees that it was widely cultivated by the Romans.

Cultivation of nuts is also well attested in parts of Cisalpine Gaul in the Roman period; I have mentioned earlier the frequency, in the archaeobotanical record, of walnuts and hazelnuts. Local cultivation can be posited with some confidence in a number of instances when macro-remains are backed up by pollen and wood remains. For instance, pollen studies for Roman Modena show that chestnut, and to a lesser degree walnut, were fairly common and that, while cereals were the main crops grown on drained wetlands, in the Republican and imperial phases a sparse tree forest covered the plain.[140] Ancient Parma also displays, for the Roman era, an increase in chestnut pollen, which can be taken as indication of chestnut cultivation, as well as of elm. The recovery of numerous grape seeds, whose morphology suggests cultivated varieties, suggests local cultivation of vines trailed on trees, since, as mentioned earlier, elm was a common choice.[141]

Obviously, changes in horticultural practices in the Roman period did not mean the obliteration of earlier traditions and practices. There are a

[138] Bosi *et al.* 2020, 688: cucumber (*Cucumis sativus*) is attested only at two sites, and watermelon (*Citrullus lanatus*) at one site only. Melon seeds recovered from a well at the rural villa of S. Agata Bolognese attest the cultivation of melon in the area as early as the first century AD: Casi 2015, 65.

[139] Mazzanti Bandini *et al.* 2000; the authors considered 11 sites. See p. 67 for the watermelon. Bosi *et al.* 2020, 692.

[140] Bosi *et al.* 2015, 23–7.

[141] Mercuri *et al.* 2012, 25. Archaeobotanical data from Parma attest the cultivation of fig, apple, pear, and grape, but no fruit of the *Prunus* group is attested, either wild or cultivated.

few remarkable examples of continuity in the use of specific types of fruit, such as the case of the 1,500 endocarps of cornel (*Cornus mas*) discovered in the production area of a Roman Republican site in Cremona, interpreted as waste from the preparation of syrup or fermented beverage. Cornel had been abundantly consumed in that area since the Neolithic.[142]

The noticeable increase in the presence and variety of cultivated fruit at Roman sites of the imperial era is clearly seen for the Emilia Romagna region. A review of the available archaeobotanical evidence (largely endocarps recovered in waterlogged conditions) from northern Italy published in the year 2000, which focused on fruit only, had already highlighted the range of fruit consumed in Emilia Romagna in the Roman era. The attested fruit included 'common' fruit such as apple, pear, and plum, and exotic fruit such as the peach. Although these data came from only eleven sites, which may seem too sparse for overall generalizations and delineation of trends, they still represented a rich archaeobotanical dataset for Roman Italy, now confirmed by more recent finds.[143] More recent archaeological investigations at the Roman rural villa of S. Agata Bolognese offer some information on horticultural production from a non-urban context. At this villa, occupied from the second half of the first century BC to the late third century AD, besides viticulture, probable cultivations included cherry, plum, walnut, and melon.[144] It is also worth noting that one of the sites included in the Roman Modena study shows the presence of a varied range of cultivated plants, not only food plants, only in the first and second century AD layers.[145] Agriculture as a whole seem to have been more intense in the early imperial age.

Increased variety of fruit and vegetables in circulation when compared to the Iron Age also occurs in the northwestern coastal part of Italy, but perhaps a bit later than in the northeast. The archaeobotanical finds from a Roman well at Vada Sabatia, in association with an area interpreted as warehouses in the ancient port quarter and covering a chronological arc from the first to the fourth century AD, attests the presence of walnut, chestnut, and grape (in all periods, but more abundantly in the third- and

[142] Bosi *et al.* 2020, 691: site 32 A = Cremona – Piazza Marconi. The authors note that Columella (*Rust.* 12.10.2) writes that cornel and wild plums were preserved just like olives, in cooked wine, vinegar, etc.

[143] Bosi *et al.* 2020.

[144] Grape cultivation / wine production is attested by a *cella vinaria*, a wine press area, and grape pips recovered from the well; other plants are attested by wood, leaves, carpological remains, and pollen (Casi 2015).

[145] Bosi *et al.* 2015.

Table 6.1. *Cultivated and wild fruit types according to the data in Mazzanti Bandini* et al. *2000*

2nd-1st c. BC	AD 15/40 –4th c. AD	5th-7th c. AD
11 fruit types	18 fruit types	13 fruit types
5 cultivated	12 cultivated	8 cultivated
4 wild (+2 uncertain)	4 wild (+ 2 uncertain)	5 wild

fourth-century layers), together with beets, cabbage, cucumber and/or melon (*Cucumis sativus/melo)*, lentil, fava bean, and flax; these plants may all have been cultivated near the well.[146] Fruits recovered in numerous exemplars include peach, sweet and sour cherry, and plum, which also may have been cultivated locally, although their import as preserved fruit, considering that the well was near a port, cannot be excluded.[147]

When considering the overall evidence for all types of fruit that were recovered from these archaeological investigations (including wild and cultivated plants), some interesting conclusions can be posited. First, the number of cultivated fruit plants attested in the archaeobotanical record increased markedly in the Roman imperial period when compared to the Republican period (second to first centuries BC) *and* also to the late antique period (fifth to seventh centuries AD) (Table 6.1).[148]

Second, among the greater *variety* of fruit attested for the imperial period, there are various 'exotic' species (peach, almond, cherry-prune) and a strong prevalence of members of the *Prunus* species of the *Rosaceae* family: sweet cherry, damson, almond, and plum. These fruit trees are not attested in late antiquity, with the exception of the peach. Lastly, as far as the peach is concerned, the size of the stones recovered from archaeobotanical deposits of the early imperial age, measuring up to 3 cm in length, indicates that they were large fruits, whereas in late antiquity both the size and frequency of peach stones diminish.[149] These data point to a very high investment in fruit cultivation in the imperial period. Large fruits are the result of well-tended plants; they show labour, use of manure and irrigation, experimentation with grafting and selection of desirable characteristics in the plant/fruit, availability of good cultivars, and reproduction of plants via vegetative propagation. In late antiquity, on the contrary, the

[146] Arobba *et al.* 2013. [147] Arobba, Bulgarelli, and Caramiello 2010, 126–7.
[148] Mazzanti Bandini *et al.* 2000, 67–8. [149] Mazzanti Bandini *et al.* 2000, 80.

disappearance of other *Prunus* species and the persistence only of the peach, but smaller in size, suggest less intensive care in fruit cultivation.

This 'horticultural history' for Emilia Romagna is also confirmed by the current available archaeobotanical data for most of northern Italy: the highest variety in terms of fruit occurred in the first and second centuries AD, with ten fruit taxa attested only in these phases and not in the later imperial period.[150] Bosi and her co-authors also firmly conclude that 'In the Roman period of Northern Italy, fruit, which was increasing both in variety and quantity of archaeobotanical remains, appears to be one of the most important elements to highlight a change from the past.'[151] To sum up, people ate better and more varied fruit after the late first century BC, increasingly less good and with fewer choices after the fourth century.

What happened between the second century and the later empire to change this picture of horticultural diversity and investment in arboriculture in northern Italy? A possible explanation is environmental. Changes in climatic conditions between the early and mid empire, a time when the so-called 'Roman Climatic Optimum' was still in place, and late antiquity, when climate seems to have become unstable and wetter, may have had an impact on the variety and strength of arboriculture in these northern regions in the earlier period and its later partial demise.[152] It has been noted that 'in the 5th to 6th century AD the onset of a comparatively colder and damper climate is manifest, with a probable increase in rainfall and flooding. This is also demonstrated by the notable variations in depositional dynamics in the Po delta.'[153] These more unstable hydrogeological conditions are likely to have had an adverse effect on cultivations, particularly on vineyards and orchards. Besides the reduced variety of fruit attested in the later imperial period, other elements may be indications of wetter and colder climate. The chestnut, which as we have seen in Chapter 4 was not much appreciated as food in the early empire, but was cultivated for its wood, seems to have slowly increased its role in the diet of the inhabitants of northern Italy starting from the third /fourth

[150] Bosi *et al.* 2020, 691–2. These taxa are *Cucumis melo*, *C. sativus*, *Citrullus lanatus*, *Lagenaria siceraria*, *Diospyros lotus*, pine nuts (of *P. pinea* and *P. cembra*), *Punica granatum*, and *Ziziphus jujuba*. Although the chronological periodization (third to first centuries BC; first to second centuries AD; third to fourth centuries AD; fifth to sixth centuries AD) followed in Bosi *et al.* 2020 is different from that adopted in Mazzanti Bandini *et al.* 2000, the overall trends identified correspond.

[151] Bosi *et al.* 2020, 692.

[152] On climate change, see McCormick *et al.* 2012; McCormick 2013; Manning 2013, and for an overview of the debate and data, Harper and McCormick 2018.

[153] Bosi *et al.* 2020, 693.

century onwards. It is in this period that the nut is attested for the first time, archaeobotanically, at domestic sites, whereas in the earlier period it appeared only at cemeteries and religious sites.[154]

These changes, together with the increased presence, in third- and fourth-century sites, especially in the plain, of rye, a cereal which is more tolerant of poorer soils and colder temperatures than other grains, do suggest a less varied agriculture from the third century AD onwards, possibly due to environmental changes. However, while climate may certainly have contributed to changes in the intensity and diversity of fruit cultivation in Cisalpine Gaul, other archaeological data point rather to disruption in the supply–demand mechanism as a major cause.[155] Depopulation of the countryside in northern Italy after the peak reached in the early second century AD is evident from the archaeological record, and a number of Roman rural sites and also urban houses in Emilia Romagna show signs of abandonment and violent destruction as early as the third century AD.[156] In this part of northern Italy, late antiquity was a time when the number of rural settlements and the size of urban settlements diminished and disruption in trade networks and social structure due to war were present. In the second half of the third century AD the Iutungi invaded Italy and battles took place in eastern Cisalpine at Placentia, Fanum, and Pavia.[157] In this period, the Roman empire at large was also affected by the so-called Plague of Cyprian (AD 249–62), a pandemic which, for some scholars like Kyle Harper, nearly caused the total collapse of the empire.[158] Later, the sixth century was marked by both the Justinianic Plague (541–3) and, in Italy specifically, by the long Gothic War (535–54). The collapse of urban living, accompanied by war ravaging the countryside, was certainly not conducive to the large-scale arboricultural activity that can be posited for the early imperial period. Demand contracted and other more basic food plants became a priority at a time when fields and their very ownership were not as secure as before. As the urban growth during the first and second centuries AD and the settlement of the veterans of Actium in eastern Cisalpine had caused

[154] Bosi *et al.* 2020, 693–4. At a villa at Cislago a large *olla* was found containing wheat, rye, and chestnuts, possibly a mixture to be ground up to make bread.
[155] Marzano 2021.
[156] For archaeological data showing contraction in the number of settlements from the third century onwards, see, e.g,. Calzolari, Campagnoli, and Giordani 1997; Matteazzi 2014; Toniolo 2000.
[157] *SHA*, *Aurel.* 21.1–3, 18.4, 19.4; Aurelius Victor, *De Vita et Moribus Imperatorum Romanorum*, 35.2.
[158] Harper 2017, 119–45.

considerable investment in drainage works and in expanding the land devoted to agriculture, so the demographic contraction and unstable political situation of the later empire greatly affected agricultural strategies.[159]

In conclusion, the picture that emerges by combining the textual evidence with archaeobotanical and archaeological data for the cultivation of fruit trees and vegetables in ancient Campania and eastern Cisalpine Gaul, though admittedly fragmentary and incomplete, suggests that in the early empire horticulture in these two regions was particularly developed and was an important component of the local economy. In both Campania and eastern Cisalpine Gaul, the first century AD is marked by a higher number and greater variety of fruits available and, as mentioned in the case of Pompeii on the basis of the evidence from the woods used for fuel, by an increased cultivation of fruit trees. Both regions may have been the geographic areas where some of the new fruit trees coming from the eastern Mediterranean regions were first introduced to Italy: Campania in the case of the citron/lemon and Cisalpine Gaul for the peach. Both these regions had a major port, Puteoli and Aquileia respectively, which ensured connectivity and high volumes of trade from the whole Mediterranean.

It may be relevant that Campania was a region where wealthy Romans had owned villas and estates since the mid Republican period.[160] Not only did the presence of opulent villas and their wealthy occupiers stimulate the demand for luxury foods and high-quality fresh food, it may also have actually directly contributed to the development of new varieties and the acclimatization of exotic plants because the owners of these estates could afford to devote part of their lands to cultivations that required years to reach full productivity and the specialized slave-arboriculturists who, we must assume, were behind the creation of many of the new varieties of fruit discussed in Chapter 4. We have seen earlier in the book that there were links between eastern Cisalpine Gaul and some prominent individuals of the first century AD who had an interest either in horticulture or in acclimatizing new plants in Italy. Whether these men were intimately involved in these projects is not known, but their properties and the personnel of their estates may have participated in innovations and the development of large-scale commercial fruit cultivation that took off in the early imperial period. There was a combination of favourable conditions for these developments: sufficient aggregate demand and the presence of

[159] Marzano 2021. [160] D'Arms 2003 for Roman elite owners on the Bay of Naples.

wealthy estates whose owners could afford the long-term planning and investment of time and money arboriculture entailed.

The discussion presented in this chapter shows that the Augustan 'horticultural' revolution addressed in Chapter 3 was not limited to the city of Rome and its environs. Campania and eastern Cisalpine Gaul were regions where horticulture, not just wine production, had a notable impetus in this period, with tangible changes in both the local economies and the diet of the people. The late antique trajectory these two regions followed was different. This different evolution shows that thriving cities, sufficient aggregate demand, and wealthy consumers who were also landowners, were instrumental in sustaining commercial horticulture, especially fruit tree cultivation. In late antiquity, on Palladius' Campanian estate one could find citron/lemon trees. In the north of Italy, not only do various previously common fruits disappear from tables and orchards, some, like the apricot, are also completely forgotten until their rediscovery in the Middle Ages.