Cato, *On Farming* transl. by A. Dalby (1998)

NOTE: You ARE NOT required to read the entire work (you may if you want). Read the sections entitled "**Buying and Developing a Farm**" and "**Rituals and Forms of Contract**" in full; for the rest just be sure to read some from each section—let your interests guide you. You should read ca. 50 pp. total.

PART ONE
<https://web.mit.edu/21h.302/www/local/cato_de.agr.pt.1.pdf>

PART TWO
<https://web.mit.edu/21h.302/www/local/cato_de.agr.pt.2.pdf>

Preface

Trading can sometimes bring success, but it is insecure; so can money-lending, but that is not respectable. So our forefathers thought; and so they enacted that a thief should pay any penalty twice over, a money-lender four times over, which allows us to infer how much worse a citizen they thought a money-lender was than a thief.[1] When they wanted to say that a man was good, their highest compliments were to call him 'a good farmer and a good husbandman'. I believe that a trader may display bravery and skill in the course of trade, but, as I said above, it is insecure and liable to disaster. As to farmers, their offspring are the strongest men and bravest soldiers; their profit is truest, safest, least envied; their cast of mind is the least dishonest of any. This is sufficient preface: now to my subject.

Buying and Developing a Farm

Selecting the Property

1. When thinking of running a farm, always remember: do not buy on a whim, take the trouble to visit, do not suppose a single look will be enough. If it is a good property, then the more you go, the happier you will be. Notice the looks of the neighbours. In a good district, they ought to look well. And while you visit and inspect, leave yourself a way out.

(1) 'Asked on one occasion what was the best investment, Cato replied, "Good stock-keeping." What came second? "Fairly good stock-keeping." What came third? "Bad stock-keeping." What came fourth? "Crops." The next question was, "What about money-lending?" To which Cato said, "What about murder?"' (Cicero, *On Duties* 2.25.89).

It must have good weather; it must not be liable to storms. It must thrive from its own excellence and from its good location: if possible, it should be at the root of a mountain,[2] south-facing, in a healthy position. There must be plenty of labour and a good water supply. There must be a sizeable town nearby, or the sea, or a river used for traffic, or a good and well-known road.[3] It should be one of the properties that is not always changing its owners, and whose sellers regret having had to sell.

It should have good buildings: never carelessly dismiss another's expertise. It is better to buy from a good husbandman and a good builder.[4] When you come to the farm buildings, check that there are plenty of presses and vats[5] (remember that the lack of them means a lack of produce) but not too much farm equipment. It is to be in a good position: see that it is not wasteful, and requires the least possible equipment. A property, like a man, may bring money in, yet be so wasteful that little is left.

If you ask me what would make a farm the first choice, I will say this: varied ground, a prime position and a hundred *iugera*;[6] then, first the vineyard (or an abundance of wine), second an irrigated kitchen garden, third a willow wood, fourth an olive field, fifth a meadow, sixth a grain-field, seventh a plantation of trees, eighth an orchard, ninth an acorn wood.[7]

(2) 'Take care to locate the farm **at the roots of a wooded mountain**, where there are ample pastures' (Columella 1.12.1), because winter pasture rights could be profitably sold (see ***149***).

(3) 'Not far from **the sea** or a navigable **river**, so that produce can be carried out and purchases fetched in' (Columella 1.2.3) to and from the **sizeable town** with its market (compare Varro 1.16.2–3). The road should not be *too* close, because 'thefts by passers-by and the continual putting-up of travellers are bad for prosperity' (Columella 1.5.7).

It is interesting to read Pliny the Younger, *Letters* 3.19 (nearly three centuries after Cato) running through the reasons for and against buying a farm he had his eye on.

(4) To complete the thought: If the seller was one of these things, he was probably both. And to buy a farm that requires buildings immediately is a heavier investment.

(5) See ***11***.

(6) On the question of minimum and ideal acreage see also note at ***3***.

(7) Scholars have differed over the purpose of this list (see Toynbee, *Hannibal's legacy* vol. 2, pp. 300–302; Astin, *Cato*, pp. 346–8). Even Roman authors such as Varro and Pliny did not take Cato's point, and puzzled over why vines come first and olives come fourth. As we shall see later, the main produce of the farm that Cato has in mind is to be

2. Each time as master you visit the farm, you must first greet the Lar of the Household.[8] Then go round the property – that day, if you can; if not that day, the next. As soon as you are clear how the business stands, what tasks are done and still to do, next day you should send for the manager and ask him how much of the work is finished, how much remains, whether what is done was done in time and there will be time to do the rest, and how it is with the wine, the grain and everything else singly.

When you have this straight, you can get down to calculating people and days' work.[9] If the work seems wanting the manager will say that he has done his best, slaves were sick, the weather was bad, slaves ran away or were requisitioned for public works: when he has put these and all his other arguments, bring him back to the calculation of workers and their work! If there was rainy

olive oil or wine. What he gives here is quite distinct: a list of added-value features whose presence — independently of whatever is the main produce — helps to promote self-sufficiency, to reduce marginal expenditure and to provide added sources of profit.

That is why, in this context, there is less need for a **vineyard** if the neighbourhood already offers abundant, and therefore cheap, wine. But, if not, wine can be made on a small scale for domestic use without expensive presses.

Olives come lower in the list because, although the production of *table olives* and relishes provides a valuable food adjunct (examples later in the text), their contribution is not as essential to the household as that of wine. The making of olive *oil* is irrelevant to this particular list: it requires investment and must be done as a main activity if at all.

Cato returns to the **kitchen garden**, **plantation**, **orchard**, meadow and **willow wood** below (***6–9***). The willow wood is principally to provide vine supports (see note at *6*). The **acorn wood** feeds oxen (***54***, ***60***) and pigs (Varro 2.4.6).

'Cato reminded us that a **meadow** does not risk storm damage like other parts of the farm, and while requiring little investment it offers a return every year – a double one, in pasture as well as in hay' (Columella 2.16.2). This is Columella's own interpretation of Cato's logic in the present passage and in other references to meadows in *On Farming*.

(8) The **master** is *pater familias*, literally 'the father of the family'. But *familia* in Latin really meant 'household' – wife, sons, daughters, and also slaves, including the farm's labour force. The Spirit or **Lar of the Household**, *lar familiaris*, whose statuette would be placed in a niche in the kitchen, watched over the slaves of the *familia* and was honoured by them (***143***). On the **manager**, *vilicus*, see *5*.

It is amusing to read Horace's poetic discussion with his farm manager (*Epistles*, 1.14) alongside Cato's businesslike chapter.

(9) Columella (2.12) calculates the number of days' labour required in various planting and harvesting tasks.

weather, what work could have been done while it rained? — washing and pitching vats, cleaning farm buildings, shifting grain, shovelling dung, making a dung-heap, threshing grain, mending ropes and making new ones; the slaves could have been patching their own cloaks and hoods.[10] On holidays they should have cleaned out blocked ditches, mended the public road,[11] cut back hedges, dug the vegetable garden, cleared the meadow, cut sticks, pulled out brambles, husked the emmer, tidied up.[12] While slaves were ill they ought not to have been given as much food.

When it is clear without dispute what work lies ahead, you must arrange for it to be done. You must check the figures for money and grain, check what is set aside for fodder, check the wine and oil figures — what is already sold, and the income from this, what is still to be produced, and what it will fetch — agree the difference and take charge of the agreed sum.

You must take stock; order to be bought whatever will be needed during the year; order to be sold whatever will be surplus; order to be contracted whatever needs contracting. You must give verbal orders on work that you want done and work that you want

(10) **If there was rainy weather**: more detail is given at ***39***. **Pitching vats**: the task is explained by Columella (12.18.5–6) and in the *Geoponica* (6.4–8). '**Grain** is brought out of store in order to put a stop to infestation by weevils. When it is brought out, put basins of water around it in the sun. The weevils will gather at these and drown' (Varro 1.63). **Making a dunghill**: see also ***5***. On slaves' clothing see ***59***.

(11) One good reason for doing this was that if a mule-track (the most likely form of **public road**) became impassable, people and animals were legally entitled to find a path through adjacent private land (see Frayn, *Subsistence farming*, p. 74 on *Laws of the Twelve Tables* 7.7), with obvious consequences in damage to crops.

(12) **On holidays**, *per ferias*, there was no right to a day off but a religious requirement that certain kinds of work, minutely defined, should not be done: see also ***138***. Columella (2.21.1–5) offers a much longer list of permitted holiday tasks, beginning by quoting Vergil, who suggests these: 'No religious rule stops you from digging ditches, hedging a cornfield, bird-snaring, firing brambles, dipping a bleating flock in the wholesome river' (*Georgics* 1.268–272).

Husked the emmer: still the commonest species of wheat in Cato's Italy, emmer (*Triticum dicoccum*, Latin *far*) was stored in the ear and later parched and pounded to extract the grain (Varro 1.63). On kinds of wheat see note at ***34***; on equipment for emmer, ***10*** and note.

contracted, and also put the latter in writing.[13] You must inspect the animals, and you must sell at auction:[14] sell oil when it will pay; sell surplus wine and grain; sell aging oxen, runty calves, runty sheep; sell wool, hides, an old cart, old iron tools, an old slave, a sickly slave,[15] and anything else surplus. The master has to be a selling man, not a buying man.

The Farm Buildings

3. The master should get down to planting a farm while young. Building requires long thought: planting requires not thought but action. When one reaches the age of 36, that is the time to build – if you have a farm planted. Build then; and build so that the buildings will not be in want of a farm![16]

It is essential for the master to order well-planned workshops – an oil press room, a winery, plenty of vats so that one is free to wait for prices to rise, which will be better for income, better for self-esteem, better for reputation.

There should be good presses, so that the work can be done well. When the olive crop is in, the oil must be made at once or it will be spoilt. Think how often there are storms and the crop is knocked off the trees: if you gather quickly and the equipment is

(13) Cato himself is said to have kept a *grammatistes*, a Greek writing-master, to teach his slaves to read. Later, Varro thought it desirable that a farm manager should be able to read (1.17.4). Columella was not so sure (1.8.4). The written orders are to ensure that contracts entered into with third parties have proper authority (compare *5* and note).

(14) Auctions might apparently be very local affairs (Frayn, *Sheep-rearing*, p. 155), sometimes held at *compita* 'cross-roads' (Cicero, *On the Agrarian Law* 1.7; see note at *5*).

(15) **While slaves were ill ... ; an old slave, a sickly slave ...** 'A modern employer must calculate coldly how much to pay sick employees and how long to keep them on the books. Cato's abrupt statements still sound callous, and sounded so to his Greek biographer Plutarch (*Cato the Elder* 4.5, 5.1). For slave rations see *56*.

(16) Later writers, Columella (1.4.6) onwards, remembered this proverb with a corollary, '... nor the farm be in want of buildings'. If Cato added this clause, it has fallen out of the manuscripts. The essential point is that the buildings must not be larger and more expensive than is justified by the produce of the farm.

For building specifications see *14*. Details of oil-making equipment are filled in at *12*, the **crushing mills** at *20–21* and *135*, and the olive harvest at *64–7*.

Why at **the age of 36**? Scholars link this with the approximate end of a Roman citizen's liability for military service.

ready, the storm will have caused no loss and the oil will be greener and better, but if the crop lies too long on the earth or in the loft, it spoils, and the oil you make will be rancid. From any crop the oil will be greener, and good, if you make it in time. For 120 *iugera* under olives,[17] given good land, close planting and good farming, there should be two sets of presses: each with a good crushing mill, and these should be of different sizes so that when the millstones are worn they can be switched over; each press with its own leather ropes, and with six levers, twelve pins, its own leather straps and Greek pulley-blocks; each worked with a pair of esparto[18] ropes. The upper blocks should have eight sheaves, the lower six (if you have [single] blocks made, you will move more quickly): this moves quite slowly, but with relatively little effort.[19]

4. Good housing for oxen: good sheds, barred feed-racks. The bars should be a foot apart: if you make them so, the oxen will not toss their fodder out.[20]

Build the country house that you can afford. If it is a good property, and you plan the house well and site it well, and live comfortably when in the country, then you will visit more readily and more often, the farm will be better, less will be done wrong,

(17) The acreage assumed or recommended by Cato varies. At ***1*** he recommends a minimum of 100 *iugera* (25 hectares, 60 acres); here he calculates for an olive farm of 120 *iugera* requiring two sets of presses; at ***10–11*** he is working with an olive farm of 240 *iugera* requiring five sets of presses, or a vineyard of 100 *iugera*. See also White, *Farming*, pp. 389–395.

The allocation of land to Roman colonists at the resettlement of Carthage, in 122 BC, was 200 *iugera*. Cato gives us a fair indication of the level of investment they would have needed to run such an estate.

(18) **Esparto** (or Spanish broom, *Lygeum spartum*), Latin *spartum*, grows in southern Spain (Pliny 19.26–30). Products made of it were imported and marketed at Capua (*135*). For details of the presses see ***18*** and notes there.

(19) This difficult sentence is translated following R. Goujard, 'Trochileae graecanicae' in *Revue de philologie* vol. 46 (1972), pp. 56–60. See Vitruvius, *On Architecture* 10.2.5.

(20) The **oxen**, as will become clear, are working animals, not kept for milk or meat. Sheep are the milk producers in Cato's agriculture. 'Some animals are suitable for eating, such as sheep and pigs; some are for man's employment, such as horses and cattle' (Isidore of Seville, *Etymologies* 12.1.5).

and you will get more profit: 'Use your eyes!'[21] Be a good neighbour, and do not allow your slaves to do wrong. When the neighbourhood looks favourably on you, you will sell more easily, find contractors more easily, hire labourers more easily; if you build, they will help you with labour, draught animals, materials; if there is ever need (good luck!)[22] they will fight for you.

The Farm Manager

5. The manager's instructions will be these.[23]

To keep good order; to make sure they observe holidays;[24] not to touch others' property and carefully to look after the owner's; to prevent household quarrels; if anyone misbehaves, to give proper punishment in proportion to damage done. The household should not be in poor condition, or sick, or hungry: the work should keep them busy, and it will then be easier to prevent mischief and theft. If the manager does not allow mischief, there will be none (and if he has allowed it, the owner must not let this pass unpunished). He must reward good behaviour, so that others will want to do well.

The manager must not go about, he should be sober always and not dine out: he is to keep the household busy! He must take care that the owner's instructions are effected, and must not suppose that he knows better than the owner. He must consider the owner's friends his own, and must obey whomever he has been

(21) **Use your eyes**: the Latin proverb is *frons occipitio prior est*, literally 'the forehead comes before the back of the head'.

(22) **Good luck!**: Latin *bona salute*, 'in good health!', a superstitious interjection.

(23) Cato's rules for the *vilicus* or **manager** are partly an attempt to ensure that he has no relationships with, or obligations to, any gods or humans except through the owner. The post was one of great responsibility. A bad manager could do lasting damage to the owner's property and ruin his business and his relations with neighbours. The manager is assumed by Cato to be a slave rather than an employee: either was possible (Columella 1 preface 12, 1.7.1).

There is further instruction, particularly on the *vilica* or 'manageress', at ***142–3***.

(24) Different work must be done on religious holidays (compare ***2***).

instructed to obey. He must not perform rites at cross-roads or hearth, except Compitalia, unless instructed by the owner.[25]

He must lend to no one but ensure that the owner's loans are repaid. He must have no loans out to anyone, of seed for sowing, food, wheat, wine or oil: there should be two or three households from whom he can ask necessities and to whom he can give, but no others.[26] He must regularly make up accounts with the owner. He must not engage the same tradesman or jobber for more than one day.[27] He must not plan any sale unknown to the owner, or any business concealed from the owner. He must have no private friend;[28] he must make appointments with no diviner, soothsayer,

(25) **Compitalia**: a festival sacred to the *Lares Compitales*, 'spirits of the cross-roads', proclaimed each year in late December or early January in this fixed form of words: 'Nine days hence the Roman people, the *Quirites*, will hold *Compitalia*. Once they are begun, *nefas*' (Gellius, *Attic Nights* 10.24.3). The single word *nefas* said it all: 'anything that is forbidden by sacred law on holy days, is now forbidden'.

Compitum has to be translated **cross-roads** – but this gets nowhere in suggesting its importance. *Compita* were the smallest and least formal of rural communities, located at or within walking distance of their focal point, which would be a junction of paths or mule-tracks. Here religious rites were held: the Compitalia, naturally, but also others which Cato's *vilicus* is to be forbidden to attend. Here auctions took place (see note at *2*) as well as sports (Horace, *Epistles* 1.1.49). See Frayn, *Subsistence farming*, pp. 20–21.

(26) In a rural economy that as yet relied rather little on cash, it would be unrealistic to rule that the manager should not borrow necessities from neighbours or lend to them. Cato instructs that such ties must be kept to a minimum.

(27) Cato is advising the owner to reserve the right to make any contracts that will require more than a single day's paid work. (Note that R. Goujard, 'Politio' considers the manuscript text faulty at this point.) At *2* the corollary is given: when instructing that such a contract be made, put the instruction in writing. On contracts for jobbing harvesting see ***136***.

'Farmers prefer to have contractors in the neighbourhood with whom they can make an annual arrangement – doctors, fullers, blacksmiths – rather than to have their own on the farm, because in that case the death of a single craftsman might wipe out the farm's profit' (Varro 1.16.4).

(28) Client-patron relationships pervaded Roman society. An underlying aim in this chapter is to prevent the manager from becoming anyone else's client (e.g. by dining out) or patron (e.g. by having a dining companion unconnected with the owner). It would, however, be odd to suggest that a slave might be a *patronus* and have a *cliens*. For 'private friend' Cato therefore uses the term *parasitus*, familiar from the Greek comedies that were popular in Rome in his time. Origin of the English word 'parasite', it meant literally 'one who dines alongside' and through its comedy contexts suggested a confidant, a sponger, a bad influence.

fortune-teller or magician.[29] He must not cheat the grain-field, for that brings bad luck.[30]

He must ensure that he knows all the work of the farm, and must do it himself often, but not so much as to tire himself out. If he does this he will know what the household are thinking: and they, too, will work more willingly. If he does this he will be less inclined to go about, will keep healthier, and will sleep better. He must be the first up and the last to bed, having first seen that the buildings are shut up, that everyone is in bed in his proper place, and that the animals have fodder.

Memoranda for the Manager

Have special care taken of the oxen, and be a little indulgent to the oxherds so that they are readier to take care of the oxen.

Make sure to have good ploughs and ploughshares.

Take care not to plough carious land: drive neither cart nor herd on it. If you ignore this, where you drive you will lose three years' harvests.[31]

Sheep and oxen are always to have straw underfoot. Attend to their hooves. Avoid sheep and ox scab, which tends to follow hunger and exposure to rain.

Get each task finished in good time. If one thing is done late you will do everything late: that is how it is with farm work.

If short of straw, cut holm-oak boughs and spread them as litter for sheep and oxen.

(29) **Magician** is *Chaldaeus*, literally 'Chaldee'. Cato provides the earliest evidence that these Eastern magic-makers were at work in rural Italy. Roughly contemporary are the first occurrences of 'Chaldees' trading as magicians or astrologers in Aramaic literature (*Daniel* 1.4 and elsewhere) and in Greek (Eupolemus quoted by Eusebius, *Praeparatio Evangelica* 9.17; *Magic* attributed to Aristotle, fr. 35 Rose).

(30) Pliny 18.198–200 shows how to calculate the volume of seed per *iugerum*. He ends thus: 'So they advise between 4 and 6 pecks, adding or subtracting a fifth depending on soil quality. Here comes in the oracle that must be painstakingly observed, "**Do not cheat the grain-field**".'

(31) 'We shall take care not to work ground that is muddy or half-moistened by a light shower: countrymen call this land ... "patchy" and "**carious**"' (Columella 2.4.5).

Be sure to have a big manure heap. Store every bit of dung. Sort it and break it down as you shift it. Cart it out in autumn. Autumn is the time to trench round your olive trees and dung them. Cut poplar, elm and oak boughs at the same time and store them, not too dry, as fodder for sheep; the late hay and the grain stalks, too, but these you must store dry. Sow rape, fodder crops and lupin after the autumn rains.[32]

Notes on Where to Plant

6. On where to sow your crops you should work to these rules. A fat and fertile ground, with no trees, can be a wheat field.[33] One that tends to be cloudy should be sown with rape, radish, broomcorn millet, foxtail millet.[34] In rich and hot ground grow pickling olives: choose from *radius maior, Sallentina, orcites, posea, Sergiana, Colminiana, albiceres* whichever people say does best in your district. Plant this type of olive 25 or 30 feet apart. For an olive plantation the ground must face the Favonius and be sunny: no other will suit, but the *Liciniana* olive can be planted in a rather cooler and leaner soil. If you plant this last variety in a fat

(32) **Hay ... fodder crops and lupin**: see ***53–4, 60*** and notes. Further details on autumn tasks and on manuring: ***26–30, 36***.

(33) 'Many old writers on farming, as I recall, have given as clear signs that land is **fat and fertile** for **wheat** the inherent sweetness of the soil, its growth of plants and trees, its black or ashy colour' (Columella 2.2.14: he disagrees on the question of colour). On types of soil see also ***34***.

(34) **Rape**, as a root vegetable, is Latin *rapa* (André, *Alimentation*, pp. 15–16). '**Rape** ... is more profitable [than turnip, Latin *napus*] and feeds animals as well as man' (Columella 2.10.22).

Radish is Cato's *raphanus* (French *raifort*). A smaller, more delicate variety was introduced from the East, probably soon after Cato's time (cf. Columella 11.3.16, Palladius 9.5.1; André, *Alimentation*, pp. 16–17): this is later Latin *radix*, French *radis*.

Broomcorn millet (*Panicum miliaceum*) is Latin *milium*. **Foxtail millet** (*Setaria italica*) is Latin *panicum*. Foxtail millet served as fodder (***54***). Either of the millets 'makes a porridge which, particularly with milk, is not to be dismissed even in times of plenty' (Columella 2.9.19). 'Broomcorn millet is the best preventive of famine because it stands all weather conditions and never falls short, even when all other food plants fail' (Strabo, *Geography* 5.1.12). 'Growing broomcorn millet is strongly recommended as a preventive of famine. Ripe grains are pounded to extract the kernel, which provides meal not inferior to foxtail millet' (*Fan Shêng-chih shu*, fragment 4.12).

or hot ground the crop will be good for nothing, the tree will exhaust itself in cropping and will be plagued with red moss.[35]

By field margins and roadways plant elms and some poplars, so that you have the boughs for sheep and oxen and wood to hand when you need it. Where these are river banks, or in waterlogged soil, you can plant poplar stands and reed beds. These are planted as follows: turn over with a spade, plant reed rhizomes three feet apart.[36] Plant wild asparagus crowns there too: reeds and asparagus go together in the digging, in the burning and because one shades the other meanwhile.[37] Plant Greek willows around the reed bed, then you will have something to tie the vines to the reeds with![38]

(35) **Olive** varieties: see also *7*. Vergil referred to the 'bitter ***pausia*** berry' (*Georgics* 2.86).

'***Pausia*** has the best flavoured fruit ... more suited for eating than for oil. Its oil has a fine flavour when green, but becomes rancid within a year. ***Orchis*** and ***radius*** are best picked for eating, not for oil. ***Licinia*** gives the best oil, ***Sergia*** the greatest quantity. It is the larger olives that are better for eating, the smaller for oil' (Columella 5.8).

'Earliest in autumn the fleshy ***posia*** ... is harvested, then the oil-rich ***orchites***, then the ***radius*** ... The rough-skinned olives, ***Licinia***, ... ***Sergia***, which combat moisture and are consequently very small, and do not turn black until the Favonius blows (that is, until 8th February) are not harvested until March ... they make excellent oil' (Pliny 15.13).

Cato's **red moss** is an unidentified parasite. On the ***Favonius*** see also note at ***29***.

(36) **Reed** (great reed, *Arundo donax*) is Latin *harundo*. Reeds were used as vine crosswires (Varro 1.8.3–4), as fishing rods and for harvesting olives too high on the tree to pick by hand: 'the most careful harvesters use a reed, and strike the branches with a light, oblique stroke' (Pliny 15.12).

(37) **Asparagus**: see also ***161***. Cato's word *corrudae* for wild asparagus crowns was afterwards thought typically rustic (Columella 11.3.43). He calls the edible shoots simply *asparagi* (also at ***149***). 'I think it useful and far-sighted to collect plenty of wild asparagus crowns in a patch of dug ground, even if stony. They give an immediate crop from land which is unsuitable for other produce. We will burn them over every year, to produce a more prolific, stronger crop. This wild kind has a better flavour' (Palladius 3.24.8; compare André, *Alimentation*, pp. 22–3).

(38) **Willows** provided canes for tying vines (***33***) and bark strips for binding grafts (***40***), and could be grown sturdier for vine-stakes, *perticae* (Columella 4.31.2). Both withies and reeds could be used for making wickerwork utensils listed at ***10–13***. See also Frayn, *Subsistence farming*, pp. 134–8.

'The **Greek** is yellow-coloured, the Gallic is dull purple with very thin canes, the Amerine [or Sabine] has slender brown canes' (Columella 4.30.4).

A vineyard of Cato's standard size required one full-time withy-cutter (***11***). 'Atticus thinks that one *iugerum* of willow can serve for tying 25 *iugera* of vineyard, one *iugerum* of reed-bed for yoking 20, and one *iugerum* of chestnut trees for staking the same area' (Columella 4.30.2).

Work out where to plant vines as follows. On ground that is said to be ideal for vines and is sunny, plant *Aminnia minuscula* and *gemina, Eugenea, helvola minuscula*. In fat soil, or where it is rather cloudy, plant *Aminnia maior* or *Murgentina, Apicia, Lucana*. Other vines, especially *miscellae*, suit either ground.[39]

7. In a property close to the City orchard planting is especially useful: timber and sticks can be marketed, and are there for the owner's use too.[40] On such a property can be planted, as required:

vines, various kinds: *Aminnia minuscula* for wine; *Aminnia maior, Apicia*, conserved in pots in grape marc, or just as good in grape syrup, in whole must, in *lora*.[41] Those that you hang,

(39) 'Cato touched on only a few kinds of **grape**, of some of which even the names are now extinct', wrote Pliny (14.44) two centuries later.

'The first place belongs to **Aminaean** varieties, for the body and the vigour of their wine, improving as it does with age. There are five sub-varieties. The ***germana minor***, with a smaller fruit, sheds its blossom better and stands rain and storms, unlike the ***maior***, though that is less troublesome trained on a tree than on a stake. The ***gemella*** ['twin'], so called because the bunches come in pairs, has a very harsh flavour but unusual strength ...' (Pliny 14.21; for more detail see Columella 3.2.7–13). We may guess that Cato's *Aminnia minuscula, maior* and *gemina* are Pliny's *germana minor, germana maior* and *gemella* respectively. The Aminaean variety was later thought low in yield (Columella 3.7.2, 3.9.1–9).

'***Eugenia***, nobly named ['well-born'], was transmitted from the slopes of Tauromenium [Taormina, Sicily] to the Alba region ... ***Helvola*** is notable for its colour, midway between purple and black and quite variable ... The blacker are preferred. Both crop best every second year, but give better wine from the scantier crop ... At Vesuvius is the very powerful ***Murgentina***, Sicilian in origin ... prolific in rich soil' (Pliny 14.25, 35). '*Murgentina*, the same as *Pompeiana*' (Columella 3.2.27). '*Eugenia* stands a cold, moist soil and climate quite well on the Alban slopes: elsewhere it practically loses its nature' (Columella 3.2.16). *Eugenia* is supposed to be the modern *Ugni blanc*, grown in southern France and Bulgaria.

'*Helvolae*, which some call *variae*: neither purple nor black, they are named, I suppose, after their light brown colour [*helvus*]. The darker yields more juice, the other is preferred for flavour. Both have berries of various colours; the juice of both is white, in greater or less quantity in alternate years. They do better on a tree, but well enough on a yoke' (Columella 3.2.23).

(40) Or perhaps 'close to a city': but in other early texts *suburbanus* means 'close to Rome' (*Oxford Latin dictionary*). 'At Rome a garden used to be in itself a poor man's farm. The plebeians went to their gardens for their market shopping' (Pliny 19.51).

(41) **Grape syrup**, Cato's *sapa*, is grape must boiled down to two-thirds or half volume: for the method see Columella 12.19. ***Lora*** is low-grade wine, made by straining water through marc (i.e. grape pressings): see ***25***.

duracina, Aminnia maior, can just as well be kept in the smithy for raisins;[42]

fruit: both *strutea* and *cotonea* quinces; *Scantiana, Quiriniana* and other apples for conserving; *mustea* quinces;[43] pomegranates, pig's urine or pig's dung to be put to the roots to feed the fruit;[44] pears, *volaema, Aniciana sementiva*, which are good for preserving in must, *Tarentina, mustea, cucurbitiva* and others; plant or graft as many as you can fit in;[45]

(42) ***Duracina*** were a group of grape varieties distinguished by their firm flesh. 'It is not worth planting vineyards for fruit unless the farm is so close to a town that it can be sold fresh to market traders like tree fruit. In this case prefer early and *duracina* varieties' (Columella 3.2.1, with a list of varieties: full details on conserving grapes, 12.44–45). 'Some [kinds of grapes] last out the winter if the bunches are hung by a string from the ceiling. Others keep well in earthenware pots which are packed in moist grape pressings inside storage jars. The flavour of others is improved by smoke' (Pliny 14.16), hence the option to keep them in the smithy.

'The ancients have written much on the making of raisins; I like to do it thus. Twist a bunch of ripe grapes and leave them to wither on the vine, then remove them and hang them in shade; then, when the bunch is dried, put them in a jar with sun-dried vine leaves under them. When the jar is full add more leaves on top, cover and place in a cold, smokeless room. Raisins made thus will last a long time' (Florentinus quoted in the *Geoponica* 6.52).

(43) **Quince** (*Cydonia oblonga*) and **apple** (*Malus pumila*) are covered by the Latin term *malum*: they were perceived as one 'species' and are mixed up in this list. Two main varieties of quince were separately named in Greek, and their names appear in Latin as ***mala strutea*** and ***cotonea***. The former is now forgotten: the latter survives in modern languages, French *coing*, English *quince*.

In Cato's Italy a third kind, ***mustea***, had already been developed, 'so called because they sweeten rapidly, but now known as *melimela* from their honey flavour' (Pliny 15.51). These gave their new name to the *marmelo*, 'quince', in Spanish and Portuguese — and thus eventually to *marmalade*, which was at first a quince conserve.

Scantiana and ***Quiriniana*** are probably varieties of apple rather than quince.

'Varieties for conserving, *mala struthea, cotonea, Scantiana, Scaudiana, orbiculata* and *melimela* (formerly called *mustea*) are all well known to keep if placed on straw in a dry, cool place; therefore those who build fruit stores take care that they face the north, with windows allowing a through draught, but also with shutters, so that if the wind persists the fruit will not lose its juice and begin to shrivel' (Varro 1.59.1).

(44) Columella (12.46.2–6) gives instructions on conserving **pomegranates** (Latin *malum punicum*).

(45) Many varieties of **pear** (Latin *pirum*) were developed in Roman times. Of the two listed by Cato, Pliny describes the ***Aniciana*** as 'late-ripening, with a pleasant rather sharp flavour' (15.54). ***Sementiva*** links them with an early winter festival 'after the sowing'; so, perhaps, these were the latest of the *Aniciana*. '"Heavy ***volaema***" — so named because they fill the palm of the hand, *vola*' (Servius, *Commentary on Vergil's* Georgics 2.88). 'Pick *volaema* ... when not quite ripe, check that they have no blemishes

orchites and *posia* olives, which are best preserved, young, in brine, or crushed with mastic. *Orchites*, black and dried, can alternatively be kept in salt for five days, then, the salt discarded, placed in the sun for two days; or preserved in grape syrup without salt;[46]

sorbs, to be preserved in must, or you can dry them, and the same goes for pears;[47]

8. marisca figs to be planted on a clayey, open ground. *Africanae, Herculaneae, Sacontinae, hibernae,* black *tellanae* with long pedicles, to be planted on a rather fat or well-manured ground.[48]

Let the grass grow long, irrigated if possible, dry if not, for your supply of hay.

Close to the City be sure to grow all kinds of vegetables; all kinds of flowers for wreaths;[49] grape-hyacinths;[50] myrtles,

and no maggots, then arrange them in a pitched earthenware jar and fill it with *passum* [Italian *passito*, wine from semi-dried grapes] or with concentrated must. Cover and seal' (Columella 12.10.4).

(46) For instructions on conserving olives see ***117–8***.

(47) **Sorbs** (service-berries, *Sorbus domestica*) are Latin *sorbum*. They are a close relative of the rowan, *Sorbus aucuparia*, and both fruits can be conserved in similar ways. 'So saying [the Creator] sliced them in half, just like people cutting sorbs in half ready for pickling' (Plato, *Symposium* 190d).

(48) **Figs** (Latin *ficus*) are easily dried (***99***). They would need to be grown close to a market, or within reach of navigable water, if they were to be sold fresh. 'Cato once brought into the Chamber an early fresh fig from Africa, and held it up for senators to see. "I wonder," he said, "how long ago you think this fig was picked?" Not long, they agreed. "Quite right," said Cato, "it was picked at Carthage, three days ago. That is how close our enemy is to our walls." The Third Punic War was at once begun' (Pliny 15.74–5).

(49) **Flowers**: Varro (1.16.3) specifies violets and roses among flowers for which there is a demand in a city. Aromatic wreaths were an essential and health-giving constituent of dinner parties, as the Greeks had already taught the Etruscans and Romans: 'Rose fragrance is suitable for a drinking party, as are myrtle and quince: the latter is stomachic and appropriate to lethargics. Meadowsweet fragrance, a stomachic, also keeps the mind clear. Marjoram and mother-of-thyme fragrances are also suitable for a drinking party ... Fenugreek fragrance is sweet and gentle. Gilliflower is aromatic and very digestive' (Hicesius quoted by Athenaeus 689c).

(50) **Grape-hyacinths** (*Muscari comosum*) are Cato's *bulbi Magarici*, literally 'Megarian bulbs', a small edible bulb which has long been a popular food in Greece and has had some reputation as an aphrodisiac. 'Bring from Megara the fertilizing seeds of the bulb, which arouse men and prime them for intercourse with women' (Columella 10.105–6, compare Plato Comicus fragment 173 quoted by Athenaeus 5b; André, *Alimentation*, pp. 20–21).

coniugulum, white and black;[51] Delphic, Cypriot and forest bay;[52] walnuts, filberts, hazelnuts, almonds.[53] A market garden, especially if it is all that one has, must be planted for maximum productivity.

9. In well-watered, damp, shady places, near streams, willows can be planted: make sure that they are productive, whether for the owner's use or for sale. By all means have an irrigated hayfield if you have water; if not, grow as much hay dry as you can.

So much for the planning of a farm in various locations.

(51) 'There are two kinds of myrtle, one black, the other white' (Columella 12.38.1). These are the male and female of *Myrtus communis*, noticeably different in colour and best planted side by side. Greeks and Romans used the leaves and berries in wreaths and for flavouring wine (***125***).

What is the third word, *coniugulum*? It is possible that Cato means 'white and black married'; however, where the list is repeated (***133***), the puzzling word is spelt *coniuolum*, which if correct would mean 'sleepy'.

(52) **Bay** (*Laurus nobilis*), sometimes misleadingly translated 'laurel': on the varieties of this species see Pliny 15.127–9. Wreaths of both myrtle and bay were needed in religious and municipal ceremonies and in festivity generally. Bay leaves were wanted in cookery and in the household for their aroma.

(53) The identification of Cato's nuts is not certain. We have *nuces calvae*, literally 'bald nuts', most likely **walnuts** which were later simply *nuces* in Latin (Italian *noce*); *nuces Graecae*, literally 'Greek nuts', most likely **almonds**, which later had the Greek-derived name *amygdala*, *amandula* (Italian *mandorla*). Between them Cato lists *nuces Abellanae*, a name that seems to correspond with French *aveline* '**filbert**', and *nuces Praenestinae*, which remain to be identified with **hazelnuts**. The town of Praeneste was close enough to Rome to provide for the Roman market not only these nuts but also a variety of rose celebrated for its aroma (Pliny 13.5, 21.16).

Equipment and Structures

Inventory[54]

10. Equipment for 240 *iugera* planted in olives.

Manager, manageress, five labourers, 3 oxherds, 1 donkey-driver, 1 swineherd, 1 shepherd: total 13 persons;

three yoke of oxen, three asses to be harnessed for carrying dung, 1 ass, 100 sheep;[55]

oil-presses complete, 5 sets;

bronze cauldron capacity 30 *quadrantals*, lid for cauldron, 3 iron hooks, 3 water-pitchers, 2 funnels;

bronze cauldron capacity 5 *quadrantals*, 3 hooks, 1 small pan, 2 oil amphoras, 1 fifty[-*hemina*] urn,[56] 3 ladles;

1 water-bucket, 1 basin, jug, slop-pail, tray, pisspot, watering-can, ladle, candlestick, pint measure;

3 largish carts, 6 ploughs with ploughshares,[57] 3 yokes complete with straps, 6 ox harnesses;

(54) At ***22*** and ***135*** Cato gives some guidance on how to buy plant and equipment in the following two lists.

I have not tried to annotate everything; instead I have kept close to the terminology adopted by White (*Equipment, Implements*) where many terms are discussed and explained. I leave the reader to piece together the logic of the lists, pointing out only that coherent sections in each of them relate to workers' daily life and to the responsibilities of the *vilica* 'manageress' (see ***143***).

(55) Some scholars believe part of the labour force is to be made up of free persons, others that it is to consist entirely of slaves. Chapter ***2*** seems to me to support the latter.

Six of the workers are *pueri* (see end of ***10*** and of ***11***) – 'boys, youngsters, young slaves', apparently, though it can be taken to mean simply 'slaves'. These six are perhaps the six stockherds in ***10***, though the same equation cannot be made at ***11***.

'For cattle, older persons; for sheep or goats, boys will do. In both cases, any who take them back and forth along the drove roads [compare ***149–150***] must be stronger than mere farm herders who can come back home every night. In mountain pastures, therefore, you see sturdy youths, sometimes armed; in farmland, boys and even girls look after the flocks' (Varro 2.10.1).

The oxen are to pull the carts and ploughs; the extra ass is to work the mill, as specified later in this section. For more on sheep see ***149***.

(56) I.e. 'larger than standard'. The standard *urna* held 40 *heminae* (20 pints).

(57) On selection and purchase of ploughs see ***135*** and note.

1 harrow, 4 hurdles for dung, 3 hampers for dung, 3 pack-saddles, 3 rugs for the asses;

iron tools: 8 forks, 8 hoes, 4 spades,[58] 5 shovels, 2 drag-hoes with four teeth, 8 scythes, 5 sickles, 5 pruning knives, 3 axes, 3 wedges,[59] 1 emmer-mortar,[60] 2 tongs, 1 fire-shovel, 2 braziers;

100 oil vats, 12 tubs, 12 vats for keeping the olive pressings, 10 [tubs] for *amurca*,[61] 10 for wine, 20 for wheat, 1 for lupins,[62] 10 jars;

one rinsing-tub, 1 soaking-tub, 2 water-tubs, a cover for each vat and jar;

1 donkey-mill, 1 pushing mill, 1 Spanish mill;[63]

3 hand grindstones, 1 stone table, 2 bronze tables;

2 tables, 3 long benches, 1 bench in the bedroom, 3 stools, 4 chairs, 2 armchairs, 1 bed in the bedroom, 4 beds sprung with straps and 3 beds;[64]

(58) **Spades**: Cato's *pala* must have been his general term for a spade, also used at ***135*** and at ***11*** (where a larger number of them is wanted because one grows many more vines than olive trees per *iugerum*: White, *Implements*, p. 19). In giving instructions for digging work (***6***, ***45***, ***46***, ***48***, ***151***) he writes instead *bipalium*, 'spade with footrest', the specific kind of spade that was to be preferred.

(59) 'Later the hard edge of iron was applied and the teeth of the honed saw, but the first farmers split and cut their timber with wedges' (Vergil, *Georgics* 1.143–4).

(60) 'The grain of emmer is pounded in a wooden mortar [to make *alica* 'groats']: stone would grind it down too fine, to flour. The motive power for the pestle is supplied, as is well known, by chained convicts as hard labour' (Pliny 18.112). Cato's emmer-mortar is evidently of similar cylindrical shape, but of iron, not wood. The pestle is listed separately.

(61) **Olive pressings**, Cato's *vinacii*, were wanted as ox feed and fertilizer. ***Amurca***: see note at ***66***.

(62) **Fresh lupin** seeds (see also note at ***54***) are poisonous until boiled, indeed 'not eaten raw by any animal' (Theophrastus, *History of Plants* 8.7.3), a good reason for keeping separate utensils for them. The water in which they were boiled could be used as a sheep dip (***96***).

(63) White (*Equipment*, pp. 12–14) suggests that the **Spanish mill** is a hand-operated rotary mill. These, more efficient than the old **pushing mill**, were to spread widely in the Roman world.

(64) The last 3 are 'presumably beds with solid frames filled in with wooden slats, as found at Herculaneum' (Frayn, *Subsistence farming*, p. 131). The reader is invited to calculate which of the 13 staff sleeps where, in what kind of bed and with what upholstery – and to consult on this point P. Hamblenne in *Revue belge de philologie et d'histoire: antiquité* vol. 61 (1983), pp. 118–123.

1 wooden mortar, 1 fuller's mortar, 1 loom, 2 mortars;

1 bean pestle, 1 for emmer, 1 for seeds, 1 to shell nuts, 1 peck measure, 1 half-peck;

8 mattresses, 8 blankets, 16 pillows, 10 bed-covers, 3 towels, 6 patchwork cloaks for the youngsters.

11. Equipment for 100 *iugera* planted in vines:[65]

Manager, manageress, 10 labourers, 1 oxherd, 1 donkey-driver, 1 withy-cutter, 1 swineherd: total 16 persons;

2 oxen, 2 asses for carts, 1 ass for the mill;

3 wine-presses complete;

enough vats for five vintages, total 800 *cullei*,[66] 20 vats for keeping the marc,[67] 20 for wheat, a lid and cover for each vat;

6 urns with esparto casings, 4 amphoras with esparto casings,[68] 2 funnels, 3 wicker strainers, 3 strainers to remove *flor*,[69] 10 pitchers for must;

(65) Several notes to chapter ***10*** apply also to terms in this list. For the **withy-cutter** see note at ***6***.

(66) The text here is uncertain: but if the **800** ***cullei*** is right, that could indeed be as much as one would need to store of the yield of **five vintages** in a 100-*iugera* vineyard. Yield in Spain and Italy in recent times is often between 25 and 50 hectolitres per hectare – about 1 to 2 *cullei* per *iugerum* per year. Small producers still have much of the market, but planting tends to be more intensive than in Cato's Italy, with little use of vines trained on trees. Moreover, modern calculations are based more strictly on area planted in vines. Cato recommends many additional uses for the 100 *iugera* total area of his notional farm.

Therefore both numbers, the 800 *cullei* and the five vintages, can stand together, and we need not accept Goujard's emendation to 'two vintages' or White's interpretation that each vintage brought in 800 *cullei*. See also the discussion by A. Tchernia, *Le vin de l'Italie romaine* (Rome, 1986), pp. 359–360.

800 *cullei* requires about 550 vats of standard size.

Vats: *dolia* are very large deep earthenware containers. Those used for storing and maturing wine were typically half-buried. Wooden casks, incidentally, were already in use in the Alps and beyond (Pliny 14.132).

(67) **Marc**: see ***25***.

(68) As protection against rough handling. On **esparto** see note at ***3***.

(69) Cato's ***flor***, Greek *anthos*, literally 'flower', is the scum that forms on the surface of fermenting wine. It is normally undesirable, but *flor* (as it is still called in Spanish) makes an essential contribution to the flavour of some sherries.

2 carts, 2 ploughs, cart yoke, vine yoke,[70] 1 ass yoke;

1 bronze table, 1 grindstone;

bronze cauldron holding 1 *culleus*, lid for bronze cauldron, 3 iron hooks, bronze boiling-cauldron holding 1 *culleus*,[71] 2 water-pitchers;

1 watering-can, 1 basin, 1 jug, 1 slop-pail, 1 water-bucket, tray, ladle, candlestick, pisspot;

4 beds, 1 bench, 2 tables, 1 stone table, 1 clothes chest, 1 cupboard, 6 long benches, 1 well-wheel, 1 iron-tipped peck measure, 1 half-peck, 1 wash-tub, 1 soaking-tub, 1 tub for lupins, 10 jars;

harnesses for oxen, harnesses for asses, 3 rugs, 3 packsaddles;

3 strainers for wine-lees, 3 donkey-mills, 1 pushing-mill;

iron tools: 5 reed knives, 6 vine-dresser's knives,[72] 3 pruning knives, 5 axes, 4 wedges, [2] ploughshares, 10 forks, 6 spades, 4 shovels, 2 drag-hoes with four teeth, 4 hurdles for dung, 1 hamper for dung, 40 grape-harvesting sickles, 10 broom-cutting sickles,[73] 2 braziers, 2 tongs, 1 fire-shovel;

20 Amerine carrying-baskets, 40 planting-baskets or troughs, 40 wooden trowels;

2 treading vats;[74]

(70) One cart is to be pulled by the pair of asses, the other by the pair of oxen, but the oxen will also be used for ploughing.

Latin *plostrum* is normally a 'two-wheeler cart'. White (*Equipment*, pp. 79–81) takes it that the 'largish carts' of the list at ***10*** are four-wheelers.

A single **vine yoke** (for which see note at ***6***) makes nonsense: there is certainly an error in the manuscript. What is really wanted here is '2 ox harnesses' for ploughing.

(71) The **boiling-cauldron** will be to boil down some of the fresh must for grape syrup and for flavoured wines (White, *Equipment*, p. 118).

(72) '**Reed knives** ... are used in a vineyard in tying faggots, cut sticks, and kindling' (Varro, *On the Latin Language* 5.137). The **vine-dresser's knife**, Cato's *falx silvatica*, was a complex and versatile tool (Columella 4.25; White, *Implements*, pp. 93–6 with illustrations).

(73) Butcher's **broom**, *ruscus*, was a hedging shrub, but stems were also used (in regions where it grew) for training and securing vines: its uses resembled those of willow and reed.

(74) The **treading vats** (so White, *Equipment*, pp. 164–5) were required for the preliminary treading that broke the grapes in preparation for mechanical pressing. Treading also produced high quality first-flow must, *mustum lixivum* (***23***, and compare ***112***: see Columella 12.27). The treading process is described in the *Geoponica* 6.11: for a translation of this text see White, *Farming*, p. 46.

4 mattresses, 4 blankets, 6 pillows, 6 bed-covers, 3 towels, 6 patchwork cloaks for the youngsters.

12. Required in the press-room for 5 working presses:

5 seasoned beams, 3 spares, 5 windlasses, 1 spare, 5 leather ropes, 5 lowering ropes, 5 straps, 10 pulleys, 5 *capistra*, 5 bars for the press-beams to rest on, 3 jars, 40 levers, 40 pins,[75] wooden clamp to compress the 'trees' if they split; also 6 wedges, 5 crushing mills, 10 axle-bars,[76] 10 troughs, 10 wooden trowels, five iron shovels.

13. Wanted to hand in the press-room:

pitcher, bronze cauldron capacity 5 *quadrantals*,[77] 3 iron hooks, bronze table, millstones, 1 sieve, 1 sifting tray, 1 axe, 1 bench, 1 wine-jar, 1 press key, bedding for two free men to sleep there as guards – the third, a slave, can sleep with the press workers – new straining bags, old straining bags, cord, a cushion, lamps, 1 hide, two wicker strainers, 1 'meat-rack',[78] one pair of steps.

These are wanted in the oil store:

oil jars, lids, 14 oil basins, 2 large and 2 small oil cups, 3 bronze ladles, 2 oil amphoras, 1 water-pitcher, 1 fifty[-*hemina* ?] urn, 1 pint oil measure, 1 pan, 2 funnels, 2 sponges, 2 earthenware pitchers, 2 half-*amphora* pitchers, 2 wooden ladles, 2 keys with bolts for the stores, 1 scales, a hundred [*libra*] weight and other weights.

Building Contracts

14. If you order a new farmhouse built from the ground up, the craftsman is to complete all walls as specified, mortar and

(75) Cato advises on the choice of wood for some of these implements at ***31***. ***Capistra*** are unknown. The **levers** and **pins** are required for turning the windlass that lowers the press-beam: '6 to each press,with 10 in reserve' (Drachmann, *Oil-mills*, p. 112).

(76) On the **crushing mills** see ***20–21***, with a note on the **axle-bars** at ***21***.

(77) Olives could be steeped in hot water to soften them before crushing (Pliny 15.23; White, *Equipment*, p. 226).

(78) The *carnarium*, literally '**meat-rack**', was a suspended beam – not for storing meat in this case but to keep the rawhide press-ropes out of the reach of rodents (so Brehaut: see ***68***).

rubble, corners in squared stone; all necessary woodwork, thresholds, doorposts, lintels, beams, rafters.

Specify ox-sheds winter and summer, feed-racks, stable,[79] slave rooms;[80] 3 'meat-racks', table, 2 bronze cauldrons;[81] 10 pigsties; hearth;[82] a great door and second door to the owner's plan; windows (with bars for larger windows)[83] 10 two-foot, 6 [small] for light; 3 benches, 5 seats, 2 looms;[84] 6 skylights; a small mortar to crush durum wheat, a fuller's mortar; exterior fittings; 2 complete presses.

The owner will supply structural timber and other timber as needed and will provide 1 saw, 1 plumb-line – thus the contractor simply fells, planes, cuts and constructs – stone, lime, sand, water, straw, earth for making clay. If the farmhouse is struck by lightning, a respectable person is to be asked to adjudicate.[85]

(79) **Ox-sheds** and **mangers**: see also ***4***. The **stable** (along with the pasturing for a horse that is to be reserved at ***149***) is presumably for the owner's horse when he visits, since horses are not among the working animals on the farm.

(80) 'Quarters for unfettered slaves are best built facing the midday sun; for those in chains, an underground prison, as healthy as possible, lit by numerous but narrow windows too high to be reached by hand' (Columella 1.6.3: for the 'chain gang' see also ***56*** and note).

(81) **2 bronze cauldrons**, of industrial size, are required in the lists at ***10–11***. It is because of their size that they are to be specified and built at the same time as the farm buildings. Cato's *orbis* is, I would guess, a stone work-**table**. *Orbis* is the term for the millstones of the olive crushing mill (***3***, ***21–2***): its has a different meaning here and at ***10–11***, ***13***, but whether a table or something else is uncertain.

(82) On the farm kitchen, its most important room, see note at ***143***.

(83) Bars, apparently, rather than shutters. The same term, *clatri*, is used of the vertical bars of feed-racks in ***4***. Compare also Plautus, *The Boastful Soldier* 377–9: 'How could the woman have got over there from here? There's no yard on our side, no garden, not even a window that isn't barred.'

(84) **Meat-racks** (see note at ***13***) and **looms** required massive beams, most easily put in place during building and perhaps incorporated in the structure. Built-in stone **benches** are typical of early excavated farmhouses in Italy.

(85) **A respectable person ...** : the customary Latin phrase is *uiri boni arbitrio*, abbreviated in the manuscripts to *u. b. a.*, 'the arbitration of a good man'. In this case the arbitrator had to decide what cost had been incurred by the contractor up to the moment when the unfinished building was destroyed. The question was difficult to settle because, as explained next, the price a contractor received for a new house would normally be determined *when it was completed* by counting the roof tiles.

The price paid for this work by a fair owner, who provides required materials fairly and pays coin fairly, is 2 *nummi* per roof tile.[86] The roof is calculated thus: whole tiles, as they come; cut tiles lacking a quarter, two count as one; all gulley tiles are taken as two; all ridge tiles are counted as four.

Farmhouse with foundations in stone and mortar to a foot above ground level, then walls in mud-brick: in this case the contractor provides lintels and exterior fittings only to order; otherwise, the rule is as for farmhouse in mortar and rubble. Price, 1 1/2 *nummi* per tile.[87]

These prices are with a fair owner on a healthy site. Payment on signing-off. On a malarial site, where work cannot go on in summer, a fair owner pays a quarter more.

15. Yard wall in mortar, rubble, flint (the owner to provide all supplies) to be specified in this form: '5 feet high and 1 foot capping, 1 1/2 feet thick, 14 feet long, and rendered'.

If house walls are ordered by the 100 square feet (which is 10 feet square), price 10 *nummi* per 5 feet horizontal and 20 feet vertical (walls 1 1/2 feet thick, the owner to make the foundations and provide one peck lime per foot length, two pecks sand).[88]

(86) Assuming regularly pitched rooves, the raw count gave a measure of the floor area and had the advantage of being open to verification. On coins and prices see p. 31.

(87) The price intended is doubtful. The best-attested text is *ns*, which could be understood '1 *nummus* + 1/2 *nummus*' or '1 single *nummus*'.

(88) I have tried to translate this paragraph in accordance with Goujard's understanding of it (note also Crawford, *Coinage and money*, p. 346). The measure of possible disagreement over it is suggested by the facts that *libellis*, here translated 'horizontal', has also been translated 'one tenth of a denarius each'; *pertica*, here translated 'vertical', means 'rod' elsewhere in *On Farming* and can also be translated as a measure of length '10 feet'; *vic.*, the abbreviation here translated 'per 20', can also be translated as a price, '1 *victoriatus*' (on coins and prices see p. 31).

If the passage is understood as here translated, the price for building walls seems low. The *Oxford Latin dictionary* (s.v. *victoriatus*) is not the only authority to take it that plastering, not building, is involved – but then the note on the thickness of the wall and the building of the foundation has to be explained away.

16. When lime-burning is contracted out, it is done as follows: the lime-burner prepares, burns and removes the lime from the kiln and prepares wood for the kiln. The owner provides stone and all necessary wood for the kiln.[89]

17. Oak for timber (and vine-posts) is always ripe for cutting between the summer solstice and the shortest day. Other timber that bears seed is ripe for cutting when its seed is ripe. Timber that produces no seed is ripe when it sheds its bark. Where seed is green and ripe together — cypress and pine, whose nut you can gather at any time — it is ready and ripe to cut at any time: they have last year's cones, now dropping their nuts, and this year's, and they can be gathered when they begin to open; the first ones ripen at sowing time, and their season continues for eight months more; this year's cones are green. The elm comes ripe for cutting a second time when its leaves fall.[90]

Press-Room and Presses

18. If you wish to build an olive press-room for four presses, make them face in alternate directions. Arrange them in this way:[91]

'Trees' two feet thick, nine feet high including tenons, with sockets cut out 3 3/4 feet long and 6 fingers wide beginning 1 1/2 feet from the ground. 2 feet between the 'trees' and the walls; 1 foot between the two 'trees'. 16 feet at right angle from the 'trees' to the nearest of the posts.

(89) On the limekiln see ***38***.

(90) On timber-cutting see also ***31***, ***37***. 'Timber should be felled between early autumn and the time when the Favonius begins to blow' (Vitruvius 2.9.1, with further explanation). See M. L. West's note in his edition of Hesiod, *Works and Days* [Oxford, 1978], p. 263.

(91) See also ***12–13*** on equipment for the press-room; ***31*** on the choice of timber.

The fullest and most sensible discussion of Cato's olive presses is that of Drachmann, *Oil mills*, pp. 99–121. There have been many other attempts at reconstructing the plan that was in Cato's mind. A translation of this passage has to adopt some one view, or it will make no sense at all. I have in general adopted Drachmann's.

Posts 2 feet thick, 10 feet high including tenons. Windlass 9 feet long plus tenons. Press-beam 25 feet long, including tongue 2 1/2 feet.[92]

The floor length wanted, assuming pairs of presses and two channels, is 32 feet. The pair of crushing mills, left and right, each wants 20 feet of floor. You need 22 feet space between opposite posts to allow space for levers. Given presses facing in opposite directions, from the further post [of each] to the wall behind the 'trees' [of the other] there must be 20 feet. Total width for the press-room with four assemblies, 66 feet; 52 feet long, wall to wall.[93]

Where you are to place the 'trees', make good foundations 5 feet deep, and on these a floor of solid flint, 5 feet long, 2 1/2 feet wide, 1 1/2 feet thick. Make a socket for the foot of each 'tree', and set the 'trees' in the stone. Fill what space remains between the two 'trees' with oak, and pour lead over it. The top of the 'trees' must form a tenon 6 fingers' breadth high, on which an oak cross-piece is set.

Having measured where the posts will stand, make 5 foot foundations and on these a flat flint floor 2 1/2 feet long, 2 1/2 feet wide, 1 1/2 feet thick. Set the posts here, the second just like the first.

On top of the 'trees' and of the posts fit a horizontal beam, 2 feet wide, 1 foot thick, 37 feet long; or fit two if you have no solid

(92) The **'trees'** are the two back posts, the **posts** are the two front posts of the olive presses. Drachmann (pp. 101–2) suggests that the assembly of the windlass and front posts is set diagonally, to take full advantage of the length of the press-beam.

(93) The **66 feet** works well (Drachmann, pp. 104, 166) but rests on assumptions not fully stated in the text. It is the total of twice the **22 feet space for levers** between each windlass and the press facing it, plus the thickness of the posts and windlasses themselves, plus space for channels and for movement around the outside of each pair of presses.

The **52 feet** is a total of the **32 feet** required for the length of each press, plus the **20 feet** required by a crushing mill.

The presses are considered to stand 'parallel to the **length** of the building, not the breadth; which explains why the shortest dimension is called the length' (Drachmann, p. 103).

one. Under these beams [and] between the channels and the far walls where the crushing mills are to stand, [build pillars. On the pillars] place a 23 1/2 foot cross-beam, 1 1/2 feet thick, or substitute a pair for a solid one: over these cross-beams, place the horizontal beams on top of the 'trees' and the posts.

On these structures build walls, and anchor them to the timbers of the building, to give adequate weight.[94]

Where you are to put the press bed, make a foundation 5 feet thick, 6 feet wide. Make the bed and the channel around it 4 3/4 feet wide.

Give the whole remaining floor a foundation 2 feet deep: straw first, then a half-foot layer each of broken stones and of mortar. Make the floor in this way. After levelling, make a first layer of gravel and mortar, and firm it with piles; then make a second layer in the same way. Dress this with sifted cement 2 fingers thick. On this lay a baked tile floor: when laid, ram down and smooth off to make a good floor.

Make the 'trees' and posts of oak or pine.

If you want to make your [cross-]beams shorter, route the channels outside the pillars. You will then want 22 foot beams.

Make the olive platen 4 feet across, with Punic joints, and 6 fingers thick. Joint with holm-oak dowels. When you have fitted the dowels, fix them with dogwood nails. Fit three ribs across this platen, and fix them to it with iron nails. Make the platen of elm or hazel: if you have both, alternate them.

19. For wine presses make the posts and 'trees' two feet taller. Above the sockets in the 'trees' (the 'trees' must be a foot apart) make a hole for a single crossbar 6 fingers square in cross-section.

Make six slots in each windlass, the first one half a foot from the tenon, the remainder spaced as equally as you can. Make a

(94) Drachmann (*Oil-mills*, pp. 120–121) calculates the upthrust on the 'trees', when the press was worked, at 7722 kilograms, most of which had to be taken by the masonry above them.

peg in the middle of the windlass.[95] Get this middle point where you are to make the peg in line with the mid point between the 'trees', so that the press-beam will be correctly centred.

When you make the 'tongue', measure it from the middle of the press-beam, so that it fits correctly between the 'trees'. Allow it 1 thumb of play.

Longest levers 18 feet, next longest 16 feet, third longest 15 feet; stops 12 feet, next longest 10 feet, third longest 8 feet.[96]

Crushing Mills

20. How to assemble the crushing mill.[97]

The iron pivot which stands on the pillar must stand at the very centre, perfectly vertical. It must be firmly fixed with wedges of willow. Pour lead over. Be sure it does not slip. If it has moved, dismount it and start again, and wedge it so that it does not.[98]

Make axle-boxes for the millstones from *orcites* olive wood. Lead them in, and be sure they are not loose. Make them fit the axle.[99] Make solid guards one thumb wide, with twin lips, to be fixed with staples, so that they do not fall out.

(95) The windlass or capstan or drum with its regular series of holes is called in Latin a 'little sow', *sucula*, and so the peg attached to its middle is a 'little piglet', *porculum*. The slots were to take the levers with which the windlass was turned to lower the press-beam.
(96) 'I suggest that each batch of pulp had to undergo three successive pressings, and that three sizes of [levers] were used for them' (Drachmann, p. 112). Drachmann suggests that the *remissarii*, here translated '**stops**', were used either for lifting the beam after pressing, or for controlling its descent: their nature and purpose is in fact unknown.
(97) This kind of **crushing mill** (*trapetum*, from Greek *trepo* 'turn') may be more accurately described as a 'revolving mill' (White, *Equipment*, pp. 227–8). 'The essential point of the whole device was to maintain such an interval as would pulp the flesh of the olive without breaking the stones' (Brehaut, p. 43). See also ***145*** and note.

For a very careful discussion of this section, and comparisons with actual crushing mills found in excavation at Pompeii, see Drachmann, *Oil-mills*, pp. 7–46. There is useful discussion too in a recent paper by A. Kloner and N. Sagiv, 'The olive presses of Hellenistic Maresha, Israel' in *La production du vin et de l'huile en Méditerranée = Oil and wine production in the Mediterranean area* ed. M.-C. Amouretti, J.-P. Brun (Athens: 1993. *Bulletin de correspondance hellénique* supplement 26), pp. 119–136.
(98) The wedges are to hold the pivot in place temporarily while molten lead is poured on to make a permanent fixing (so Drachmann, pp. 25–6).
(99) Following Drachmann, I use the translation '**axle**' for *cupa* as this assists the mental picture. However, the *cupa* does not turn on itself, as axles do; it is the beam on which the millstones are suspended as they circle around the pivot.

21. Make the axle 10 feet long, as thick as the axle-boxes require.

Its middle, fitting between the millstones, is to be pierced, wide enough to take the iron pivot, so that you can mount it on to the pivot. Insert an iron sheath to fit the pivot and the axle. Between the centre and the two ends, pierce the axle [with slots for axle-bars] at left and at right, 4 fingers wide, 3 fingers long. Under the axle fit an iron base-plate, as wide as the axle itself at its middle, and pierced to take the pivot.[100] To left and right, where you made the slots, sheath with metal plates, folding back all four plates to the underside of the axle. To left and right, on either side of the slots, insert small thin plates under these plates, and fix them to one another so that the slots for the axle-bars do not enlarge.[101]

On each end of the axle in the axle-boxes, four iron bushes. Make them so that they fit by themselves, and secure their middles with pins. Beyond the bushes, on the outside, pierce the axle to take a bolt to hold the millstone, and above this slot fit an iron collar 6 fingers wide, pierced right through for the bolt. All this is done so that the axle will not get worn in the stone. Make four iron washers to fit around the millstone, so that the axle and bolt will not wear inside.

Make the axle of solid elm or beech.

The same craftsman who makes the required iron parts can fit them. It will cost 60 *sestertii*, plus 4 *sestertii* to buy the lead to seat the axle, plus 8 *sestertii* for the craftsman's labour in assembling the axle, fitting, and leading the axle-boxes (he can go on to adjust the crushing mill). Total cost 72 *sestertii* plus helpers.

(100) The **finger** is a measure of 2 centimetres, somewhat less than an inch. 'The purpose of the iron [base-]plate was to take the wear between the underside of the axle and the top of the [pillar]' (Drachmann, p. 29).

(101) Each axle takes two vertical **axle-bars** to assist in turning the press. The points where the axle is pierced are a structural weakness, so it is reinforced here with iron plates (so Drachmann, pp. 30–33).

The axle-bars are replaceable parts, not regarded as part of the presses: they appear in the list at *12*.

22. The crushing mill is to be adjusted as follows. The *librator* is to be equidistant from the lips of the mortar;[102] each millstone to be at least 1 finger from the surface of the mortar. Take care that the stones do not graze the mortar. There should be 1 finger between the millstone and the pillar. If there is more, and the stones are too far away, wind a rope around the pillar, looping it tight, so as to fill the unwanted space. If the millstones are too deep and graze the mortar undesirably at their base, insert pierced wooden discs around the pivot on the pillar, to adjust the height. Adjust laterally in the same way with wooden discs or iron washers until the gauge is correct.

Note on Buying Crushing Mills

A crushing mill bought in Suessa country cost HS 400[103] and 50 *lb.* oil; HS 60 assembly; ox transport, 6 days' work, 6 men with the oxherds, HS 72; axle with accessories, HS 72; grand total HS 729,[104] counting HS 25 for the oil.

Bought at Pompeii, complete with accessories, HS 384; transport, HS 280; best assembled and adjusted on site, for which allow HS 60: grand total HS 724.

If getting new millstones for an old mill, 1 foot 3 fingers thick at the centre, 3 1/2 feet high,[105] axle slot 1/2 foot square. When

(102) The ***librator*** is not mentioned elsewhere by this name. This clause has been understood in several different ways by commentators.

(103) HS is the standard abbreviation for *sestertii*. It will be seen that the purchase at Suessa is the record of an actual transaction, while that at Pompeii is an estimate worked out for comparison's sake.

(104) The true total is HS 627: a copyist's error, presumably. Some editors change the transport cost to HS 172, giving a total of HS 727 – nearly right. But the figures must both be calculated with some specific destination in mind. If we assume Cato's farm to be in the southern part of the territory of Venafrum (see note below and at ***135***), the transport cost from Suessa country might conceivably be as little as a quarter of that from Pompeii, and that actually was the case if the manuscript costs for transport are both correct. It is difficult to see how the cost from Suessa could ever have been more than half of that from Pompeii, which it would be if the emendation to HS 172 were accepted.

(105) These dimensions make for an almost spherical assembly. Later it was realised that the millstones did not need to be so bulky, and late first century AD specimens found at Pompeii have a thinner cross-section (White, *Equipment*, p. 229).

you get them home they have to be fitted to the mill. They are sold at the walls of Rufrium at HS 180; fitting, HS 30.[106] Same price at Pompeii.

Farm work through the year[107]

Around the Vintage[108]

23. Have everything necessary ready for the vintage.

Have utensils washed, carrying-baskets mended, pitched, vats pitched where necessary. If it rains, have picking-baskets made or mended, emmer milled, anchovies bought, windfall olives salted. When time allows, gather *miscellae* grapes for early-harvest wine for the workers to drink.[109]

Working cleanly, distribute each day's juice into the vats evenly.

If necessary, add grape syrup, boiled down from first-flow must,[110] to the [regular] must. Add one fortieth part of grape syrup (or 1 1/2 *lb.* salt) per *culleus*.

If you add marble, allow 1 *lb.* per *culleus*. Put it into an urn, mix with must, pour the mixture into the vat.

(106) **The walls of Rufrium**: this sounds like an unofficial market site. Rufrium was a small old hill town closer than any of the other places in ***22*** and ***135*** to Venafrum, where Cato himself may have farmed: this could explain why transport, carefully costed elsewhere in the chapter, is omitted in this case. The phrase has also been translated 'at Rufrius' yard' (Frayn, *Markets*).

(107) This section may be compared with the much fuller and more coherent calendars given by Columella 11.2.3–101 and Pliny 18.220–320.

(108) The grape-harvest and the wine-making are assumed to be carried out by a contractor (so Brehaut). Cato does not describe the work. For a handy outline see White, *Equipment*, pp. 112–5.

'When Orion and Sirius reach the middle of the sky, and rosy-fingered Dawn observes Arcturus [8 September in Hesiod's Greece], then, Perses, bring your grape harvest home. You must show them to the sun ten days and ten nights; for five more, shade them; on the sixth, draw off into jars the gifts of joyous Dionysus' (Hesiod, *Works and Days* 609–614).

(109) '*Praecox* and ***miscella*** grapes (those called 'black') ripen much earlier and are to be picked first' (Varro 1.54.1).

(110) **First-flow must** is the by-product of the preliminary treading of the grapes (see note at ***11***).

If you add resin, use 3 *lb.*, finely broken down, to 1 *culleus* must. Put it in a strainer and suspend it in the vat of must. Shake it frequently so that the resin dissolves.

Whether adding grape syrup, marble or resin, stir frequently for 20 days.

Press daily. First-press and cut-round must to be divided among the vats equally.[111]

24. Greek Wine can be made as follows. Select very ripe *apicius* grapes. When gathered, to 1 *culleus* of must 2 *quadrantals* old sea water or 1 peck pure salt: suspend in a strainer and allow to dissolve in the must.[112]

If you wish to make *helviolus* wine, take half of *helviolus*, half of *apicius*,[113] and add a thirtieth part of old grape syrup.

Whatever wine you add grape syrup to, add a thirtieth part of syrup.

25. When grapes are ripe and are harvested, first be sure that enough is kept by for the household and the owner's people. And be sure that they are harvested fully ripe and dry, or your wine will lose its reputation!

Spread fresh marc daily on a hemp mat, or make a sieve for the purpose. Tread it into pitched vats or a pitched wine tank. Have it well sealed, to feed to the oxen in winter. You can also strain water through it gradually and get *lorea* for the household to drink.[114]

(111) 'When it stops flowing from the press, some cut around the edge of the pressings and press again. They call this second juice *circumsicium* and they keep it separate because it tastes of the iron' (Varro 1.54.3). Varro's *circumsicium* is probably Cato's *circumcidaneum*, which I have translated 'cut-round'.

(112) Instructions are given again for Greek Wine, with greater detail, at ***105***.

(113) For these two grape varieties see ***6*** and note.

(114) On the uses of ***lorea***, a cheap wine substitute, see ***57*** and ***7***. An alternative wine substitute is given at ***104***.

26. Once the harvest is completed, order the press equipment, carrying-baskets, straining bags, ropes, bars,[115] pins to be put away in their proper places.

In Autumn

Have the vats of wine skimmed twice a day, and have handy a brush, a separate one for each vat, to brush around the lips of the vats.

Thirty days after the vintage, once the vats are clear of marc, seal them. If you want to take the wine off the lees, this will be the best time to do so.

27. Sow *ocinum*,[116] vetch, fenugreek, bean, bitter vetch,[117] as fodder for oxen. Have a second and a third sowing of fodder. Then sow other legumes.

In a fallow field, trenches for olives, elms, vines, figs. If it is a dry spot, plant olives now during the legume sowing. Now also trim lower shoots on young trees planted earlier, and trench around trees.

28. When you plant out olives, elms, figs, fruit trees, vines, pines, cypresses, take them out with all their roots and as much of their earth as you can, wrapping them round to carry them. Order them to be carried in a trough or a basket. Do not dig them up or move them in wind or rain: this is particularly to be avoided. When you set them in the trench, put the top soil to the bottom,

(115) I think these *patibula*, also listed at ***68*** where the olive harvest is in question, are bars or other wooden utensils from the press-room (see ***12***) under a different name. There is another possibility. Varro describes vineyards in which the vines are not trained on trees or trellises: once fruit appears, shoots are raised about two feet from the ground on forked sticks, *furcillae*. 'Here, when the owner sees the back of the vintage contractor, he puts his forks away for the winter, so that he will have a free supply of them next year' (Varro 1.8.6). The *Oxford Latin dictionary* interprets Cato's *patibula* as forked vine-props like Varro's *furcillae*.

(116) Compare *5*: 'Sow rape, fodder crops and lupin after the autumn rains.' On ***ocinum*** and other fodder crops see notes at ***53–4***.

(117) **Vetch** (*Vicia sativa*) is Latin *vicia*: see also note at ***37***. **Bitter vetch** (*Vicia ervilia*) is Latin *ervum*. **Fenugreek** (*Trigonella foenum-graecum*) is Latin *foenum graecum*, grown as a fodder crop but known also as an aromatic herb and a source of perfume (Pliny 13.9; see note at ***8***). **Bean** (broad bean, faba bean, *Vicia faba*) is Latin *faba*.

then cover the roots with earth to the top, then tread down well with the feet, then firm as well as you can with rammers and sticks: this is important here. Sturdier trees, 5 fingers thick, should be cut back before planting, the cuts sealed with dung and bound with leaves.

29. Allocate dung as follows. Cart half of it to the fields where you are to sow fodder, and if there are olives there trench round them and lay dung; then sow your fodder. Lay a quarter around the trenched olives, wherever it is most needed, and cover the dung with earth. Keep back the other quarter for the pasture, and, when it is most needed, cart it out when there is no moon and the Favonius blows.[118]

30. Give oxen elm, poplar, oak and fig foliage as long as you have it. Provide sheep with green foliage as long as you have it. Pasture sheep where you are to sow fodder.

Foliage till the fodder is ripe. Conserve your stored dried fodder as long as you can: keep in mind how long winter is.

31. What is needed for the olive harvest is to be got ready. Cut ripe withy canes and willow at the right time, so that you have enough to make carrying-baskets and mend old ones. To make pins, dip dry holm-oak, elm, walnut, fig sticks in dung or water: make pins from them as needed. Have ready-made levers of holm-oak, holly, bay. The press-beam is best made from black hornbeam.

When you cut down elm, pine, walnut and all other timber, cut it when the moon is waning, in the afternoon, and not under a south wind. It is ripe for cutting when its seed is ripe. Do not shift it or chop it in dew. Timber that bears no seed is ripe for cutting when it sheds its bark.[119]

Do not handle timber, or wine, under a south wind, unless essential.

(118) 'One *iugerum*, if it is to be manured heavily, takes 24 cartloads; more lightly, 18' (Columella 2.5.1). 'When the ***Favonii*** start to blow, that is, from the 13th February to the beginning of March' (Columella 8.11.7). Compare ***50***.

(119) For the press-beam, levers and pins see ***18–19*** and ***12***. More details on cutting timber at ***17***.

32. Be sure to begin in good time to prune vines trained on trees[120] and to layer vines.

Tending Vines

Be sure to train vines upwards, as much as you can.

The trees are to be pruned thus: the branches that you leave to be well separated; cut straight; do not leave too many. Vines should have good knots on each tree-branch. Take great care not to 'precipitate' the vine[121] and not to tie it too tight. Be sure that trees are well married, and that vines are planted in sufficient numbers: where appropriate, detach vines entirely from the tree, layer to the ground, and separate from the stock two years later.

33. Have the vines tended as follows: Vine shoots, with plenty of knots, to be trained straight and not to be crooked. Always train upwards, as much as you can. Leave fruiting wood and renewal wood. The vine to be trained as high as possible and tied straight but not too tight.

Tend in this way: trench round the heads;[122] dig round the pruned vine; begin to plough; trace continuous furrows on each side. Layer new vines as early as possible, then hoe. Cut old vines back as little as possible. It is better to layer to the ground and separate from the stock two years later. It is time enough for the young vine to be cut back when it is strong.

If the vineyard is bald of vines, trench between and plant cuttings.[123] Keep shade from these trenches, and dig frequently. In an old vineyard that is poor, sow *ocinum*, but not to bear seed; and

(120) Columella (5.6) gives more information. He assumes that elms will be used to support vines, but mentions alternative species at 5.7.1. Cypresses, which Cato was interested in growing, could also be used: see ***48*** and note, ***151***.

(121) 'Shoots are called *praecipites* which, sprung from one-year-old rods, are tied to the hard wood. They fruit very heavily but damage the mother vine' (Columella 5.6.33, with additional details).

(122) **Trenching**, Latin *ablaqueare*, removed surface roots and allowed warmth and moisture to reach the 'head' (Pliny 17.140; Columella, *On Trees* 5.3–4).

(123) On the vine nursery see ***47***. Columella marketed cuttings at 600 *sestertii* the thousand (Columella 3.3.13–14).

put dung, or chaff, or marc, or whatever, to the heads to make them healthier.

When the vine comes into leaf, tie in. Tie young vines at close intervals, so that the shoots do not break. If they are already at the rod, tie their young tendrils lightly and train them to the right angle. When the grapes begin to colour, tie the branches to support them, strip and expose the grapes. Hoe around the heads.

Cut willow at the proper time, strip of bark and tie in bundles. Keep the bark, and, when required in the vineyard, soak some in water and use for tying. Keep the canes to make carrying-baskets.

Autumn Sowing; More Notes on Where to Plant[124]

34. I return to sowing. Sow first in the coldest, wettest field. The last sowing should be made in the hottest field. Avoid working carious land.

Red earth,[125] grey earth,[126] ground that is heavy, stony, sandy, and also that is not watery: lupins will do well there.

In chalk[127] and mud and red earth and in watery ground, it is best to sow emmer.

Fields that are dry and not weedy, open and not shaded: sow durum wheat there.[128]

(124) Columella (2.2.2) speaks of 'six soil qualities, fat or lean, loose or dense, wet or dry'. On **carious** land see ***5*** and note.

(125) My **red earth** is Cato's *rubrica*, which perhaps equates with Italian *terra rossa* (White, *Farming*, p. 97). 'Red earth, Atticus adds, is heavy and does not give roots an even purchase. It nourishes the vine, once rooted; but it is difficult to work. Digging it is difficult when it is wet because it is so very sticky, and when very dry because it is so excessively hard' (Columella 3.11.10).

(126) My **grey earth** is Cato's *pullus*. This was a good, dark grey, crumbly, moderately loose soil typical of Campanian farmland (Columella 1 preface 24, 2.10.18, 3.11.6), of volcanic origin.

(127) See note at ***40***.

(128) The three species of wheat familiar in Roman Italy are **emmer**, *Triticum dicoccum*, Latin *far* or *semen adoreum*; **durum wheat**, *T. durum*, Latin *triticum*; and **bread wheat**, *T. aestivum*, Latin *siligo*. 'Experts plant emmer rather than durum wheat in relatively wet ground; barley rather than emmer in rather dry; in middling, either' (Varro 1.9.4; see also André, *Alimentation*, pp. 51–3).

35. Sow beans in fields that are strong and not prone to fail.

Sow vetch and fenugreek in your least weedy fields.

You should sow bread wheat and durum wheat in open, high fields where the sun shines longest.

Sow lentil in stony ground or red earth that is not weedy.

Sow barley in a newly cleared field or in one that can be sown every year.[129]

You should sow three month wheat[130] in a field that you were unable to sow early, or a field that is fat enough to be sown every year.

Sow turnip, field rape and radish in a well-manured field or a fat field.

Memoranda on Crops and Manuring

36. Manure for crops:

You can spread pigeon dung on pasture, garden or arable field.[131]

Store goat, sheep, ox and all other dung carefully.

Spread *amurca*,[132] or water trees with it: around larger heads, dose 1 amphora; smaller, 1 *urna*; add half of water. Trench beforehand, but not deeply.

37. Bad for crops:

To dig carious ground.

Chickpea is bad, because it is pulled up, and because it is salty.[133]

Barley, fenugreek, bitter vetch, all suck the field dry; so do all crops that are pulled up.

(129) **Lentil** is Latin *lens*. **Barley** is Latin *hordeum*.

(130) '**Three month wheat** [Latin *trimestre*], so convenient to farmers: when early sowing did not get done because of rain or some other cause, recourse is had to this. It is another kind of bread wheat' (Columella 2.6.2: see White, *Farming*, pp. 36–7). It was sown in March, according to the *Menologium Colotianum*.

(131) 'Cassius writes that the best dung is that of birds, except marsh and sea birds, and best of all is pigeon, because it is hottest and makes the ground ferment. It should be scattered on the field like seed, not heaped like cowdung' (Varro 1.38.1).

(132) ***Amurca***: see note at ***66***. On the dosing of olive trees compare ***93***.

(133) **Chickpea** (*Cicer arietinum*) is Latin *cicer*.

Do not put olive stones to the crop.
Legumes that feed cereals:
Lupin, beans, vetch.[134]
Sources of manure:
Straw, lupin, chaff, beanstalks, pods, holm-oak and oak foliage.

In Winter

Pull out danewort, hemlock, from the crop, and *herba alta* and sedge from the willow bed. Lay this stinking foliage as litter for sheep and oxen.[135]

Sieve the debris from the olive stones, put in a tank, add water, turn over well with a shovel. Use this mixture to manure trenched olives; also use burnt olive stones.

If a vine is poor, chop up its shoots and plough them or dig them in at the spot.

Do this by candlelight in winter: dry-trim vine-posts and stakes,[136] having brought them under cover a day beforehand; make torches; clear the sheds of dung, but not at new moon or half moon.[137]

Do not touch timber at those times. Best to take is the wood that you trim or fell in the seven days closest to full moon. Take special care never to trim or fell timber, or to touch it if you can help, unless it is dry and not icy or dewy.

(134) **Vetch**: Columella (2.13.1–2) agrees with Cato, 'provided that, after being cut green, they are immediately afterwards ploughed in … [otherwise] they will take all the moisture from the soil and absorb its strength.'

(135) **Danewort**, *Sambucus ebulus*, is Latin *ebulus*. It is a close relative of the equally stinking elderberry. **Hemlock** is Latin *cicuta*. **Sedge** is Latin *ulva*. Some of this foliage is poisonous, but because it is strong-smelling the beasts will not eat it.

Latin ***herba alta*** 'tall weed' is not identified; later authors do not use the name. It is possibly the poisonous *Anagyris fetida* 'bean trefoil', which is nowadays called *erva fetente* 'stinking weed' in the Italian dialect of Naples. Pliny (27.30) gives this plant a Greek name, *anagyros*.

(136) 'There are about four kinds of vine support. The stoutest, generally most useful in the vineyard, is made of oak or juniper and called *ridica* 'vine-post'. Next is the *palus* 'vine-stake' made of a branch, and preferably a good hardwood one, so that it will last longer …' (Varro 1.8.4).

(137) Compare the list given by Columella 11.2.90–91.

Hoe twice, weed and pull out oats from the wheat.

Bring back canes from pruned vines and trees. Make faggots, and pile up for the owner's use vine branches, fig wood for kindling, and chopped wood.

38. The limekiln. Make a limekiln 10 feet wide, 20 feet high; narrow it to 3 feet wide at the top. If your kiln has a single door, make a large cavity inside to hold the ash, so that it does not have to be cleared, and design the kiln carefully, making sure that the hearth extends across the whole bottom of the kiln. If your kiln has two doors, there is no need for this cavity: when the ash is to be cleared it can come out of one door while the fire is at the other. Take care that the fire never goes out, neither at night nor at any other time. Load the kiln with good stones, as white and as evenly coloured as possible. In making the kiln, make the furnace as steep-sided as possible. Dig deep enough to site the kiln so that it is as deep and as sheltered from the wind as possible. If you cannot site it as deep as you would like, make the top of brick or of concrete, and seal the top part on the outside. After lighting, if fire emerges anywhere except by the chimney, stop with mud. Take care that the wind does not get in at the door: be especially wary of the south wind.

You will tell that the lime is cooked when you find that the top stones are cooked. Also the lowest stones, once cooked, will collapse, and the fire will begin to give less smoke.

If you cannot sell firewood and sticks and have no stone to make lime, make charcoal with your wood. Sticks and canes that are no use to you should be burnt in the field. Sow poppy where you had the bonfire.[138]

(138) **Poppy**, Latin *papaver*, would be profitable for its seeds, used in confectionery (*79*) and cooking, and even more for its opium, highly important medicinally. Its leaves also had a place in the diet. Pliny recognized two kinds of poppy, white and black, the latter cultivated for edible oil, 'the former's seed served roasted with honey at dessert by the ancients; peasants sprinkle it on loaves, using egg to bind it' (Pliny 19.168, compare 18.229, 20.198–209 and elsewhere).

39. When the weather is bad and no field work can be done,[139] shift dung to the dung-heap; clean out the ox shed, the sheepfold, the hen-run,[140] the farm buildings; mend wine vats with lead, or bind with sappy oak stems. If you mend or bind them well, fill the cracks with putty, and pitch well, any vat can become a wine vat. Make up putty for wine vats as follows: 1 *lb.* wax, 1 *lb.* resin, 1/3 oz. sulphur. Put all together in a new saucepan, add powdered gypsum till it reaches the consistency of a plaster. Use to mend vats. After mending, to make all the same colour: mix 2 parts raw clay with a third part lime. Make small bricks, cook in the oven, grind and apply.[141]

In rain, look for work to be done indoors. Rather than do nothing, do cleaning. Remember that the establishment will cost just as much if nothing is done.

In Spring

40. You can do the following in spring:

Dig trenches and planting holes.

Dig nursery beds and young vine beds.

Layer vines.

Plant elms, figs, fruit trees and olives in heavy and waterlogged ground. Figs, olives, apples, pears, vines can be planted at new moon, in the afternoon, when there is no south wind.

Graft olives, figs, pears and apples as follows. Cut the stem on which you wish to graft, somewhat sloping, so that water will run off. When you cut, take care not to tear the bark. Take a dry twig; sharpen it to a point. Tear off some Greek willow. Mix clay or chalk,[142] a little sand, and cow dung; knead well together so that

(139) Vergil, in the *Georgics* (1.259–267), makes further suggestions for bad-weather work.

(140) Keeping chickens was one of the manageress's duties (***143***).

(141) On earthenware **vats** (*dolia*) see note at ***11***. Mending them was worthwhile because they took several days to 'build' and were correspondingly expensive (*Geoponica* 6.3; Frayn, *Subsistence farming*, p. 139).

(142) **Clay or chalk**: the two Latin words *argilla* and *creta*, used here, fall in this semantic area but are not as conceptually distinct as *clay* and *chalk*. Palladius (1.34.3) writes of 'the kind of *creta* that we call *argilla*'.

it becomes as sticky as possible. Take the torn-off willow, bind round the cut stock with it and do not let the bark break. At this spot, insert the sharpened twig between bark and stock to a length of 2 fingertips' breadth. Now take a scion of the kind you want to graft, and sharpen its end obliquely to 2 fingertips' breadth. Remove the dry twig that you inserted, insert the desired scion, match bark to bark. Insert to the depth of the sharpened end.[143] Make a second, a third, a fourth graft in the same way; insert as many varieties as you wish. Bind generously with Greek willow. Seal the stock with the kneaded mixture to 3 fingers' breadth. Bandage with bugloss,[144] so that water will not collect on the bark: tie this bugloss over the bark in such a way that it will not come off. Then cover with straw, and tie, to avoid frost damage.

41. Vines are grafted, firstly in spring, secondly when they are in flower: the second season is the best. Pears and apples are grafted in spring, in the fifty days of solstice, and at harvest. Olives and figs are grafted in spring.

Vines are grafted as follows.[145] Cut the stock; split it in the centre through the quick; insert sharpened scions; match quick to quick as you insert. A second method is this: if vine is close to vine, sharpen a young shoot of each obliquely, and tie them together with bark, quick to quick. A third method is this. With a gimlet make a hole in the stock. Into this insert two vine shoots of the required kind, both cut obliquely, up to the quick; be sure to match quick to quick. Insert one from each side into the hole that you have pierced. Your shoots should be two feet long. Insert them below ground level and turn them back towards the head of the vine. Fasten the parent vines into the earth and cover with soil.

(143) For a fuller explanation see Columella 5.11.3–5. He recommends 'a kind of thin wedge of iron or bone' rather than a dry twig. Nowadays, a penknife serves.

(144) **Bugloss**: Cato's *lingua bubula* is identified with Greek *bouglossos* (Dioscorides 4.127) and both names have the same literal meaning, 'ox-tongue'. A distinguishing feature of *Anchusa arvensis*, 'field bugloss' and of *Echium vulgare*, 'viper's bugloss', is their hairiness, which should make their leaves effective at repelling water. Probably one or both of these related species is meant.

(145) For a fuller explanation see Columella 4.29.6–17.

Seal all with kneaded mixture, bandage and cover in the same way as for olives.

42. Figs and olives by another method.[146] On any kind of fig or olive you want it to be, cut away some bark with a scalpel. Cut a second piece of bark, with a bud, from the fig of the kind you choose, put it to the spot where you cut the bark away for your graft, and shape it to fit. The graft should be 3 1/2 fingers' breadth long, 3 fingers' breadth wide. Seal and cover in the same way as the others.

43. In wet ground, drainage trenches should be dug 3 feet wide at the top, 4 feet deep, 1 foot 1 palm wide at the bottom. Pave with stone. If you have no stone, spread with green willow rods placed crosswise. If you have no rods, canes tied in bundles. Then dig your planting holes 3 1/2 feet deep, 4 feet wide, and let the water run from these into the trench. Then plant the olives.

In vineyards, rows and plants should be not less than 2 1/2 feet apart in any direction. If you want the vines and olives that you have planted to grow quickly, you can dig the rows once a month and around the olive trees every month until they are three years old. Tend other trees in the same way.

44. Begin to prune the olive orchard 15 days before the equinox. It is correct to prune for 45 days starting on that day.

Prune as follows. In really vigorous ground, cut out every dry branch and anything broken by the wind. In ground that is not so vigorous, prune and plough more: remove eyes carefully and smooth off the trunks.

45. Olive cuttings that you are to plant out[147] should be trimmed to 3 feet. Handle them carefully: make sure the bark is not damaged when you cut or trim them.

Those that you are to plant in the nursery should be 1 foot long. Plant them thus: turn the ground with a spade, and get the soil quite soft and crumbly. When you insert the cutting, firm it down

(146) For a fuller explanation of 'scutcheon grafting' see Columella 5. 11.6–8.
(147) For a fuller explanation see Columella 5.9.1–11.

with the foot. If it will not go deep enough, knock in with a small hammer or mallet, and be careful not to split the bark as you knock it. Do not make a hole with a stake to plant the cutting in. It will take better if you plant it so that it stands upright. Once the cuttings are three years old, they are ripe to plant out when the bark turns. If you plant them in planting holes or trenches, place them in threes and spread them apart. They should not be more than 4 fingers' breadth above the ground.

Or, plant buds.

46. Make the nursery as follows. A ground as good, as open and as well manured as you can manage, and whose soil is as similar as possible to that where you will eventually plant the seedlings, and where the seedlings will not have to be carried too far. Turn the ground with a spade, take out stones, fence round carefully, plant in rows. Plant cuttings 1 1/2 feet apart in any direction; firm down with the foot. If you cannot plant them deep enough, knock in with a hammer or mallet. Make the cuttings stand 1 finger's breadth above the ground. Seal the base of the cutting with cow dung, put a marker beside it, and hoe frequently if you want the cuttings to grow quickly. Plant other cuttings in the same way.

47. Sow reeds as follows: Arrange the 'eyes' 3 feet apart.[148]

Make and plant a vine nursery in the same way.[149] When the vine is two years old, cut it back. When it is three years old, replant it. If animals are to graze where you will plant your vineyard, cut back three times before you put them to the tree. Put them to the tree when they have five old eyes.

Every year you sow leeks, you will have leeks to pull.

48. Make a fruit nursery in the same way as an olive nursery. Plant each kind separately.

(148) This repeats the instruction at ***6*** (see note there).

(149) Columella reckoned 24,000 plants to the *iugerum* in a vine nursery (Columella 3.5.3–4).

Where you plant cypress seed,[150] turn the ground with a spade: plant at the beginning of spring. Make the ridges five feet wide. Add crumbled dung, hoe in and break down the sods. Make the ridges flat, slightly concave. Then sow the seed, as densely as flax,[151] and sieve earth over densely, 1 finger's breadth thick. Flatten this earth down with a board or with the feet. Fix forked props around, stretch rods between them, place canes or fig-drying hurdles across these to keep out the cold and the sun. Make them high enough for a person to walk underneath. Weed frequently: as soon as the weeds begin to grow, take them out, because if you pull up tough weeds you will pull up the cypresses as well.

Plant and screen pear and apple seed in the same way.

Plant pine kernels in the same way, or else plant them like garlic.[152]

49. If you wish to move an old vine to a new spot, you can do so if it is no thicker than an arm. Prune first, leaving no more than two buds per branch. Dig up the roots carefully, following their full length, and take care not to damage them. Place it in the planting hole or trench, oriented as it was, cover and tread down well. Mount it, tie it and arrange its branches just as they were, and dig frequently.

50. Manure the pastures at the beginning of spring at new moon, or, if they are not irrigated, when the Favonius begins to blow.[153]

While the animals are out of the pastures, clear them and root out all invasive weeds.

After pruning vines, pile up firewood and sticks.

Thin out figs. In the vineyard, prune the lower branches of figs so that the vines do not climb them.

(150) **Cypresses** were used to support vines (Varro 1.26.1), and cypress wood made good vine-props (Columella 4.26.1). Alternative instructions for cypresses are given at ***151***.
(151) 'One *iugerum* of land is sown with eight pecks of **flax**' (Columella 2.10.17).
(152) Pine trees were wanted for their wood, for their resin and for the **pine kernels** themselves (Cato's *nux pinea*), a culinary flavouring. On **garlic** see note at ***70***.
(153) See note at ***29***.

Make a vine nursery, or restore an existing one.

All these things are to do before you begin to dig the vineyard.

When the Feast is shared and eaten, begin the spring ploughing. Plough first the grounds that are driest: those that are fattest and wettest plough last, so long as they do not begin to harden.[154]

51. Layering of fruit trees, other trees.[155]

Suckers that grow from the tree at ground level to be layered to the ground (the extremity to be raised) so that they root. Two years later, dig them up and replant them. Fig, olive, pomegranate, quince and all other apples,[156] bay, myrtle, hazelnut, plane, can all be layered from the root, dug up and replanted in the same way.

52. Those that you wish to layer more carefully, you can layer in pots or planting-baskets with holes: they can eventually be planted out without removing these. The aim is that they take root while on the tree. Make a hole in a pot; take the branch that you wish to root through the hole. (Or basket.) Fill the pot or basket with earth, firm it down well, and leave it on the tree. In time, sever the branch under the basket. Make a cut in the basket from bottom to top; if a cup, break. Plant out with the basket or pot.

You can layer a vine in the same way, severing it and planting it out with the basket a year later. Layer any kind you wish in this way.

53. Cut hay at the right time, and take care not to cut it late. Cut it before it is ripe.[157]

Store separately what will be your best hay, for them to eat in spring when they are ploughing, before you give them *ocinum*.

(154) This paragraph is repeated at ***131–2***, where details of the Feast are given.

(155) ***51–2***, a very hastily-written passage, is repeated in similar words at ***133***.

(156) See note at ***7***.

(157) 'Best before it begins to dry, because you get more of it and it is more acceptable food for cattle. The balance in storing **hay** is not to harvest it when dried out, because once it has lost its sap it is no better than straw, nor when quite green, because if too sappy it rots in the hayloft and risks heating up, catching fire and causing a conflagration' (Columella 2.18.1).