

Roman Farm Management: The Treatises of Cato and Varro

Marcus Porcius Cato and Marcus Terentius



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*** START OF THE PROJECT GUTENBERG EBOOK ROMAN FARM
MANAGEMENT: THE TREATISES OF CATO AND VARRO ***

[Transcriber's note: The extensive and lengthy footnotes have been renumbered and placed at the end of the book.]

ROMAN FARM MANAGEMENT

THE TREATISES OF CATO AND VARRO

DONE INTO ENGLISH, WITH NOTES OF MODERN INSTANCES

BY A VIRGINIA FARMER

1918

PREFACE

The present editor made the acquaintance of Cato and Varro standing at a book stall on the Quai Voltaire in Paris, and they carried him away in imagination, during a pleasant half hour, not to the vineyards and olive yards of Roman Italy, but to the blue hills of a far distant Virginia where the corn was beginning to tassel and the fat cattle were loafing in the pastures. Subsequently, when it appeared that there was then no readily available English version of the Roman agronomists, this translation was made, in the spirit of old Piero Vettori, the kindly Florentine scholar, whose portrait was painted by Titian and whose monument may still be seen in the Church of Santo Spirito: in the preface of his edition of Varro he says that he undertook the work, not for the purpose of displaying his learning, but to aid others in the study of an excellent author. Victorius was justified by his scholarship and the present editor has no such claim to attention: he, therefore, makes the confession frankly (to anticipate perhaps such criticism as Bentley's "a very pretty poem, Mr. Pope, but don't call it Homer") and offers the little book to those who love the country, and to read about the country amidst the crowded life of towns, with the hope that they may find in it some measure of the pleasure it has afforded the editor.

The texts and commentaries used have been those of Schneider and Keil, the latter more accurate but the former more sympathetic.

F.H. BELVOIR,
Fauquier County,
Virginia.

December, 1912.

FOREWORD TO SECOND EDITION

The call for a reprint of this book has afforded the opportunity to correct some errors and to make several additions to the notes.

In withholding his name from the title page the editor sought not so much to conceal his identity as to avoid the appearance of a parade in what was to him the unwonted field of polite literature. As, however, he is neither ashamed of the book nor essays the *rôle* of

A violet by a mossy stone
Half hidden from the eye,

he now and here signs his name.

FAIRFAX HARRISON.

BELVOIR HOUSE,
Christmas, 1917.

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VARRO'S *RERUM RUSTICARUM LIBRI TRES*

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ROMAN FARM MANAGEMENT

NOTE UPON THE ROMAN AGRONOMISTS

Quaecunque autem propter disciplinam ruris nostrorum temporum cum priscis discrepant, non deterrere debent a lectione discentem. Nam multo plura reperiuntur, apud veteres, quae nobis probanda sint, quam quae repudianda.

COLUMELLA I, I.

The study of the Roman treatises on farm management is profitable to the modern farmer however practical and scientific he may be. He will not find in them any thing about bacteria and the "nodular hypothesis" in respect of legumes, nor any thing about plant metabolism, nor even any thing about the effects of creatinine on growth and absorption; but, important and fascinating as are the illuminations of modern science upon practical agriculture, the intelligent farmer with imagination (every successful farmer has imagination, whether or not he is intelligent) will find some thing quite as important to his welfare in the body of Roman husbandry which has come down to us, namely: a background for his daily routine, an appreciation that two thousand years ago men were studying the same problems and solving them by intelligent reasoning. Columella well says that in reading the ancient writers we may find in them more to approve than to disapprove, however much our new science may lead us to differ from them in practice. The characteristics of the Roman methods of farm

management, viewed in the light of the present state of the art in America, were thoroughness and patience. The Romans had learned many things which we are now learning again, such as green manuring with legumes, soiling, seed selection, the testing of soil for sourness, intensive cultivation of a fallow as well as of a crop, conservative rotation, the importance of live stock in a system of general farming, the preservation of the chemical content of manure and the composting of the rubbish of a farm, but they brought to their farming operations some thing more which we have not altogether learned—the character which made them a people of enduring achievement. Varro quotes one of their proverbs "Romanus sedendo vincit," which illustrates my present point. The Romans achieved their results by thoroughness and patience. It was thus that they defeated Hannibal and it was thus that they built their farm houses and fences, cultivated their fields, their vineyards and their oliveyards, and bred and fed their live stock. They seem to have realized that there are no short cuts in the processes of nature, and that the law of compensations is invariable. The foundation of their agriculture was the fallow[1] and one finds them constantly using it as a simile—in the advice not to breed a mare every year, as in that not to exact too much tribute from a bee hive. Ovid even warns a lover to allow fallow seasons to intervene in his courtship.

While one can find instruction in their practice even today, one can benefit even more from their agricultural philosophy, for the characteristic of the American farmer is that he is in too much of a hurry.

The ancient literature of farm management was voluminous. Varro cites fifty Greek authors on the subject whose works he knew, beginning with Hesiod and Xenophon. Mago of Carthage wrote a treatise in the Punic tongue which was so highly esteemed that the Roman Senate ordered it translated into Latin, but, like most of the Greeks,[2] it is now lost to us except in the literary tradition.

Columella says that it was Cato who taught Agriculture to speak Latin. Cato's book, written in the middle of the second century B. C, was the first on the subject in Latin; indeed, it was one of the very first books written in that vernacular at all. Of the other Latin writers whose bucolic works have survived, Varro and Virgil wrote at the beginning of the Augustan Age and were followed by the Spanish Columella under Tiberius, and by Pliny (with his Natural History) under Titus. After them (and "a long way after," as Mr. Punch says) came in the fourth century the worthy but dull Palladius, who supplied the hornbook used by the agricultural monks throughout the Dark Ages.

MARCUS PORCIUS CATO (B.C. 234-149), known in history as the elder Cato, was the type of Roman produced by the most vigorous days of the Republic. Born at Tusculum on the narrow acres which his peasant forefathers had tilled in the intervals of military service, he commenced advocate at the country assizes, followed his fortunes to Rome and there became a leader of the metropolitan bar. He saw gallant military service in Spain and in Greece, commanded an army, held all the curule offices of state and ended a contentious life in the Senate denouncing Carthage and the degeneracy of the times.

He was an upstanding man, but as coarse as he was vigorous in mind and in body. Roman literature is full of anecdotes about him and his wise and witty sayings.

Unlike many men who have devoted a toilsome youth to agricultural labour, when he attained fame and fortune he maintained his interest in his farm, and wrote his *De re rustica* in green old age. It tells what sort of farm manager he himself was, or wanted to be thought to be, and, though a mere collection of random notes, sets forth more shrewd common sense and

agricultural experience than it is possible to pack into the same number of English words. It remains today of much more than antiquarian interest.

MARCUS TERENTIUS VARRO (B.C. 116-28) whom Quintilian called "the most learned of the Romans," and Petrarch "il terzo gran lume Romano," ranking him with Cicero and Virgil, probably studied agriculture before he studied any thing else, for he was born on a Sabine farm, and although of a well to do family, was bred in the habits of simplicity and rural industry with which the poets have made that name synonymous. All his life he amused the leisure snatched from his studies with intelligent supervision of the farming of his several estates: and he wrote his treatise *Rerum Rusticarum* in his eightieth year.[3]

He had his share of active life, but it was as a scholar that he distinguished himself.[4] Belonging to the aristocratic party, he became a friend and supporter of Pompey, and, after holding a naval command under him in the war against the Pirates in B.C. 67, was his legatus in Spain at the beginning of the civil wars and there surrendered to Caesar. He was again on the losing side at the battle of Pharsalia, but was pardoned by Caesar, who selected him to be librarian of the public library he proposed to establish at Rome.[5] From this time Varro eschewed politics and devoted himself to letters, although his troubles were not yet at an end: after the death of Caesar, the ruthless Antony despoiled his villa at Casinum (where Varro had built the aviary described in book Three), and like Cicero he was included in the proscriptions which followed the compact of the triumvirs, but in the end unlike Cicero he escaped and spent his last years peacefully at his villas at Cumae and Tusculum.

His literary activity was astonishing: he wrote at least six hundred books covering a wide range of antiquarian research. St. Augustine, who dearly loved to turn a balanced phrase, says that Varro had read so much that it is

difficult to understand when he found time to write, while on the other hand he wrote so much that one can scarcely read all his books. Cicero, who claimed him as an intimate friend, describes (*Acad.* III) what Varro had written before B.C. 46, but he went on producing to the end of his long life, eighteen years later: "For," says Cicero, "while we are sojourners, so to speak, in our own city and wandering about like strangers, your books have conducted us, as it were, home again, so as to enable us at last to recognize who and whence we are. You have discussed the antiquities of our country and the variety of dates and chronology relating to it. You have explained the laws which regulate sacrifices and priests: you have unfolded the customs of the city both in war and peace: you have described the various quarters and districts: you have omitted mentioning none of the names, or kinds, or functions, or causes of divine or human things: you have thrown a flood of light on our poets and altogether on Latin literature and the Latin language: you have yourself composed a poem of varied beauties and elegant in almost every part: and you have in many places touched upon philosophy in a manner sufficient to excite our curiosity, though inadequate to instruct us."

Of Varro's works, beside the *Rerum Rusticarum*, there have survived only fragments, including a considerable portion of the treatise on the Latin language: the story is that most of his books were deliberately destroyed at the procurement of the Church (something not impossible, as witness the Emperor Theodosius in *Corpus Juris Civilis*. Cod. Lib. I, tit. I, cap. 3, § I) to conceal St. Augustine's plagiarism from them; yet the *De Civitate Dei*, which is largely devoted to refuting Varro's pagan theology, is a perennial monument to his fame. St. Augustine says (VI, 2): "Although his elocution has less charm, he is so full of learning and philosophy that ... he instructs the student of facts as much as Cicero delights the student of style."

Varro's treatise on farm management is the best practical book on the subject which has come down to us from antiquity. It has not the spontaneous originality of Cato, nor the detail and suave elegance of Columella. Walter Harte in his *Essays on Husbandry* (1764) says that Cato writes like an English squire and Varro like a French academician. This is just comment on Cato but it is at once too much and too little to say of Varro: a French academician might be proud of his antiquarian learning, but would balk at his awkward and homely Latin, as indeed one French academician, M. Boissier, has since done. The real merit of Varro's book is that it is the well digested system of an experienced and successful farmer who has seen and practised all that he records.

The authority from which Virgil drew the practical farming lore, for which he has been extolled in all ages, was Varro: indeed, as a farm manual the *Georgics* go astray only when they depart from Varro. It is worth while to elaborate this point, which Professor Sellar, in his argument for the originality of Virgil, only suggests.[6]

After Philippi the times were ripe for books on agriculture. The Roman world had been divided between Octavian and Antony and there was peace in Italy: men were turning "back to the land."

An agricultural regeneration of Italy was impending, chiefly in viticulture, as Ferrero has pointed out. With far sighted appreciation of the economic advantages of this, Octavian determined to promote the movement, which became one of the completed glories of the Augustan Age, when Horace sang

Tua, Caesar, aetas
Fruges et agris rettulit uberes.

Varro's book appeared in B.C. 37 and during that year Maecenas commissioned Virgil to put into verse the spirit of the times; just as, under similar circumstances, Cromwell pensioned Samuel Hartlib. Such is the coincidence of the dates that it is not impossible that the *Rerum Rusticarum* suggested the subject of the *Georgics*, either to Virgil or to Maecenas.

There is no evidence in the *Bucolics* that Virgil ever had any practical knowledge of agriculture before he undertook to write the *Georgics*. His father was, it is true, a farmer, but apparently in a small way and unsuccessful, for he had to eke out a frugal livelihood by keeping bees and serving as the hireling deputy of a *viator* or constable. This type of farmer persists and may be recognized in any rural community: but the agricultural colleges do not enlist such men into their faculties. So it is possible that Virgil owed little agricultural knowledge to his father's precepts or example. Virgil perhaps had tended his father's flock, as he pictures himself doing under the guise of Tityrus; certainly he spent many hours of youth "patulae recubans sub tegmine fagi" steeping his Celtic soul with the beauty and the melancholy poetry of the Lombard landscape: and so he came to know and to love bird and flower and the external aspects of

wheat and woodland tilth and vineyard, hive and horse and herd,

but it does not appear that he ever followed the plough, or, what is more important, ever laid off a ploughgate. As a poet of nature no one was ever better equipped (the highest testimony is that of Tennyson), but when it came to writing poetry around the art of farm management it was necessary for him to turn to books for his facts. He acknowledges (*Geo.* I, 176) his obligation only to *veterum praecepta* without naming them, but as M. Gaston Boissier says he was evidently referring to Varro "le plus moderne de tous les anciens." [7] Virgil evidently regarded Varro's treatise as a solid foundation for his poem and he used it freely, just as he drew on Hesiod for

literary inspiration, on Lucretius for imaginative philosophy, and on Mago and Cato and the two Sasernas for local colour.

Virgil probably had also the advantage of personal contact with Varro during the seven years he was composing and polishing the *Georgics*. He spent them largely at Naples (*Geo.* IV, 563) and Varro was then established in retirement at Cumae: thus they were neighbours, and, although they belonged to different political parties, the young poet must have known and visited the old polymath; there was every reason for him to have taken advantage of the opportunity. Whatever justification there may be for this conjecture, the fact remains that Varro is in the background every where throughout the *Georgics*, as the "deadly parallel" in the appended note will indicate. This is perhaps the most interesting thing about Varro's treatise: instructive and entertaining as it is to the farmer, in the large sense of the effect of literature on mankind, Virgil gave it wings—the useful cart horse became Pegasus.

As a consequence of the chorus of praise of the *Georgics*, there have been those, in all ages, who have sneered at Virgil's farming. The first such *advocatus diaboli* was Seneca, who, writing to Lucilius (*Ep.* 86) from the farm house of Scipio Africanus, fell foul of the advice (*Geo.* I, 216) to plant both beans and millet in the spring, saying that he had just seen at the end of June beans gathered and millet sowed on the same day: from which he generalized that Virgil disregarded the truth to turn a graceful verse, and sought rather to delight his reader than to instruct the husbandman. This kind of cheap criticism does not increase our respect for Nero's philosophic minister.[8] Whatever may have been Virgil's mistakes, every farmer of sentiment should thank God that one of the greatest poems in any language contains as much as it does of a sound tradition of the practical side of his art, and here is where Varro is entitled to the appreciation which is always due the schoolmaster of a genius.

NOTE ON THE OBLIGATION OF VIRGIL TO VARRO

At the beginning of the first *Georgic* (1-5) Virgil lays out the scope of the poem as dealing with three subjects, agriculture, the care of live stock and the husbandry of bees. This was Varro's plan (R.R. I, I, 2, and I, 2 *passim*) except that under the third head Varro included, with bees, all the other kinds of stock which were usually kept at a Roman steading. Varro asserts that his was the first scientific classification of the subject ever made. Virgil (G. I, 5-13) begins too with the invocation of the Sun and the Moon and certain rural deities, as did Varro (R.R. I, I, 4). The passages should be compared for, as M. Gaston Boissier has pointed out, the difference in the point of view of the two men is here illustrated by the fact that Varro appeals to purely Roman deities, while Virgil invokes the literary gods of Greece. Following the *Georgics* through, one who has studied Varro will note other passages for which a suggestion may be found in Varro, usually in facts, but some times in thought and even in words, viz: Before beginning his agricultural operations a farmer should study the character of the country (G. I, 50: R.R. I, 6), the prevailing winds and the climate (G. I, 51: R.R. I, 2, 3), the farming practice of the neighbourhood (G. I, 52: R.R. I, 18, 7), "this land is fit for corn, that for vines, and the other for trees," (G. I, 54: R.R. I, 6, 5). He should practise fallow and rotation (G. I, 71: R.R. I, 44, 2), and compensate the land by planting legumes (G. I, 74: R.R. I, 23); he should irrigate his meadows in summer (G. I, 104: R.R. I, 31, 5), and drain

off surface water in winter (G. I, 113: R.R. I, 36). Man has progressed from a primitive state, when he subsisted on nuts and berries, to the domestication of animals and to agriculture (G. I, 121-159: R.R. II, 1, 3). The threshing floor must be protected from pests (G. I, 178: R.R. I, 51). Seed should be carefully selected (G. I, 197: R.R. 40, 2); the time for sowing grain is the autumn (G. I, 219: R.R. I, 34). "Everlasting night" prevails in the Arctic regions (G. I, 247: R.R. I, 2, 5); the importance to the farmer of the four seasons (G.I. 258; R.R. I, 27) and the influence of the Moon (G.I. 276: R.R. I, 37).

The several methods of propagating plants described (G. II, 9-34: R.R. I, 39), but here Varro follows Theophrastus (H.P. II, 1); trees grow slowly from seed (G. II, 57; R.R. I, 41, 4); olives are propagated from truncheons (G. II, 63; R.R. I, 41, 6). "The praise of Italy" (G. II, 136-176: R.R. I, 2, 6), where trees bear twice a year (G. II, 150: R.R. I, 7, 6). Certain plants affect certain soils (G. II, 177: R.R. I, 9). A physical experiment (G. II, 230; R.R. I, 7); the advantage of the quincunx in planting (G. II, 286: R.R. I, 7). Fence the vineyard to keep out live stock (G. II, 371: R.R. I, 14); the goat a proper sacrifice to Bacchus (G. II, 380: R.R. I, 2, 19). Be the first to put your vine props under cover (G. II, 409: R.R. I, 8, 6).

The points of cattle (G. III, 50: R.R. II, 5, 7); their breeding age (G. III, 61: R.R. II, 5, 13); segregate the bulls before the breeding season (G. III, 212: R.R. II, 5, 12). Recruit your herd with fresh blood (G. III, 69: R.R. II, 5, 17). How to break young oxen (G. III, 163: R.R. I, 20).

Of breeding live stock, the males should be fat, the females lean (G. III, 123-129: R.R. II, 5, 12).

The points of a horse (G. III, 79: R.R. II, 7, 5). Mares fecundated by the wind (G. III, 273: R.R. II, 1, 19). The care of the brood mare (G. III, 138: R.R. II, 7, 10). The bearing of a spirited colt in the field (G. III, 75: R.R. II,

7, 6); the training of a colt, "rattling bridles" in the stable (G. III, 184: R.R. II, 7, 12).

Supply bedding for the sheep (G. III, 298: R.R. II, 2, 8), the goat stable should face southeast (G. III, 302: R.R. II, 3, 6). Goats' hair used for military purposes (G. III, 313: R.R. II, 11, 11.) Goats affect rough pasture (G. III, 314: R.R. II, 3, 6). A shepherd's daily routine (G. III, 322; R.R. II, 2, 10-11). The life of shepherds in the saltus (G. III, 340: R.R. II, 10, 6). Beware of a ram with a spotted tongue (G. III, 387: R.R. II, 2, 4). Anoint sheep as a precaution against scab (G. III, 448: R.R. II, 11, 7).

The location of the bee-stand: a drinking pool with stones in it (G. IV, 26: R.R. III, 16, 27); planted round with bee plants (G. IV, 25: R.R. III, 16, 13), and free from an echo (G. IV, 50: R.R. III, 16, 12). When saving a swarm sprinkle bees balm and beat cymbals (G. IV, 62: R.R. III, 16, 7 and 30). Bees at war obey their leaders 'as at the sound of a trumpet,' but may be quelled by the bee-keeper (G. IV, 70-87: R.R. III, 16, 9 and 35). Keep the mottled king and destroy the black one (G. IV, 90: R.R. III, 16, 18); the "old Corycian" and the brothers Veiani (G. IV, 125: R.R. III, 16, 10): the bees' care of their king (G. IV, 212: R.R. III, 16, 8). Take off the honey twice in the season (G. IV, 221: R.R. III, 16, 34); the generation of bees from the carcass of an ox (G. IV, 281: R.R. II, 5, 5) and cf. the wisdom on this subject attributed to Varro by the *Geoponica* (XV, 2).

CATO'S DE AGRICULTURA

Introduction: of the dignity of the farmer

The pursuits of commerce would be as admirable as they are profitable if they were not subject to so great risks: and so, likewise, of banking, if it was always honestly conducted. For our ancestors considered, and so ordained in their laws, that, while the thief should be cast in double damages, the usurer should make four-fold restitution. From this we may judge how much less desirable a citizen they esteemed the banker than the thief. When they sought to commend an honest man, they termed him good husbandman, good farmer. This they rated the superlative of praise.[9] Personally, I think highly of a man actively and diligently engaged in commerce, who seeks thereby to make his fortune, yet, as I have said, his career is full of risks and pitfalls. But it is from the tillers of the soil that spring the best citizens, the stanchest soldiers; and theirs are the enduring rewards which are most grateful and least envied. Such as devote themselves to that pursuit are least of all men given to evil counsels.

And now, to get to my subject, these observations will serve as preface to what I have promised to discuss.

Of buying a farm

(I)[10] When you have decided to purchase a farm, be careful not to buy rashly; do not spare your visits and be not content with a single tour of inspection. The more you go, the more will the place please you, if it be worth your attention. Give heed to the appearance of the neighbourhood,—a flourishing country should show its prosperity. "When you go in, look about, so that, when needs be, you can find your way out."

Take care that you choose a good climate, not subject to destructive storms, and a soil that is naturally strong. If possible, your farm should be at the foot of a mountain, looking to the South, in a healthy situation, where labour and cattle can be had, well watered, near a good sized town, and either on the sea or a navigable river, or else on a good and much frequented road. Choose a place which has not often changed ownership, one which is sold unwillingly, that has buildings in good repair.

Beware that you do not rashly condemn the experience of others. It is better to buy from a man who has farmed successfully and built well.[11]

When you inspect the farm, look to see how many wine presses and storage vats there are; where there are none of these you can judge what the harvest is. On the other hand, it is not the number of farming implements, but what is done with them, that counts. Where you find few tools, it is not an expensive farm to operate. Know that with a farm, as with a man, however productive it may be, if it has the spending habit, not much will be left over.[12]

Of the duties of the owner.

(II) When you have arrived at your country house and have saluted your household, you should make the rounds of the farm the same day, if possible; if not, then certainly the next day. When you have observed how

the field work has progressed,[13] what things have been done, and what remains undone, you should summon your overseer the next day, and should call for a report of what work has been done in good season and why it has not been possible to complete the rest, and what wine and corn and other crops have been gathered. When you are advised on these points you should make your own calculation of the time necessary for the work, if there does not appear to you to have been enough accomplished. The overseer will report that he himself has worked diligently, but that some slaves have been sick and others truant, the weather has been bad, and that it has been necessary to work the public roads. When he has given these and many other excuses, you should recall to his attention the program of work which you had laid out for him on your last visit and compare it with the results attained. If the weather has been bad, count how many stormy days there have been, and rehearse what work could have been done despite the rain, such as washing and pitching the wine vats, cleaning out the barns, sorting the grain, hauling out and composting the manure, cleaning seed, mending the old gear, and making new, mending the smocks and hoods furnished for the hands. On feast days the old ditches should be mended, the public roads worked, briars cut down, the garden dug, the meadow cleaned, the hedges trimmed and the clippings collected and burned, the fish pond cleaned out. On such days, furthermore, the slaves' rations should be cut down as compared with what is allowed when they are working in the fields in fine weather.

When this routine has been discussed quietly and with good humour and is thoroughly understood by the overseer, you should give orders for the completion of the work which has been neglected.

The accounts of money, supplies and provisions should then be considered. The overseer should report what wine and oil has been sold, what price he got, what is on hand, and what remains for sale. Security

should be taken for such accounts as ought to be secured. All other unsettled matters should be agreed upon. If any thing is needed for the coming year, it should be bought; every thing which is not needed should be sold. Whatever there is for lease should be leased. Orders should be given (and take care that they are in writing) for all work which next it is desired to have done on the farm or let to contract. You should go over the cattle and determine what is to be sold. You should sell the oil, if you can get your price, the surplus wine and corn, the old cattle, the worn out oxen, and the cull sheep, the wool and the hides, the old and sick slaves, and if any thing else is superfluous you should sell that. The appetite of the good farmer is to sell, not to buy.[14]

(IV) Be a good neighbour. Do not roughly give offence to your own people. If the neighbourhood regards you kindly, you will find a readier market for what you have to sell, you will more easily get your work done, either on the place or by contract. If you build, your neighbours will aid you with their services, their cattle and their materials. If any misfortune should overtake you (which God forbid!) they will protect you with kindly interest. [15]

Of laying out the farm

(I) If you ask me what is the best disposition to make of your estate, I would say that should you have bought a farm of one hundred *jugera* (about 66 acres) all told,[16] in the best situation, it should be planted as follows: 1° a vineyard, if it promises a good yield, 2° an irrigated garden, 3° an osier bed, 4° an olive yard, 5° a meadow, 6° a corn field, 7° a wood lot, 8° a cultivated orchard, and 9° a mast grove[17].

(III) In his youth, the farmer ought, diligently to plant his land, but he should ponder before he builds. Planting does not require reflection, but

demands action. It is time enough to build when you have reached your thirty-sixth year, if you have farmed your land well meanwhile. When you do build, let your buildings be proportioned to your estate, and your estate to your buildings[18]. It is fitting that the farm buildings should be well constructed, that you should have ample oil cellars and wine vats, and a good supply of casks, so that you can wait for high prices, something which will redound to your honour, your profit and your self-respect.

(IV) Build your dwelling house in accordance with your means. If you build well in a good situation and on a good property, and furnish the house suitably for country life, you will come there more often and more willingly[19]. The farm will then be better, fewer mistakes will be made, and you will get larger crops. The face of the master is good for the land.
[20]

(VI) Plant elm trees along the roads and fence rows, so that you may have the leaves to feed the sheep and cattle, and the timber will be available if you need it. If any where there are banks of streams or wet places, there plant reeds; and surround them with willows that the osiers may serve to tie the vines.

(VII) It is most convenient to set out the land nearest the house as an orchard, whence fire wood and faggots may be sold and the supply of the master obtained. In this enclosure should be planted every thing fitting to the land and vines should be married to the trees.[21]

(VIII) Near the house lay out also a garden with garland flowers and vegetables[22] of all kinds, and set it about with myrtle hedges, both white and black, as well as Delphic and Cyprian laurel.

Of stocking the farm

(X) An olive farm of two hundred and forty *jugera* (160 acres) ought to be stocked as follows: an overseer, a house keeper, five labourers, three ox drivers, one swineherd, one ass driver, one shepherd; in all thirteen hands: three pair of oxen,[23] three asses with pack saddles, to haul out the manure, one other ass to turn the mill, and one hundred sheep.[24]

Of the duties of the overseer.[25]

(V) These are the duties of the overseer: He should maintain discipline. He should observe the feast days. He should respect the rights of others and steadfastly uphold his own. He should settle all quarrels among the hands; if any one is at fault he should administer the punishment. He should take care that no one on the place is in want, or lacks food or drink; in this respect he can afford to be generous, for he will thus more easily prevent picking and stealing.[26]

Unless the overseer is of evil mind, he will himself do no wrong, but if he permits wrong-doing by others, the master should not suffer such indulgence to pass with impunity. He should show appreciation of courtesy, to encourage others to practise it. He should not be given to gadding or conviviality, but should be always sober. He should keep the hands busy, and should see that they do what the master has ordered. He should not think that he knows more than his master. The friends of the master should be his friends, and he should give heed to those whom the master has recommended to him. He should confine his religious practices to church on Sunday, or to his own house.[27]

He should lend money to no man unbidden by the master, but what the master has lent he should collect. He should never lend any seed reserved for sowing, feed, corn, wine, or oil, but he should have relations with two or three other farms with which he can exchange things needed in emergency.

He should state his accounts with his master frequently. He should not keep any hired men or day hands longer than is necessary. He should not sell any thing without the knowledge of the master, nor should he conceal any thing from the master. He should not have any hangers-on, nor should he consult any soothsayer, fortune teller, necromancer, or astrologer. He should not spare seed in sowing, for that is bad economy. He should strive to be expert in all kinds of farm work, and, without exhausting himself, often lend a hand. By so doing, he will better understand the point of view of his hands, and they will work more contentedly; moreover, he will have less inclination to gad, his health will be better, and he will sleep more refreshingly.

First up in the morning, he should be the last to go to bed at night; and before he does, he should see that the farm gates are closed, and that each of the hands is in his own bed, that the stock have been fed. He should see that the best of care is taken of the oxen, and should pay the highest compliments to the teamsters who keep their cattle in the best condition. He should see to it that the ploughs and plough shares are kept in good repair. Plan all the work in ample time, for so it is with farm work, if one thing is done late, every thing will be late.

(XXXIX) When it rains try to find some thing to do indoors. Clean up, rather than remain idle. Remember that while work may stop, expenses still go on.

Of the duties of the housekeeper

(CXLIII) The overseer should be responsible for the duties of the housekeeper. If the master has given her to you for a wife, you should be satisfied with her, and she should respect you. Require that she be not given to wasteful habits; that she does not gossip with the neighbours and other

women. She should not receive visitors either in the kitchen or in her own quarters. She should not go out to parties, nor should she gad about.[28] She should not practise religious observances, nor should she ask others to do so for her without the permission of the master or the mistress. Remember that the master practises religion for the entire household. She should be neat in appearance and should keep the house swept and garnished. Every night before she goes to bed she should see that the hearth is swept and clean. On the Kalends, the Ides, the Nones, and on all feast days, she should hang a garland over the hearth. On those days also she should pray fervently to the household gods. She should take care that she has food cooked for you and for the hands. She should have plenty of chickens and an abundance of eggs.[29] She should diligently put up all kinds of preserves every year.

Of the hands

(LVI) The following are the customary allowances for food: For the hands, four pecks of meal for the winter, and four and one-half for the summer. For the overseer, the housekeeper, the wagoner, the shepherd, three pecks each. For the slaves, four pounds of bread for the winter, but when they begin to cultivate the vines this is increased to five pounds until the figs are ripe, then return to four pounds.

(LVII) The sum of the wine allowed for each hand per annum is eight quadrantals, or Amphora, but add in the proportion as they do work. Ten quadrantals per annum is not too much to allow them to drink.

(LVIII) Save the wind fall olives as much as possible as relishes for the hands. Later set aside such of the ripe olives as will make the least oil. Be careful to make them go as far as possible. When the olives are all eaten,

give them fish pickles and vinegar. One peck of salt per annum is enough for each hand.

(LIX) Allow each hand a smock and a cloak every other year. As often as you give out a smock or cloak to any one take up the old one, so that caps can be made out of it. A pair of heavy wooden shoes should be allowed every other year.

Of draining

(XLIII) If the land is wet, it should be drained with trough shaped ditches dug three feet wide at the surface and one foot at the bottom and four feet deep. Blind these ditches with rock. If you have no rock then fill them with green willow poles braced crosswise. If you have no poles, fill them with faggots. Then dig lateral trenches three feet deep and four feet wide in such way that the water will flow from the trenches into the ditches.

(CLV) In the winter surface water should be drained off the fields. On hillsides courses should be kept clear for the water to flow off. During the rainy season at the beginning of Autumn is the greatest risk from water. When it begins to rain all the hands should go out with picks and shovels and clear out the drains so that the water may flow off into the roads, and the crops be protected.

Of preparing the seed bed

(LXI) What is the first principle of good agriculture? To plough well. What is the second? To plough again; and the third is to manure. When you plough corn land, plough well and in good weather, lest you turn a cloddy furrow. The other things of good agriculture are to sow seed plentifully, to thin the young sprouts, and to hill up the roots with earth.

(V) Never plough rotten land[30] nor drive flocks or carts across it.

If care is not taken about this, the land so abused will be barren for three years.

Of manure

(V) Plan to have a big compost heap and take the best of care of the manure. When it is hauled out see that it is well rotted and spread. The Autumn is the time to do this.

(XXXVII) You can make manure of litter, lupine straw, chaff, bean stalks, husks and the leaves of ilex and of oak.[31]

(XXX) Fold your sheep on the land which you are about to seed, and there feed them leaves.[32]

Of soil improvement

(XXXVII) The things which are harmful to corn land are to plough the ground when it is rotten, and to plant chick peas which are harvested with the straw and are salt. Barley, fenugreek and pulse all exhaust corn land, as well as all other things which are harvested with the straw. Do not plant nut trees in the corn land. On the other hand, lupines, field beans and vetch manure corn land.[33]

(VI) Where the soil is rich and fertile, without shade, there the corn land ought to be. Where the land lies low, plant rape, millet, and panic grass.

Of forage crops

(VIII) If you have a water meadow you will not want forage, but if not then sow an upland meadow, so that hay may not be lacking.

(LIII) Save your hay when the times comes, and beware lest you mow too late. Mow before the seed is ripe. House the best hay by itself, so that you may feed it to the draft cattle during the spring ploughing, before the clover is mature.

(XXVII) Sow, for feed for the cattle, clover, vetch, fenugreek, field beans and pulse. Sow these crops a second and a third time.

Of planting

(XXXIV) Wherever the land is cold and wet, sow there first, and last of all in the warmest places.

Of pastures

(L) Manure the pastures in early spring in the dark of the moon, when the west wind begins to blow. When you close your pastures (to the stock) clean them and root out all weeds.

Of feeding live stock

(XXX) As long as they are available, feed green leaves of elm, poplar, oak and fig to your cattle and sheep.

(V) Store leaves, also, to be fed to the sheep before they have withered.
[34]

(XXX) Take the best of care of your dry fodder, which you house for the winter, and remember always how long the winter may last.

(IV) Be sure you have well constructed stables furnished with substantial stalls and equipped with latticed feed racks. The intervals between the bars of the racks should be one foot. If you build them in this way, the cattle will not waste their food.

(LIV) This is the way that provender should be prepared and fed: When the seeding is finished, gather mast and soak it in water. Feed a measure of it every day to each steer; or if they have not been worked it will be sufficient to let them pasture the mast beds. Another good feed is a measure of grape husks which you shall have preserved in jars. By day turn the cattle out and at night feed twenty-five pounds of hay to each steer. If hay is short, feed the leaves of the ilex and ivy.[35] Stack the straw of wheat, barley, beans, vetch and lupine, indeed all the grain straws, but pick out and house the best of it. Scatter your straw with salt and you can then feed it in place of hay. When in the spring you begin to feed (more heavily to prepare for work), feed a measure of mast or of grape husks, or a measure of ground lupines, and fifteen pounds of hay. When the clover is ripe, feed that first. Gather it by hand so that it will bloom a second time, for what you harvest with the sickle blooms no more. Feed clover until it is dry, then feed vetch and then panic grass, and after the panic grass feed elm leaves. If you have poplar, mix that with the elm so that the elm may last the longer. If you have no elm feed oak and fig leaves.

Nothing is more profitable than to take good care of your cattle.

Cattle should not be put out to graze except in winter when they are not worked; for when they eat green stuff they expect it all the time, and it is then necessary to muzzle them while they plough.

Of the care of live stock

(V) The flocks and herds should be well supplied with litter and their feet kept clean. If litter is short, haul in oak leaves, they will serve as bedding for sheep and cattle. Beware of scab among the sheep and cattle. This comes from hunger and exposure to rain.

(LXXII) To prevent the oxen from wearing down their hoofs, anoint the bottom of the hoof with liquid pepper before driving them on the highroad.

(LXXIII) Take care that during the summer the cattle drink only sweet and fresh water. Their health depends on it.

(XCVI) To prevent scab among sheep, make a mixture of equal parts of well strained amurca,[36] of water in which lupine has been steeped, and of lees of good wine. After shearing, anoint all the flock with this mixture, and let them sweat profusely for two or three days. Then dip them in the sea. If you have no sea water, make salt water and dip then in that. If you will do this they will suffer no scab, they will have more and better wool and they will not be molested by ticks.

(LXXI) If an ox begins to sicken, give him without delay a raw hen's egg and make him swallow it whole. The next day make him drink from a wooden bowl a measure of wine in which has been scraped the head of an onion. Both the ox and his attendant should do these things fasting and standing upright.

(CII) If a serpent shall bite an ox, or any other quadruped, take a cup of that extract of fennel, which the physicians call smyrnean, and mix it with a measure of old wine. Inject this through his nostrils and at the same time poultice the wound with hogs' dung.[37] You can treat a man the same way.

(CLX) If a bone is dislocated it can be made sound by this incantation. Take a green reed four or five feet long, split it down the middle and let two men hold the pieces against your hips. Begin then to chant as follows:

"In Alio. S.F. Motas Vaeta,
Daries Dardaries Astataries Dissunapiter"

and continue until the free ends of the reed are brought slowly together in front of you. Meanwhile, wave a knife above the reeds, and when they come together and one touches the other, seize them in your hand and cut them right and left. These pieces of reed bound upon a dislocated or fractured bone will cure it.[38]

But every day repeat the incantation, or in place of it this one:

"Huat Hanat Huat
Ista Pista Sista
Domiabo Damnaustra"[39]

Of cakes and salad[40]

(LXXV) This is the recipe for cheese cake (*libum*): Bray well two pounds of cheese in a mortar, and, when this is done, pour in a pound of corn meal (or, if you want to be more dainty, a half pound of flour) and mix it thoroughly with the cheese. Add one egg and beat it well. Pat into a cake, place it on leaves and bake slowly on a hot hearth stone under a dish.

(CXIX) This is the recipe for olive salad (*epityrum*): Select some white, black and mottled olives and stone them. Mix and cut them up. Add a dressing of oil, vinegar, coriander, cumin, fennel, rue and mint. Mix well in an earthen ware dish, and serve with oil.

(CXXI) This is the recipe for must cake (*mustaceus*): Sprinkle a peck of wheat flour with must. Add anise, cumin, two pounds of lard, a pound of cheese and shredded laurel twigs. When you have kneaded the dough, put laurel leaves under it and so bake.

Of curing hams

(CLXII) This is the way to cure hams in jars or tubs: When you have bought your hams trim off the hocks. Take a half peck (*semodius*) of ground Roman salt for each ham. Cover the bottom of the jar or tub with salt and put in a ham, skin down. Cover the whole with salt and put another ham on top, and cover this in the same manner. Be careful that meat does not touch meat. So proceed, and when you have packed all the hams, cover the top with salt so that no meat can be seen, and smooth it out even. When the hams have been in salt five days, take them all out with the salt and repack them, putting those which were on top at the bottom. Cover them in the same way with salt and press them down.

After the twelfth day remove the hams finally, brush off the salt and hang them for two days in the wind. On the third day wipe them off clean with a sponge and rub them with (olive) oil. Then hang them in smoke for two days, and on the third day rub them with a mixture of (olive) oil and vinegar.

Then hang them in the meat house, and neither bats nor worms will touch them.[41]

VARRO'S RERUM RUSTICARUM

LIBRI TRES

BOOK I

THE HUSBANDRY OF AGRICULTURE

Introduction: the literary tradition of country life

I

Had I leisure, Fundania, this book would be more worthy of you, but I write as best I may, conscious always of the necessity of haste: for, if, as the saying is, all life is but a bubble, the more fragile is that of an old man, and my eightieth year admonishes me to pack my fardel and prepare for the long journey.

You have bought a farm and wish to increase its fertility by good cultivation, and you ask me what I would do with it were it mine. Not only while I am still alive will I try to advise you in this, but I will make my counsel available to you after I am dead. For as it befel the Sibyl to have been of service to mankind not alone while she lived, but even to the uttermost generations of men after her demise (for we are wont after so many years still to have solemn recourse to her books for guidance in interpretation of strange portents), so may not I, while I still live, bequeath my counsel to my nearest and dearest.[42] I will then write three books for you, to which you may have recourse for guidance in all things which must be done in the management of a farm.

And since, as men say, the gods aid those who propitiate them, I will begin my book by invoking divine approval, not like Homer and Ennius, from the Muses, nor indeed from the twelve great gods of the city whose golden images stand in the forum, six male and as many female, but from a

solemn council of those twelve divinities who are the tutelaries of husbandmen.

* * * * *

First: I call upon Father Jupiter and Mother Earth, who fecundate all the processes of agriculture in the air and in the soil, and hence are called the great parents.

Second: I invoke the Sun and the Moon by whom the seasons for sowing and reaping are measured.

Third: I invoke Ceres and Bacchus because the fruits they mature are most necessary to life, and by their aid the land yields food and drink.

Fourth: I invoke Robigus and Flora by whose influence the blight is kept from crop and tree, and in due season they bear fruit (for which reason is the annual festival of the *robigalia* celebrated in honour of Robigus, and that of the *floralia* in honour of Flora).[43]

Next: I supplicate Minerva, who protects the olive; and Venus, goddess of the garden, wherefore is she worshipped at the rural wine festivals.

And last: I adjure Lympha, goddess of the fountains, and Bonus Eventus, god of good fortune, since without water all vegetation is starved and stunted and without due order and good luck all tillage is in vain.

* * * * *

And so having paid my duty to the gods, I proceed to rehearse some conversations[44] concerning agriculture in which I have recently taken part. From them you will derive all the practical instruction you require, but

in case any thing is lacking and you wish further authority, I refer you to the treatises of the Greeks and of our own countrymen.

The Greek writers who have treated incidentally of agriculture are more than fifty in number. Those whom you may consult with profit are Hieron of Sicily and Attalus Philometor, among the philosophers; Democritus the physicist; Xenophon the disciple of Socrates; Aristotle and Theophrastus, the peripatetics; Archytas the pythagorean; likewise the Athenian Amphilochous, Anaxipolis of Thasos, Apollodorus of Lemnos, Aristophanes of Mallos, Antigonus of Cyme, Agathocles of Chios, Apollonius of Pergamum, Aristandrus of Athens, Bacchius of Miletus, Bion of Soli, Chaeresteus and Chaereas of Athens, Diodorus of Priene, Dion of Colophon, Diophanes of Nicaea, Epigenes of Rhodes, Evagon of Thasos, Euphronius of Athens, and his name sake of Amphipolis, Hegesias of Maronea, the two Menanders, one of Priene, the other of Heraclaea, Nicesius of Maronea, Pythion of Rhodes. Among the rest whose countries I do not know, are Andiotion, Aeschrion, Aristomenes, Athenagoras, Crates, Dadis, Dionysius, Euphiton, Euphorion, Eubulus, Lysimachus, Mnaseas, Menestratus, Plentiphanes, Persis, and Theophilus.

All those whom I have named wrote in prose, but there are those also who have written in verse, as Hesiod of Ascra and Menecrates of Ephesus.

The agricultural writer of the greatest reputation is, however, Mago the Carthaginian[45] who wrote in the Punic tongue and collected in twenty-eight books all the wisdom which before him had been scattered in many works. Cassius Dionysius of Utica translated Mago into Greek in twenty books (and dedicated his work to the praetor Sextilius), and notwithstanding that he reduced Mago by eight books he cited freely from the Greek authors whom I have named. Diophanes made a useful digest of Cassius in six books, which he dedicated to Deiotarus, King of Bithynia. I have ventured

to compress the subject into the still smaller compass of three books, the first on the husbandry of agriculture, the second on the husbandry of live stock and the third on the husbandry of the steading.

From the first book I have excluded all those things which I do not deem to relate immediately to agriculture: thus having first limited my subject I proceed to discuss it, following its natural divisions. My information has been derived from three sources, my own experience, my reading, and what I have heard from others.

Of the definition of agriculture

a. What it is not

II. On the holiday which we call Sementivae I came to the temple of Tellus at the invitation of the Sacristan (I was taught by my ancestors to call him *Aeditumus* but the modern purist tells me I must say *Aedituus*). There I found assembled C. Fundanius, my father-in-law, C. Agrius, a Roman Knight and a disciple of the Socratic school, and P. Agrasius, of the Revenue service: they were gazing on a map of Italy painted on the wall. "What are you doing here?" said I. "Has the festival of the seed-sowing drawn you hither to spend your holiday after the manner of our ancestors, by praying for good crops?" "We are here," said Agrius, "for the same reason that you are, I imagine—because the Sacristan has invited us to dinner. If this be true, as your nod admits, wait with us until he returns, for he was summoned by his chief, the aedile, and has not yet returned though he left word for us to wait for him."

"Until he comes then," said I, "let us make a practical application of the ancient proverb that 'The Roman conquers by sitting down.'"

"You're right," cried Agrius, and, remembering that the first step of a journey is the most difficult,[46] he lead the way to the benches forthwith and we followed. When we were seated Agrasius spoke up. "You who have travelled over many lands," said he, "have you seen any country better cultivated than Italy?"

"I, for one, don't believe," replied Agrius, "that there is any country which is so intensely cultivated. By a very natural division Eratosthenes has divided the earth into two parts, that facing South and that facing North: and as without doubt the North is healthier than the South, so it is more fertile, for a healthy country is always the most fertile. It must be admitted then that the North is fitter for cultivation than Asia, and particularly is this true of Italy; first, because Italy is in Europe, and, second, because this part of Europe has a more temperate climate than the interior. For almost everlasting winter grips the lands to the North of us. Nor is this to be wondered at since there are regions within the Arctic Circle and at the pole where the sun is not seen for six months at a time. Yea, it is even said that it is not possible to sail a ship in those parts because the very sea is frozen over."

"Would you think it possible," said Fundanius, "for any thing to grow in such a region, and, if it did grow, how could it be cultivated? The tragedian Pacuvius has spoken sooth where he says:

'Should sun or night maintain e'er lasting reign,
Then all the grateful fruits of earth must die,
Nipped by the cold, or blasted by the heat.'

Even here in this pleasant region, where night and day revolve punctually, I am not able to live in summer unless I divide the day with my appointed midday nap. How is it possible to plant or to cultivate or to harvest any thing there where the days and nights are six months long. On

the other hand, what useful thing is there which does not only grow but flourish in Italy? What spelt shall I compare with that of Campania? What wheat with that of Apulia? What wine with that of Falernum? What oil with that of Venafrum? Is not Italy so covered with fruit trees that it seems one vast orchard? Is Phrygia, which Homer calls [Greek: ampeloessa], more teeming with vines, or is Argos, which the same poet calls [Greek: polupuros] more rich in corn?[47] In what land does one jugerum produce ten, nay even fifteen, cullei of wine, as in some regions of Italy? Has not M. Cato written in his book of *Origines* 'That region lying this side of Ariminium and beyond Picenum, which was allotted to colonists, is called Roman Gaul. There in several places a single jugerum of land produces ten cullei of wine.' Is it not the same in the region of Faventia where the vines are called *tre centaria* because a jugerum yields three hundred amphorae of wine," and, looking at me, he added, "indeed L. Martius, your chief engineer, said that the vines on his Faventine farm yielded that much.[48] The Italian farmer looks chiefly for two things in considering a farm, whether it will yield a harvest proportioned to the capital and labour he must invest, and whether the location is healthy. Whoever neglects either of these considerations and despite them proposes to carry on a farm, is a fool and should be taken in charge by a committee of his relatives.[49] For no sane man is willing to spend on an agricultural operation time and money which he knows he cannot recoup, nor even if he sees a likely profit, if it must be at the risk of losing all by an evil climate.

"But there are here present those who can discourse on this subject with more authority than I, for I see C. Licinius Stolo and Cn. Tremelius Scrofa approaching. It was the ancestor of the first of these who brought in the law for the regulation of land-holding; for the law which forbade a Roman citizen to own more than 500 jugera of land was proposed by that Licinius who acquired the cognomen of Stolo on account of his diligence in cultivating his land: he is said to have dug around his trees so thoroughly

that there could not be found on his farm a single one of those suckers which spring up from the ground at the roots of trees and are called *stolones*. Of the same family was that other C. Licinius who, when he was tribune of the people, 365 years after the expulsion of the Kings, first transferred the Sovereign function of law making from the Comitium to the Forum, thus as it were constituting that area the 'farm' of the entire people. [50] The other whom I see come hither is Cn. Tremelius Scrofa, your colleague on the Committee of Twenty for the division of the Campanian lands, a man distinguished by all the virtues and considered to be the Roman most expert in agriculture.[51]

"And justly so," I exclaimed, "for his farms are a more pleasing spectacle to many on account of their clean cultivation than the stately palaces of others;[52] when one goes to visit his country place, one sees granaries and not picture galleries, as at the 'farm' of Lucullus.[53] Indeed," I added, "the apple market at the head of the Sacred Way is the very image of Scrofa's fruit house."

As the new comers joined us, Stolo inquired: "Have we arrived after dinner is over, for we do not see L. Fundilius who invited us."

"Be of good cheer," replied Agrius, "for not only has that egg which indicates the last lap of the chariot race in the games at the circus not yet been removed, but we have not even seen that other egg which is the first course of dinner.[54] And so until the Sacristan returns and joins us do you discourse to us of the uses or the pleasures of agriculture, or of both. For now the sceptre of agriculture is in your hands, which formerly, they say, belonged to Stolo."

"First of all," began Scrofa, "we must have a definition. Are we to be limited in discussing agriculture to the planting of the land or are we to touch also on those other occupations which are carried on in the country,

such as feeding sheep and cattle. For I have observed that those who write on agriculture, whether in Greek or Punic or Latin, wander widely from their subject."

"I do not think that those authors should be imitated in that," said Stolo, "for I deem them to have done better who have confined the subject to the straitest limits, excluding all considerations which are not strictly pertinent to the subject. Wherefore the subject of grazing, which many writers treat as a part of agriculture, seems to me to belong rather to a treatise on live stock. That the occupations are different is apparent from the difference in the names of those we put in charge of them, for we call one the farmer (*villicus*) and the other the herdsman (*magister pecoris*). The farmer is charged with the cultivation of the land and is so called from the *villa* or farm house to which he hauls in the crops from the fields and from which he hauls them away when they are sold. Wherefore also the peasants say *vea* for *via*, deriving their word for the road over which they haul from the name of the vehicle in which they do the hauling, *vectura*, and by the same derivation *vella* for *villa*, the farm house to and from which they haul. In like manner the trade of a carrier is called *vellatura* from the practice of driving a *vectura*, or cart."

"Surely," said Fundanius, "feeding cattle is one thing and agriculture is another, but they are related. Just as the right pipe of the *tibia* is different from the left pipe, yet are they complements because while the one leads, it is to carry the air, and the other follows, it is for the accompaniment."

"And, to push your analogy further, it may be added," said I, "that the pastoral life, like the *tibia dextra*, has led and given the cue to the agricultural life, as we have on the authority of that learned man Dicaearchus who, in his *Life of Greece* from the earliest times, shows us how in the beginning men pursued a purely pastoral life and knew not how

to plough nor to plant trees nor to prune them; only later taking up the pursuits of agriculture; whence it may be said that agriculture is in harmony with the pastoral life but is subordinate to it, as the left pipe is to the right pipe."

"Beware," exclaimed Agrius, "of pushing your musical analogy too far, for you would not only rob the farmer of his cattle and the shepherd of his livelihood but you would even break the law of the land in which it is written that a farmer may not graze a young orchard with that pestiferous animal which astrology has placed in the heavens near the Bull."

"See here, Agrius," said Fundanius, "let there be no mistake about this. The law you cite applies only to certain designated kinds of cattle, as indeed there are kinds of cattle which are the foes and the bane of agriculture such as those you have mentioned—the goats—for by their nibbling they ruin young plantations, and not the least vines and olives. But, because the goat is the greatest offender in this respect, we have a rule for him which works both ways, namely: that victims of his family are grateful offerings on the altar of one god but should never come near the fane of another; since by reason of the same hate one god is not willing even to see a goat and the other is pleased to see him killed. So it is that goats found among the vines are sacrificed to Father Bacchus as it were that they should pay the penalty of their evil doing with their lives; while on the contrary nothing of the goat kind is ever sacrificed to Minerva, because they are said to make the olive sterile even by licking it, for their very spittle is poison to the fruit. For this reason goats are never driven into the Acropolis of Athens, except once a year for a certain necessary sacrifice, lest the olive tree, which is said to have its origin there,[55] might be touched by a goat."

"No kind of cattle," said I, "are of any use to agriculture except those which aid in the cultivation of the land, as they do when they are yoked to

the plough."

"If this was so," said Agrasius, "how could we afford to take cattle off the land, since it is from our flocks and herds that we derive the manure which is of the greatest benefit to our purely agricultural operations."

"On your argument of convenience," said Agrius, "we might claim that slave dealing was a branch of agriculture, if they were agricultural slaves which we dealt in. The error lies in the assumption that because cattle are good for the land, they make crops grow on the land. It does not follow, for by that reasoning other things would become part of agriculture which have nothing to do with it: as for example spinsters and weavers and other craftsmen which you might keep on your farm."

"Let us then agree," said Scrofa, "to exclude live stock from our consideration of the art of agriculture. Does any one want to exclude any thing else?"

"Are we to follow the book of the two Sasernas," I inquired, "and discuss whether the manufacture of pottery is more related to agriculture than mining for silver or other metals? Doubtless the material comes out of the ground in both cases, but no one claims that quarrying for stone or washing sand has any thing to do with agriculture, so why bring in the potter? It is not a question of what comes out of the land, nor of what can be done profitably on a farm, for if it were it might as well be argued that had one a farm lying along a frequented road and a site on it convenient to travellers, it would be the farmer's business to build a cross-roads tavern. But surely, however profitable this might prove, it would not make the speculation any part of agriculture. It is not, I repeat, whether the business is carried on on account of the land, nor out of the land, that it may be classed as a part of agriculture, but only if from planting the land one gains a profit."

"You are jealous of this great writer," interrupted Stolo. "Because of his unfortunate potteries you rebuke him captiously and give him no credit for all the admirable things which he says about matters which certainly relate to agriculture."

At this sally, Scrofa, who knew the book and justly contemned it, smiled, whereupon Agrasius, who thought that he and Stolo alone knew the book demanded of Scrofa a quotation from it.

"Here is his recipe for getting rid of bugs," said Scrofa. "'Steep a wild cucumber in water and where-ever you sprinkle it the bugs will disappear,' and again, 'Grease your bed with ox gall mixed with vinegar.'"

Fundanius looked at Scrofa. "And yet Saserna gives good advice even if it is in a book on agriculture," he said.

"Yes, by Hercules," said Scrofa, "and especially in his recipe for removing superfluous hair, in which he bids you take a yellow frog and stew it down to a third of its size and then rub the body with what is left."
[56]

"I would rather cite," said I, "Sasernas' prescription for the malady from which Fundanius suffers, for his corns make wrinkles on his brow."

"Tell me, pray, quickly," exclaimed Fundanius, "for I had rather learn how to root out my corns than how to plant beet roots."

"I will tell you," said Stolo, "in the very words he wrote it, or at least as I heard Tarquenna read it: 'When a man's feet begin to hurt he should think of you to enable you to cure him.'"

"I am thinking of you," said Fundanius, "now cure my feet."

"Listen to the incantation," said Stolo.

'May the earth keep the malady,
May good health remain here.'

Saserna bids you chant this formula thrice nine times, to touch the earth, to spit and be sure that you do it all before breakfast."

"You will find," said I, "many other wonderful secrets in Saserna, all equally foreign to agriculture, and so all to be left where they are. But it must be admitted that such digressions are found in many other authors. Does not the agricultural treatise of the great Cato himself fairly bristle with them, as for instance his instructions how to make must cake and cheese cake, and how to cure hams?"

"You forget," said Agrius, "his most important precept: 'If you wish to drink freely and dine well in company, you should eat five leaves of raw cabbage steeped in vinegar, before sitting down to the table.'"

b. What agriculture is

III. "And so," said Agrasius, "as we have agreed upon and eliminated from the discussion all those things which agriculture is not, it remains to discuss what it is. Is it an art, and, if so, what are its principles and its purposes?"

Stolo turned to Scrofa and said: "You are our senior in age, in reputation and in experience, you should speak." And Scrofa, nothing loath, began as follows:

"In the first place, agriculture is not only an art but an art which is as useful as it is important. It is furthermore a science, which teaches how

every kind of land should be planted and cultivated, and how to know what kind of land will produce the largest crops for the longest time.[57]"

The purposes of agriculture are profit and pleasure

IV. The elements with which this science deals are the same as those which Ennius says are the elements of the universe—water, earth, air and fire. Before sowing your seed it behooves you to study these elements because they are the origin of all growing things. So prepared, the farmer should direct his efforts to two ends: profit and pleasure,[58] one solid the other agreeable: but he should give the preference to the pursuit of profit. [59] And yet those who have regard for appearances in their farming, as for instance by planting their orchards and olive yards in orderly array, often add not only to the productiveness of the farm but as well to its saleability, and so doubly increase the value of their estate. For of two things of equal usefulness, who would not prefer to buy the better looking?

The farm which is healthiest is the most valuable, for there the profit is certain. On the other hand, on an unhealthy farm, however fertile it may be, misfortune dogs the steps of the farmer. For where the struggle is against Death, there not only is the profit uncertain, but one's very existence is constantly at risk: and so agriculture becomes a gamble in which the farmer hazards both his life and his fortune. And yet this risk can be diminished by forethought, for, when health depends upon climate, we can do much to control nature and by diligence improve evil conditions. If the farm is unhealthy by reason of the plight of the land itself, or of the water supply, or is exposed to the miasma which breeds in some localities, or if the farm is too hot on account of the climate, or is exposed to mischievous winds, these discomforts can be mitigated by one who knows what to do and is willing to spend some money. What is of the greatest importance in this respect is the situation of the farm buildings, their plan and convenience, and what is

the aspect of their doors and gates and windows. During the great plague, Hippocrates the physician saved not merely one farm but many cities because he knew this. But why should I summon him as a witness: for when the army and the fleet lay at Corcyra[60] and all the houses were crowded with the sick and dying, did not our Varro here contrive to open new windows to the healthy North wind and close those which gave entrance to the infected breezes of the South, to change doors and to do other such things, and so succeed in restoring his comrades safe and sound to their native land?

The fourfold division of the study of agriculture

V. I have rehearsed the elements and the purposes of agriculture, it now remains to consider in how many divisions this science is to be studied."

"I have supposed these to be without number," said Agrius, "when I have read the many books which Theophrastus wrote on *The History of Plants* and *The Causes of Vegetation*."

"These books," said Stolo, "have always seemed to me to be fitter for use in the schools of the philosophers than in the hands of a practical farmer. I do not mean to say that they do not contain many things which are both useful and practical. However that may be, do you rather explain to us the divisions in which agriculture should be studied."

"There are four chapters for the study of agriculture, of the highest practical importance," resumed Scrofa, "namely:"

1° What are the physical characteristics of the land to be cultivated, including the constitution of the soil;

2° What labour and equipment are necessary for such cultivation;

3° What system of farming is to be practised;

4° What are the seasons at which the several farming operations are to be carried out.

Each of these four chapters may be divided in at least two subdivisions:

The first into (a) a study of the soil, and (b) a survey of the buildings and stabling.

The second into an enquiry as to (c), the men who will carry on the farming operations, and (d) the implements they will require.

The third into (e) the kind of work to be planned, and (f) where that work is to be done.

The fourth into what relates (g) to the annual revolution of the sun, and (h) the monthly revolution of the moon.

I will speak of the four principal parts first, and then in detail of the eight subdivisions.

1° CONCERNING THE FARM ITSELF

How conformation of the land affects agriculture

VI. Four things must be considered in respect of the physical characteristics of the farm: its conformation, the quality of the soil, its extent, and whether it is naturally protected. The conformation is either natural, or artificial as the result of cultivation, and may be good or bad in either case. I will speak first of natural conformation, of which there are three kinds: plain, hill and mountain—although there is a fourth kind made

up of a combination of any two or all three of those mentioned, as may be seen in many places. A different system of cultivation is required for each of these three kinds of farms, for without doubt that which is suited for the hot plain would not suit the windy mountain, while a hill farm enjoys a more temperate climate than either of the other two kinds and so demands its own system of cultivation. These distinctions are most apparent when the several characteristic conformations are of large extent, as for example the heat and the humidity are greater in a broad plain, like that of Apulia, while on a mountain like Vesuvius the climate is usually fresher and so more healthy. Those who cultivate the lowlands feel the effects of their climate most in summer, but they are able to do their planting earlier in the spring, while those who dwell in the mountains suffer most from their climate in winter, and both sow and reap at later seasons. Frequently the winter is more propitious to those who dwell in the plains because then the pastures are fresh there and the trees may be pruned more readily. On the other hand the summer is more kindly in the mountains for then the upland grass is rich when the pastures of the plains are burnt, and it is more comfortable to cultivate the trees in a keen air.

A lowland farm is best when it is gently sloping rather than absolutely flat, because on a flat farm water cannot run off and so forms swampy places. But it is a disadvantage to have the surface too rolling because that causes the water to collect and form ponds.

Certain trees, like the fir and the pine, flourish most in the mountains on account of the eager air, while in this region where it is more temperate the poplars and the willows thrive best. Again the arbuté and the oak prefer the more fertile lands, while the almond and the fig trees love the lowlands.[61] The growth on the low hills takes on more of the character of the plains, on the high hills that of the mountains. For these reasons the kind of crops to

be planted must be suited to the physical characteristics of the farm, as grain for the plains, vines for the hills and forests for the mountains.

All these considerations should be weighed separately with reference to each of the three kinds of conformation.

VII. "It seems to me," said Stolo, "that, so far as concerns the natural situation of a farm, Cato's opinion is just. He wrote, you will recall, that the best farm was one which lay at the foot of a mountain looking to the South."

Scrofa resumed: "So far as concerns the laying out of the farm, I maintain that the more appearances are considered the greater will be the profit, as, for instance, orchards should be planted in straight lines arranged in quincunxes and at a reasonable distance apart. It is a fact that, because of their unintelligent plan of planting, our ancestors made less wine and corn to the acre than we do. The point is that if each plant is set with due reference to the others they occupy less land and are less likely to screen from one another the influence of the sun and the moon and the air. This may be illustrated by an experiment: you can press a parcel of nuts with their shells on into a measure having only two thirds of the capacity of what is required to contain them after they have been cracked, because the shells keep them naturally compacted. When trees are planted in rows the sun and the moon have access to them equally from all sides, with the result that more raisins and olives are developed and then mature more quickly, a double result with the double consequence of a larger crop of must and oil and a greater profit."

How character of soil affects agriculture

"We will now take up the second consideration in respect of the physical characteristics of a farm, namely: the quality of the soil, which partly, if not entirely, determines whether it is considered a good or a bad farm: for on this depends what crops can be planted and harvested and how they should be cultivated, as it is not possible to plant everything successfully on the same soil. For one soil is suitable for vines, another for corn, and others for other things. In the island of Crete, near Cortynia, there is said to be a plane tree which does not lose its leaves even in winter—a phenomenon due doubtless to the quality of the soil. There is another of the same kind in Cyprus, according to Theophrastus. Likewise within sight of the city of Sybaris (which is now called Thurii) stands an oak having the same characteristic. Again at Elephantine neither the vines nor the fig trees lose their leaves, something that never happens with us. For the same reason many trees bear fruit twice a year, as do the vines near the sea at Smyrna, and the apples in the fields of Consentinium. The effect of soil appears also from the fact that those plants which bear most profusely in wild places produce better fruit under cultivation. The same explanation applies to those plants which cannot live except in a marshy place, or indeed in the very water: they are even nice about the kind of water, some grow in ponds like the reeds at Reate, others in streams like the alders in Epirus, some even in the sea like the palms and the squills of which Theophrastus writes. When I was in the army, I saw in Transalpine Gaul, near the Rhine, lands where neither the vine, nor the olive, nor the pear tree grew, where they manured their fields with a white chalk which they dug out of the ground:[62] where they had no salt, either mineral or marine, but used in place of it the salty ashes obtained from burning a certain kind of wood."

Stolo here interrupted. "You will recall," he said, "that Cato in comparing the different kinds of soil, ranked them by their merit in nine classes according to what they would produce, of which the first was that on which the vine would grow a plentiful supply of good wine; the second that fit for

an irrigated garden; the third for an osier bed; the fourth for an olive yard; the fifth for a meadow; the sixth for a corn field; the seventh for a wood lot; the eighth for a cultivated orchard, and the ninth for a mast grove."

"I know he wrote that," replied Scrofa, "but every one does not agree with him. There are some who put a good pasture first, and I am among them."

Our ancestors were wont to call them not *prala*, as we do, but *parata* (because they are always ready for use). The sedile Caesar Vopicus, in pleading a cause before the Censors, once said that the prairie of Rosea was the nurse of Italy, because if one left his surveying instruments there on the ground over night they were lost next day in the growth of the grass.[63]

(A digression on the maintenance of vineyards)

VIII. There be those who assert that the cost of maintaining a vineyard eats up the profit. What kind of vineyard? I ask. For there are several: in one the vines grow on the ground without props, as in Spain; in another, which is the kind common in Italy, the vines climb and are trained either separately on props or one with another on a trellis, which last is what is called marrying the vine. There are four kinds of trellis in use—made out of poles, of reeds, of ropes and of vines themselves, which are in use respectively in Falerum, in Arpinum, in Brundisium and in Mediolanum. There are two methods of training the vine on trellises, one upright, as is done in the country of Canusium; the other crossed and interwoven, as is the practice generally throughout Italy. If one obtains the material for his trellises from his own land, the expense of maintaining that kind of vineyard is negligible, nor is it burdensome if the material is procured from the neighbourhood. Such trellis material, as has been described, can be grown at home by planting willows, reeds and rushes, or some thing of that

kind; but if you propose to rely on the vines to form their own trellis, then you must plant an *arbustum* where the vines can be trained on trees, such as maples, which the inhabitants of Mediolanum use for that purpose; or fig trees, on which the people of Canusium train their vines. Likewise there are four kinds of props used for the cultivation of unwedded vines; first, the planted post, which is called *ridicum* and is best when fashioned out of oak or juniper; second, poles cut in the swamp, and the more seasoned they are the longer they will last, but it is the practice to reset them upside down when they rot out in the ground; third, for lack of some thing better, a bundle of reeds tied together and thrust into a pointed tube of baked clay, which is then planted in the ground and serves to preserve the reeds from water rot; the fourth is what may be called the natural prop, when vines are swung from tree to tree. Vines should be trained to the height of a man and the interval between the props should be sufficient to give room for a yoke of oxen to plough. The least expensive kind of a vineyard is that which brings wine to the jug without the aid of any sort of prop. There are two of this kind, one in which the earth serves as a bed for the grapes, as in many places in Asia, and where usually the foxes share the crop with man;[64] or, if mice appear, it is they who make the vintage, unless you put a mouse trap in every vine, as they do on the island of Pandataria. The other kind of vineyard, is that where each shoot which promises to bear grapes is lifted from the earth and supported about two feet off the ground by a forked stick: by this means the grapes, as they form, learn to hang as it were from a branch and do not have to be taught after the vintage; they are held in place with a bit of cord or by that kind of tie which the ancients called a *cestus*. As soon as the farmer sees the vintagers turn their backs he carries these props under cover for the winter so that he may use them another year without expense for that account. In Italy the people of Reate practise this custom.

Thus there are as many methods of cultivating the vine as there are kinds of soil. For where the land is wet the vine must be trained high because when wine is being made and matured on the vine, it needs sun, not water—as when it is in the cup! For this reason it was, I think, that first the vine was made to grow on trees.

Of the different kinds of soil

IX. It is expedient then, as I was saying, to study each kind of soil to determine for what it is, and for what it is not, suitable. The word *terra* is used in three senses: general, particular and mixed. It is a general designation when we speak of the orb of the earth, the land of Italy or any other country. In this designation is included rock and sand and other such things. In the second place, *terra* is referred to particularly when it is spoken of without qualification or epithet. In the third place, which is the mixed sense, when one speaks of *terra* as soil—that in which seeds are sown and developed; as for example, clay soil or rocky soil or others. In this sense there are as many kinds of earth as there are when one speaks of it in the general sense, on account of the mixtures of substances in it in varying quantities which make it of different heart and strength, such as rock, marble, sand, loam, clay, red ochre, dust, chalk, gravel, carbuncle (which is a condition of soil formed by the burning of roots in the intense heat of the sun); from which each kind of soil is called by a particular name, in accordance with the substances of which it is composed, as a chalky soil, a gravelly soil, or what ever else may be its distinguishing quality. And as there are different varieties of soil so each variety may be subdivided according to its quality, as, for example, a rocky soil is either very rocky, moderately rocky or hardly rocky at all. So three grades may be made of other mixed soils. In turn each of these three grades has three qualities: some are very wet, some very dry, some moderate, These distinctions are of

the greatest importance in respect of the crops, for the skilled husbandman plants spelt rather than wheat in wet land, and on dry land barley rather than spelt, in medium land both. Furthermore there are still more subtle distinctions to be made in respect of all these kinds of soil, as for example it must be considered in respect of loam, whether it is white loam or red loam, because white loam is unfit for nursery beds, while red loam is what they require. But the three great distinctions of quality of soil are whether it is lean or fat, or medium. Fat soils are apparent from the heavy growth of their vegetation, and the lean lie bare; as witness the territory of Pupinia (in Latium), where all the foliage is meagre and the vines look starved, where the scant straw never stools, nor the fig tree blooms, while for the most part the trees are as covered with moss as are the arid pastures. On the other hand, a rich soil like that of Etruria reveals itself heavy with grain and forage crops and its umbrageous trees are clean of moss. Soil of medium strength, like that near Tibur, which one might say is rather hungry than starved, repays cultivation in proportion as it takes on the quality of rich land."

"Diophanes of Bithynia," said Stolo, "was very much to the point when he wrote that the best indication of the suitability of soil for cultivation can be had either from the soil itself or from what grows in it: so one should ascertain whether it is white or black, if it is light and friable when it is dug, whether its consistency is ashy, or too heavy: or it can be tested by evidence that the wild growth upon it is heavy and fruitful after its kind.[65] But proceed and tell us of your third division, which relates to the measurement and laying out of the farm."

Of the units of area used in measuring land

X. Scrofa resumed: "Every country has its own system for measuring land. In Further Spain the unit of area is the *jugum*, in Campania the *versus*,

here in the Roman country and among the Latins it is the *jugerum*. They call a *jugum* the area which a pair of oxen can plough in a day. The *versus* is one hundred feet square: the *jugerum* is the area containing two square *actus*: the *actus quadratus* or *acnua*, as it is called by the Latins, measuring 120 feet in width and as much in length.[66] The smallest fraction of a *jugerum* is called a *scripulum* and is ten feet square. From this base the surveyors some times call the butts of land which exceed a *jugerum unciae* (twelfths) or *sextantes* (seventy seconds) or some other such duodecimal division, for the *jugerum* contains 288 *scripula*, like the ancient pound weight which was in use before the Punic wars. Two *jugera*, which Romulus first made the headright and which thus became the unit of inheritance, are called an *haeredium*:[67] later one hundred *haeredia* were called a *centuria*, which is 2,400 *unciae* square. Four *centuriae* adjoining, so that there are two on each side, are called a *saltus* in the distribution of the public lands."

Of the considerations on building a steading

a. Size

XI. As the result of faulty surveys of the farm it often happens that the steading is constructed either too small or too large for the farm, a mistake which in either case is of prejudice both to the property and its revenue. If one builds too large or too many buildings he is eaten up by the expense of maintenance, while if one builds less than the farm requires the harvest is lost, for there is no doubt that the largest wine cellar must be provided for that farm on which the vintages are largest, or granary, if it is a grain farm.

b. Water supply

If possible, the steading should be so built that it shall have water within the walls, or certainly near at hand: it is preferable that this should be derived from a spring, or, if not, then from an unfailing stream. If no running water is available a cistern should be constructed within doors, and a pond in the open, the one for the use of the men, the other for the use of the cattle.

c. Location, with regard to health

XII. When you plan to build, try your best to locate the steading at the foot of a wooded hill where the pastures are rich, and turn it so as to catch the healthiest prevailing breeze. The best situation is facing the east so to secure shade in summer and sun in winter. But if you must build on the bank of a river, take care that you do not let the steading face the river, for it will be very cold in winter and unhealthy in summer. Like precautions must be taken against swampy places for the same reasons and particularly because as they dry, swamps breed certain animalculae which cannot be seen with the eyes and which we breathe through the nose and mouth into the body where they cause grave maladies."[68]

"But," said Fundanius, "suppose I inherited a farm like that, what should I do to avoid the malady you describe?"

"The answer to that question is easy," said Agrius. "You should sell the farm for what you can get for it: and if you can't sell it, give it away."

Scrofa resumed: "Take care to avoid having the steading face the direction from which disagreeable winds blow, yet you should not build in a hollow. High ground is the best location for a steading: for by ventilation all noxious gases are dissipated, and the steading is healthier if exposed to the sun all day: with the further advantage that any insects which may be bred in or brought upon the premises are either blown away or quickly perish

where there is no damp. Sudden rains and overflowed streams are dangerous to those who have their steadings in low or hollow places, and they are more at the hazard of the ruthless hand of the robber because he is able to take advantage of those who are unprepared. Against either of these risks the higher places are safer."

d. Arrangement

XIII. In arranging the steading, see that the cattle are put where they will be warm in winter. Such crops as wine and oil should be housed below ground in cellars, or rather in jars placed in such cellars, while dry crops like beans, and hay, are best stored on high board floors. A rest room should be provided for the comfort of the hands where they can gather after the day's work or for protection from cold or heat and there recruit themselves in quiet. The room of the overseer should be near the entrance to the farm house so that he may know who comes in and who goes out during the night, and what they bring in or out, especially if there is no gate-keeper. The kitchen also should be near the overseer's room because there in winter is great activity before daylight when food is being prepared and eaten. Good sized sheds should be built in the barn yard for the wagons and other implements which might be damaged by the rain. For while they may be kept safe from the thief within the gates, yet if they are exposed to the weather they will be lost nevertheless. It is better to have two barn yards for a large farm. The inner court should contain a cistern like a little fish pond into which the drainage from the eaves may collect: as here the cattle and swine and geese can drink and bathe in summer when they are driven in from work or pasture. In the outer court there should be another pond where you can handle lupines and such other things as must be soaked in water. This exterior court yard should be strewn thick with straw and chaff, which, by being trampled under the feet of the cattle, becomes the handmaid of the

farm by reason of the service it renders when it is hauled out. Every farm should have two manure pits, or one divided into two parts; into one division should be put the new manure from the barn, in the other the old manure which is ready for use on the farm: for new manure is not as good as that which is well rotted.[69] The manure pit is more serviceable when its sides and top are protected from the sun by leaves and branches, for the sun draws out from the manure those elements which the land requires; for this reason experienced farmers sprinkle water on their manure pits, and so largely preserve its quality: here too some establish the privies for the slaves. One should build a barracks (what we call a *nubilarium* because it affords protection from the weather) and it should be large enough to contain under its roof the entire crop of the farm: this should be placed near the threshing floor and left open only on the side of the threshing floor, so that while threshing you may conveniently throw out the corn and if it begins to cloud up then quickly throw it back again under shelter. There should be windows in this barracks on the side most fitted for ventilation."

"A farm would be more of a farm," said Fundanius, "if the buildings were constructed with reference to the diligence of our ancestors rather than the luxury of their descendants. For they built for use, while we build to gratify an unbridled luxury. Their barns were bigger than their houses, but the contrary is often the case today. Then a house was praised if it had a good kitchen, roomy stables and a cellar for wine and oil fitted, according to the custom of the country, with a floor draining into a reservoir, into which the wine can flow when, as often happens after the new wine has been laid by, the fermentation of the must bursts both Spanish butts and our own Italian tuns. In like manner our ancestors equipped a country house with whatever other things were necessary to agriculture, but now on the contrary it is the effort to make such a house as vast and as elegant as possible, and we vie with those palaces which men like Metellus and Lucullus have built, to the detriment of the very state itself: in them the effort is to contrive summer

dining rooms fronting the cool east, and those designed for use in winter facing the western sun, rather than, as the ancients did, to adjust their windows with regard chiefly to the cellars, since wine in casks keeps best when it is cool, while oil craves warmth. For this reason also it would seem that the best place to put a house is on a hill, if nothing obstructs it."

Of the protection of farm boundaries

a. Fences

XIV. "Now," resumed Scrofa, "I will speak of fences, which are constructed for the protection of the farm or for dividing the fields. There are four kinds of such barriers: natural, dead wood, military and masonry. The first is the natural fence of live hedge, consisting of planted shrubs or thorns, and, as it has roots, runs no risk from the flaming torch of the passing traveller who may be inclined to mischief. The second kind is built of the wood of the country, but is not alive. It is made either of palings placed close together and wattled with twigs, or posts placed at some distance apart and pierced to receive the ends of rails, which are generally built two or three to the panel, or else of trunks of trees laid on the ground and joined in line. The third, or military fence, consists of a ditch and a mound: but such a ditch should be so constructed to collect all the rain water, or it should be graded to drain the surface water off the farm. The mound is best when constructed close adjoining the ditch, or else it should be steep so that it will be difficult to scale. It is customary to construct this kind of fence along the public roads or along streams. In the district of Crustumeria one can see in many places along the via Salaria ditches and mounds constructed as dikes against damage by the river (Tiber).[70] Mounds are some times built without ditches and are called walls, as in the country around Reate. The fourth and last kind of fence is of built up

masonry. There are usually four varieties: those of cut stone, as in the country around Tusculum; those of burned brick, as in Gaul; those of unburned brick as in the Sabine country; those of gravel concrete,[71] as in Spain and about Tarentum."

b. Monuments

XV. Lacking fences, the more discreet establish the boundaries of their property, or of their sowings, by blazed trees, and so prevent neighbourhood quarrels and lawing about corners. Some plant pines around their boundaries, as my wife did on her Sabine farm, or cypresses, as I have on my property on Vesuvius.[72] Others plant elms, as many have done in the district of Crustumeria: indeed, for planting in plains where it flourishes there is no tree which can be set out with such satisfaction or with more profit than the elm, for it supports the vine and so fills many a basket with grapes, yields its leaves to be a most agreeable forage for flocks and herds, and supplies rails for fences and wood for hearth and oven.

"And now," said Scrofa, "I have expounded my four points upon the physical characteristics of a farm, which were, its conformation, the quality of the soil, its extent and layout, its boundaries and their protection."

Of the considerations of neighbourhood

XVI. It remains to discuss the conditions outside the farm itself, for the character of the neighbourhood is of the utmost importance to agriculture on account of the necessary relations with it. There are four considerations in this respect also, namely: whether the neighbourhood bears a bad reputation; whether it affords a market to which our products can be taken and whence we can bring back what we may require at home; whether there

is a road or a river leading to that market, and, if so, whether it is fit for use; and fourth whether there is in our immediate vicinity any thing which may be to our advantage or disadvantage. Of these four considerations the most important is whether the neighbourhood bears a bad reputation: for there are many farms which are fit for cultivation but not expedient to undertake on account of the brigandage in the neighbourhood, as in Sardinia those farms which adjoin Oelium, and in Spain those on the borders of Lusitania.

On the second point those farms are the most profitable which have opportunities in the vicinity for marketing what they raise and buying what they must consume: for there are many farms which must buy corn or wine or what ever else they lack, and not a few which have a surplus of these commodities for sale. So in the suburbs of a city it is fitting to cultivate gardens on a large scale, and to grow violets and roses and many other such things which a city consumes, while it would be folly to undertake this on a distant farm with no facilities for reaching the market. So, again, if there is nearby a town or a village or even the well furnished estate of a rich man where you can buy cheap what you require on the farm, and where you can trade your surplus of such things as props and poles and reeds, your farm will be more profitable than if you had to buy at a distance; nay, more profitable even than if you were able to produce all you require at home: because in this situation you can make annual arrangements with your neighbours to furnish on hire the services of physicians, fullers and blacksmiths to better advantage than if they were your own: for the death of a single such skilled slave wipes out the entire profit of a farm. In carrying on the operation of a vast estate, the rich can afford to provide such servants for every department of the work: for if towns and villages are far distant from the farm, they supply blacksmiths and all other necessary craftsmen and keep them on the place, in order to prevent the hands from leaving the farm and spending working days in going leisurely to and from the shop when they might more profitably be engaged on what should be done in the

fields. So Saserna's book lays down the rule that "No one may leave the farm except the overseer, the butler, or such a one as the overseer sends on an errand. If any one disobeys this rule, he shall be punished for it, but if he disobeys a second time the overseer shall be punished." This rule may be better stated that no one should leave the farm without the approval of the overseer, and, without the consent of the master, not even the overseer, for more than a day at a time, but in no event more frequently than the business of the farm requires.

On the third point, conveniences of transportation make a farm more profitable, and these are whether the roads are in such condition that wagons can use them smoothly, or whether there are rivers nearby which can be navigated. We know that each of these means of transportation is available to many farms.

The fourth point, which is concerned with how your neighbour has planted his land, also relates to your profits: because if he has an oak forest near your boundary, you cannot profitably plant olives in that vicinity, for the oak is so perverse in its effect upon the olive that not only will your trees bear less but they will even avoid the oaks and bend away from them until they are prostrate on the ground, as the vine is wont to do when planted near vegetables. Like the oak, a grove of thickly planted full grown walnut trees renders sterile all the surrounding land.

2° CONCERNING THE EQUIPMENT OF A FARM

XVII. I have spoken of the four points of husbandry which relate to the land to be cultivated and also of those other four points which have to do with the outside relations of that land: now I will speak of those things which pertain to the cultivation of the land. Some divide this subject into two parts, men and those assistants to men without which agriculture cannot be carried on. Others divide it into three parts, the instruments of agriculture which are articulate, inarticulate and mute: the articulate being the servants, [73] the inarticulate the draught animals, and the mute being the wagons and other such implements.

Of agricultural labourers

All men carry on agriculture by means of slaves or freemen or both. The freemen who cultivate the land do so either on their own account, as do many poor people with the aid of their own children, or for wages, [74] as when the heaviest farm operations, like the vintage and the harvest, are accomplished with the aid of hired freemen: in which class may be included those bond servants whom our ancestors called *obaerati*, a class which may still be found in Asia, in Egypt and in Illyricum. With respect to the use of freemen in agriculture, my own opinion is that it is more profitable to use hired hands than one's own slaves in cultivating unhealthy lands, and, even

where the country is salubrious, they are to be preferred for the heaviest kind of farm work, such as harvesting and storing grapes and corn. Cassius has this to say on the subject: 'Select for farm hands those who are fitted for heavy labour, who are not less than twenty-two years of age and have some aptitude for agriculture, which can be ascertained by trying them on several tasks and by enquiring as to what they did for their former master.' Slaves should be neither timid nor overconfident. The foreman should have some little education, a good disposition and economical habits, and it is better that they should be some what older than the hands, for then they will be listened to with more respect than if they were boys. It is most important to choose as foremen those who are experienced in agricultural work, for they should not merely give orders but lend a hand at the work, so that the labourers may learn by imitation and may also appreciate that it is greater knowledge and skill which entitles the foreman to command. The foreman should never be authorized to enforce his discipline with the whip if he can accomplish his result with words.

Avoid having many slaves of the same nation, for this gives rise to domestic rows.

The foremen will work more cheerfully if rewards are offered them, and particularly pains must be taken to see that they have some property of their own, and that they marry wives among their fellow servants, who may bear them children, some thing which will make them more steady and attach them to the place.[75] On account of such relationships families of Epirote slaves are esteemed the best and command the highest prices.

Marks of consideration by the master will go far in giving happiness to your hands: as, for instance, by asking the opinion of those of them who have done good work, as to how the work ought to be done, which has the effect of making them think less that they are looked down upon, and

encourages them to believe that they are held in some estimation by the master.

Those slaves who are most attentive to their work should be treated more liberally either in respect of food or clothes, or in holidays, or by giving them permission to graze some cattle of their own on the place, or something of that kind. Such liberality tempers the effect of a harsh order or a heavy punishment, and restores the slaves' good will and kindly feeling towards their master.

XVIII. On the subject of the number of slaves one will require for operating a farm, Cato lays down the two measures of the extent of the farm and the kind of farming to be carried on. Writing about the cultivation of olives and vines he gives these formulas, viz.:

For carrying on an olive farm of two hundred and forty jugera, thirteen slaves are necessary, to-wit: an overseer, a housekeeper, five labourers, three teamsters, an ass driver, a swineherd and a shepherd: for carrying on a vineyard of one hundred jugera, fifteen slaves are necessary, to-wit: an overseer, a housekeeper, ten labourers, a teamster, an ass driver and a swineherd.

On the other hand Saserna says that one man is enough for every eight jugera,[76] as a man should cultivate that much land in forty-five days: for while one man can cultivate a jugerum in four days, yet he allows thirteen days extra for the entire eight jugera to provide against the chance of bad weather, the illness or idleness of the labourer and the indulgence of the master.[77]

At this Licinius Stolo put in.

"Neither of these writers has given us an adequate rule," he said. "For if Cato intended, as he doubtless did, that we should add to or subtract from what he prescribes in proportion as our farm is of greater or less extent than that he describes, he should have excluded the overseer and the housekeeper from his enumeration. If you cultivate less than two hundred and forty jugera of olives you cannot get along with less than one overseer, while if you cultivate twice or more as much land you will not require two or three overseers. It is the number of labourers and teamsters only which must be added to or diminished in proportion to the size of the farm: and this applies only if the land is all of the same character, for if part of it is of a kind which cannot be ploughed, as for example very rocky, or on a steep hillside, there is that much less necessity for teams and teamsters. I pass over the fact that Cato's example of a farm of two hundred and forty jugera is neither a fair nor a comparable unit.[78] The true unit for comparison of farms is a *centuria*, which contains two hundred jugera, but if one deducts forty jugera, or one-sixth, from Cato's two hundred and forty jugera, I do not see how in applying this rule one can deduct also one-sixth of his thirteen slaves; or, even if we leave out the overseer and the housekeeper, how one can deduct one-sixth of eleven slaves. Again, Cato says that one should have fifteen slaves for one hundred jugera of vineyard, but suppose one had a *centuria* half in vines and half in olives, then, according to Cato's rule, one would require two overseers and two housekeepers, which is absurd. Wherefore it is necessary to find another measure than Cato's for determining the number of slaves, and I myself think better of Saserna's rule, which is that for each jugerum it suffices to provide four days work of one hand. Yet, if this was a good rule on Saserna's farm in Gaul, it might not apply on a mountain farm in Liguria. In fine you will best determine what number of slaves and what other equipment you will require if you diligently consider three things, that is to say, what kind of farms are there in your neighbourhood, how large are they, and how many hands are

engaged in cultivating them, and you should add to or subtract from that number in proportion as you take up more or less work. For nature gave us two schools of agriculture, which are experience and imitation. The most ancient farmers established many principles by experiment and their descendants for the most part have simply imitated them. We should do both these things: imitate others and on our own account make experiments, following always some principle, not chance:[79] thus we might work our trees deeper or not so deep as others do to see what the effect would be. It was with such intelligent curiosity that some farmers first cultivated their vines a second and a third time, and deferred grafting the figs from spring to summer."

Of draught animals

XIX. In respect of those instruments of agriculture which are called inarticulate, Saserna says that two yokes of oxen will be enough for two hundred jugera of arable land, while Cato prescribes three yokes for two hundred and forty jugera in olives: thus if Saserna is correct, one yoke of oxen is required for every hundred jugera, but if Cato is correct a yoke is needed for every eighty jugera. My opinion is that neither of these standards is appropriate for all kinds of land, but each for some kind: for some land is easy and some difficult to plough, and oxen are unable to break up some land except by great effort and often they leave the ploughshare in the furrow broken from the beam: wherefore in this respect we should observe a triple rule on every farm, when we are new to it, namely: find out the practice of the last owner; that of the neighbours, and make some experiments of our own.

"Cato adds," resumed Scrofa, "that on his olive farm there are required three asses to haul out the manure and one to turn the mill, and on his

hundred jugera vineyard a yoke of oxen and a pair of asses for the manure, and an ass for the wine press."

In respect of cattle kept for all these purposes, which it is customary to feed in the barn yard, it should be added that you should keep as many and only as many as you need for carrying on the work of the farm, so that more easily you can secure diligent care of them from the servants whose chief care is of themselves. In this connection the keeping of sheep is preferable to hogs not only by those who have pastures but also by those who have none, for you should keep them not merely because you have pasture, but for the sake of the manure.

Watch dogs should be kept in any event for the safety of the farm.

XX. The most important consideration with respect to barn yard cattle is that the draft oxen should be fit for their work: when bought unbroken they should not be less than three years old nor more than four, strong, but well matched, lest the stronger wear out the weaker: with large horns, black rather than any other color, broad foreheads, flat noses, deep chests and heavy quarters. Old steers which have worked in the plains cannot be trained to service in rough and mountain land; a rule as applicable when reversed. In breaking young steers it is best to begin by fastening a fork shaped yoke on their necks and leaving it there even when they are fed; in a few days they will become used to it and disposed to be docile. Then they should be broken to work gradually until they are accustomed to it, as may be done by yoking a young ox with an old one, so that he may learn what is expected of him by imitation. It is best to work them first on level ground without a plough, then with a light plough, so that their first lessons may be easy and in sand and mellow soil.

Oxen intended for the wagon should be broken in the same way, at first by drawing an empty cart, if possible through the streets of a village or a

town, where they may become quickly inured to sudden noises and strange sights. You should not work an ox always on the same side of the team, for an occasional change from right to left relieves the strain of the work.

Where the land is light, as in Campania, they do not plough with heavy steers but with cows or asses, as they can be driven more easily to a light plough. For turning the mill and for carrying about the farm some use asses, some cows and others mules: a choice determined by the supply of provender. For an ass is cheaper to feed than a cow, though a cow is more profitable.[80]

In the choice of the kind of draft animals he is to keep, a farmer should always take into consideration the characteristics of his soil: thus on rocky and difficult land the prime requirement is doubtless strength, but his purpose should be to keep that kind of stock which under his conditions yields the largest measure of profit and still do all the necessary work.

Of watch dogs

XXI. It is more desirable to keep a few dogs and fierce ones than a pack of curs. They should be trained to watch by night and to sleep by day chained in the kennel [so that they may be the more alert when set loose.]

It remains to speak elsewhere of unyoked cattle, like the flocks, but if there are meadows on the farm and the owner keeps no live stock, it is the business of a good farmer after he has sold his hay to graze and feed another's cattle on his land.

Of farming implements

XXII. Concerning the instruments of agriculture which are called mute, in which are included baskets, wine jars and such things, this may be said: Those utensils which can be produced on the farm or made by the servants should never be bought, among which are what ever may be made out of osiers or other wood of the country, such as hampers, fruit baskets, threshing sledges, mauls and mattocks, or what ever is made out of the fibre plants like hemp, flax, rushes, palm leaves and nettles, namely: rope, twine and mats. Those implements which cannot be manufactured on the farm should be bought more with reference to their utility than their appearance that they may not diminish your profit by useless expense, a result which may be best secured by buying where the things you need may be found at once of good quality, near at hand and cheap. The requirement of the kind and number of such implements is measured by the extent of the farm because the further your boundaries lie apart the more work there is to do."

"In this connection," put in Stolo, "given the size of the farm, Cato recommends with respect to implements as follows: he who cultivates 240 jugera in olives should have five sets of oil making implements, which he enumerates severally, such as the copper utensils, including kettles, pots, ewers with three spouts, etc.; the implements made out of wood and iron, including three large wagons, six ploughs with their shares, four manure carriers, etc. So of the iron tools, what they are and how many are needed, he speaks in great detail, as eight iron pitch forks, as many hoes and half as many shovels, etc.

"In like manner he lays down another formula of implements for a vineyard, viz.: if you cultivate 100 jugera you should have three sets of implements for the wine press and also covered storage vats of a capacity of eight hundred *cullei*, as well as twenty harvesting hampers for grapes and as many for corn, and other things in like proportion.

"Other writers advise a smaller quantity of such conveniences, but I believe Cato prescribed so great a capacity in order that one might not be compelled to sell his wine every year, for old wine sells better than new, and the same quality sells better at one time than another. Cato writes further in great detail of the kind and number of iron tools which are required for a vineyard, such as the falx or pruning hook, spades, hoes. So also several of these instruments are of many varieties, as for instance the falx, of which this author says that there must be provided forty of the kind suitable for use in a vineyard, five for cutting rushes, three for pruning trees and ten for cutting briars."

So far Stolo, when Scrofa began again. "The owner should have an inventory of all the farm implements and equipment, with a copy on file both at the house and at the stading, and it should be the duty of the overseer to see that everything is checked against this inventory and is assigned its appropriate keeping place in the barn. What cannot be kept under lock and key should be kept in plain sight, and this is particularly necessary in respect of the utensils which are used only at intervals, as at harvest time, like the grape baskets and such things, for what ever one sees daily is in the least danger from the thief."

3° CONCERNING THE OPERATION OF A FARM

XXIII. "And now," interposed Agrasius, "as we have discussed the two first parts of the four-fold division of agriculture, namely: concerning the farm itself and the implements with which it is worked, proceed with the third part."

Of planting field crops

"As I hold," said Scrofa, "that the profit of a farm is that only which comes from sowing the land, there are two considerations which remain for discussion, what one should sow and where it is most expedient to sow it, for some lands are best suited for hay, some for corn, some for wine and some for oil. So also should be considered the forage crops like basil, mixed fodder, vetch, alfalfa, snail clover and lupines. All things should not be sown in rich land, nor should thin land be left unsown, for it is better to sow in light soil those things which do not require much nourishment, such as snail clover and the legumes, except always chick peas (for this also is a legume like the other plants which are not reaped but from which the grain is plucked) because those things which it is the custom to pluck (*legere*) are called legumes. In rich land should be sown what ever require much nourishment, such as cabbage, spring and winter, wheat and flax. Certain plants are cultivated not so much for their immediate yield as with

forethought for the coming year, because cut and left lying they improve the land. So, if land is too thin it is the practice to plough in for manure, lupines not yet podded, and likewise the field bean, if it has not yet ripened so that it is fitting to harvest the beans.[81]

"Not less should you make provision for cultivating what yields you profit in mere pleasure, like arbours and flower gardens: and those plantations which do not serve either for the support of man or the delight of the senses, but are not the less useful in the economy of the farm. Thus suitable places must be set aside for growing willows and reeds and other such things which affect wet places. On the other hand, you should sow field beans as much as possible in your corn land. There are other plants which seek dry places, and still others demand shade, like asparagus, both when wild and cultivated: while violets and garden flowers, which flourish in the sun should be set out in the open.

"So other things demand other planting conditions, like the osiers from which you derive your material for making basket ware, for wagon frames, winnowing baskets and grape hampers. Elsewhere you might plant and cultivate a forest for cut wood and a spinney for fowling.

"So you should reserve ground for planting hemp, flax, rush and Spanish broom (spartum) which serve to make shoes for the cattle, thread, cord and rope. Other situations are suitable for still other kinds of planting, as, for example, some plant garden truck and some plant other things, in a nursery, or between the rows of a young orchard before the roots of the trees have spread far out, but this should never be done when the trees have grown lest the roots be injured."

"In this respect," said Stolo, "what Cato says about planting is in point, that a field which is rich and in good heart and without shade should be

planted in corn, while a low lying field should be set in turnips, radishes, millet and panic grass."

Of planting olives

XXIV. Scrofa resumed: "The varieties of olives to plant in rich and warm land are the preserving olive *radius major*, the olive of Sallentina, the round *orchis*, the bitter *posea*, the Sergian, the Colminian, and the waxy *albicera*: which ever of these does best in your locality, plant that most extensively. An olive yard is not worth cultivating unless it looks to the west wind and is exposed to the sun; if the soil is cold and thin there you should plant the Licinian olive, for if you set out this variety in a rich and warm soil it will never make a *hostus* and the tree will exhaust itself in bearing and will become infected with red moss. (*Hostus* is the country name for the yield of oil from a single tree at each *factus* or pressing: some claim this should amount to 160 *modii*, while others reduce it to 120 *modii*, and even less in proportion to the size and number of their storage vats.)

"Cato advises you to plant elms and poplars around the farm so as to obtain from them leaves to feed the sheep and cattle as well as a supply of lumber: while this is not necessary on all farms, nor in some for the forage alone, it may be done with advantage as a wind break against the north where the trees will not shut out the sun."

Stolo added the following advice from the same author: 'If you have a piece of wet ground there plant cuttings of poplars, and also reeds which are set out as follows: having turned the sod with a hoe plant the scions of reed three feet one from the other. Wild asparagus (from which you may cultivate garden asparagus) should also be set out in such a place because the same kind of cultivation is suitable for it as for reeds. You should set out Greek willows around the reed bed to supply ties for your vines.'

Of planting vines

XXV. "In respect of planting vines," resumed Scrofa, "it should be observed that the varieties fitted for the best land and exposure to the sun are the little Aminean, the twin *Eugeneam* and the little yellow kind: while on rich or wet land the best varieties are the large Aminean, the Murgentine, the Apician and the Lucanian. Other vines, and especially the mixed varieties, do well in any kind of land."

XXVI. "In all vineyards care is taken that the prop should shelter the vine against the north wind. And if live cypresses are used as props they are planted in alternate rows and are not allowed to grow higher than is necessary for use as a prop. Cabbages are never planted near vines because they do each other damage."

"I fear," said Agrius, turning to Fundanius, "that the Sacristan may get back before we have reached the fourth head of our subject, that of the vintage, for I am looking forward thirstily to the vintage."

"Be of good cheer," said Scrofa, "and prepare the grape baskets and the ewer."

4° CONCERNING THE AGRICULTURAL SEASONS

XXVII. We have two standards of time, the first that of the revolution of the year, because in it the sun completes his circuit, the other the measure of the month, because it includes the waxing and the waning of the moon.

Of the solar measure of the year

First I will speak of the sun, whose recurring journey is divided with reference to the pursuits of agriculture into four seasons of three months each, or more accurately into eight seasons of a month and a half each. The four seasons are Spring, Summer, Autumn and Winter. In Spring certain crops are sown and the sod fields are broken up,[82] so that the weeds in them may be destroyed before they have seeded themselves again, and the clods, by drying out in the sun, may become more accessible to the rain and when broken down by its action easier to cultivate. Such land should be ploughed not less than twice, but three times is better.[83] The Summer is the season of the grain harvest; the Autumn, when the weather is dry, that of the vintage: and it is also the fit time for thinning out the woods, when the trees to be removed should be cut down close to the ground and the roots should be dug up before the first rains to prevent them from stooling. In Winter the trees may be pruned, provided this is done at a time when the bark is free from frost and rain and ice.

XXVIII. Spring begins when the sun is in Aquarius, Summer when it is in Taurus, Autumn when it is in Leo, and Winter when it is in Scorpio. Since the beginning of each of the four seasons is the twenty-third day after the entrance of the sun in these signs respectively, it follows that Spring has ninety-one days, Summer ninety-four, Autumn ninety-one and Winter eighty-nine: which, reduced to the dates of our present official calendar,[84] makes the beginning of Spring on the seventh day before the Ides of February (February 7), of Summer on the seventh day before the Ides of May (May 9), of Autumn on the third day before the Ides of August (August 11), and of Winter on the fourth day before the Ides of November (November 10).

A CALENDAR OF AGRICULTURAL OPERATIONS

By a more exact definition of the seasons, the year is divided into eight parts, the first of forty-five days from the date of the rising of the west wind (February 7) to the date of the vernal equinox (March 24), the second of the ensuing forty-four days to the rising of the Pleiades (May 7), the third of forty-eight days to the summer solstice (June 24), the fourth of twenty-seven days to the rising of the Dog Star (July 21), the fifth of sixty-seven days to the Autumn equinox (September 26), the sixth of thirty-two days to the setting of the Pleiades (October 28), the seventh of fifty-seven days to the winter solstice (December 24), and the eighth of forty-five days to the beginning of the first.[85]

1° February 7-March 24

XXIX. These are the things to be done during the first of the seasons so enumerated: All kinds of nurseries should be set out, the vines should be first pruned, then dug, and the roots which have protruded from the ground should be cut out, the meadows should be cleaned, willows planted and the corn hoed. We call that corn land (*seges*) which has been ploughed and sowed as distinguished from plough land (*arva*) which has been ploughed

but not yet sowed, while that land which was formerly sowed and lies awaiting a new ploughing is called stubble (*novalis*). When land is ploughed for the first time it is said to be broken up (*proscindere*), and at the second ploughing to be broken down (*offringere*) because at the first ploughing large clods are turned up and at the second ploughing these are reduced. The third cultivation, after the seed has been sown, is called ridging (*lirare*), that is, when by fastening mould boards on the plough, the sown seed is covered up in ridges[86] and at the same time furrows are cut by means of which the surface water may drain off. Some farmers who cultivate small farms, as in Apulia, are wont to harrow their land after it is ridged, if perchance any large clods have been left in the seed bed. The hollow channel left by the share of the plough is called the furrow, the raised land between two furrows is called the ridge (*porca*), because there the seed is as it were laid upon an altar (*porricere*) to secure a crop, for when the entrails are offered to the gods this word *porricere* is used to describe the oblation.

2° March 24-May 7

XXX. These are the things to be done during the second season between the vernal equinox and the rising of the Pleiades. Weed the corn land, break up old sod, cut the willows, close the pastures (to the stock) and complete any thing left undone in the preceding season. Plant trees before the buds shoot and they begin to blossom, for deciduous trees are not fit to transplant after they put forth leaves. Plant and prune your olives.

3° May 7-June 24

XXXI. These are the things to be done during the third season between the rising of the Pleiades and the summer solstice. Dig the young vines or plough them, and afterwards put the land in good order; that is to say, fine the soil so that no clods shall remain. This is called fining the soil (*occare*) because it breaks down (*occidare*) the clods. Thin out the vines, but let it be done by one who knows how, for this operation which is considered of great importance is performed only on vines and not on the orchard. To thin a vine is to select and reserve the one, two and some times even three best new tendrils sprung from the stem of the vine, cutting off all the others, lest the stem may be unable to furnish nourishment for those which have been reserved. So in a nursery it is the custom to cut it back at first so that the vine may grow with a stronger stem and may have greater strength to produce fruitful tendrils: for a stem which grows slender like a rush is sterile through weakness and cannot throw out tendrils. Thus it is the custom to call a weak stem a flag, and a strong stem, which bears grapes, a palm. The name *flagellum*, indicating something as unstable as a breeze, is derived from *flatus*, by the change of a letter, just as in the case of the word *flabellum*, which means fly fan. The name *palma*, which is given to those vine shoots which are fruitful in grapes, was it seems, at first, *parilema*, derived from *parire* (to produce), whence by a change of letters, such as we find in many instances, it came to be called *palma*.

From another part of the vine springs the *capreolus*, which is a little spiral tendril, like a curled hair, by means of which the vine holds on while it creeps towards the place of which it would take possession, from which quality of taking hold of things (*capere*) it is called *capreolus*.

All forage crops should be saved at this season; first, basil, then mixed fodder (*farrago*)[87] and vetch, and last of all the hay. Our name for basil is

ocinum, which is derived from the Greek word [Greek: *ocheos*] and signifies that it comes quickly, like the pot herb of the same name. It has this name also because it quickens the action of the bowels of cattle and so is fed to them as a purgative. It is cut green from a bean field before the pods are formed. On the other hand that forage which is cut with a sickle from a field in which barley and vetch and other legumes have been sown in mixture for forage, is called *farrago* from the instrument (*ferro*) with which it is cut, or perhaps because it was first sown in the stubble of a field of corn (*far*). It is fed to horses and other cattle in the spring to purge and to fatten them.

Vetch (*vicia*) is so called from its quality of conquering (*vincire*) because this plant, like the vine, has tendrils by means of which it creeps twisting upward on the stalks of lupines or other plants where it clings until it over-tops its host.

If you have irrigated meadows, proceed to water them at this season, as soon as you have saved the hay.

During droughts water your grafted fruit trees every evening. They probably derive their name, (*poma*), from their appetite for drink (*potus*).

4° *June 24-July 21*

XXXII. During the fourth season between the summer solstice and the rising of the Dog Star most farmers make their harvest, because it is claimed that to mature properly corn should be allowed fifteen days to germinate and shoot, fifteen days to bloom and fifteen days to ripen.

Finish your ploughing: it will be more profitable in proportion as the earth is ploughed warm, when the land is broken up, fine it, that is, work it again in order that all the clods may be reduced, for at the first ploughing large clods are always turned up. This is the time also to sow vetch, lentils, the small variety of chick peas, pulse (*ervilia*) and the other things which we call legumes, but which others, as for example the Gauls, call *legarica*, both of which names come from the practice of picking their fruit (*legere*) because they are not cut but gathered.

Work the old vines a second time and the young ones thrice, especially if there are any clods left.

5° July 21-September 26

XXXIII. During the fifth season between the rising of the Dog Star and the autumn equinox thresh your straw and rick it, continue the harrowing of your fallow land, prune your fruit trees, and mow your irrigated meadow the second time.

6° September 26-October 28

XXXIV. The authorities advise you to begin to sow at the commencement of the sixth season immediately after the autumn equinox and to keep it up for the following 91 days, but not to attempt to sow any thing after the winter solstice, unless it is absolutely necessary, because seed

sown before the winter solstice germinates in seven days, while that sown later hardly ever sprouts for 40 days.

In like manner the authorities say that you should not begin your sowing before the equinox, lest continued rains cause the seed to rot in the ground. The best time to plant beans is at the setting of the Pleiades, but gather the grapes and make the vintage between the equinox and the setting of the Pleiades. Immediately afterward begin to prune the vines, to propagate them and plant fruit trees, but in those regions where the frost comes early it is better to postpone these operations until the following spring.

7° October 28-December 24.

XXXV. These are the things to do during the seventh season between the setting of the Pleiades and the winter solstice. Plant lilies and crocuses and propagate roses, which may be done by making cuttings about three inches in length from a stem already rooted, set these out and later, after they have formed their own roots, transplant them. The cultivation of violets has no place on a farm because they require elevated beds for which the soil is scraped up and these are damaged or even washed away by heavy rains, thus wasting the fertility of the land. At any time of the year between the rising of the west wind and the rising of Arcturus (February-September) it is proper to transplant from the seed beds thyme, an herb, which owes its name, *serpyllum*, to its creeping habit (*quod serpit*). This is the season also to dig new ditches, clean the old ones, and to prune the trees in the arbustum and the vines which are married to them, but be careful that you suspend most of your work during the fifteen days before and after the

winter solstice: it is fitting, however, to set out some trees during this period, as, for example, elms.

8° December 24-February 7

XXXVI. These are the things to do during the eighth season between the winter solstice and the rising of the west wind. Drain the fields, if any water is standing on them, but if they are dry and the land is friable, harrow them. Prune the vines and the orchard. When it is not fitting to work in the fields then those things should be done which can be done under cover during the winter twilight.

All these rules should be written out and posted in the farmstead and the overseer especially should have them at the tip of his tongue.

Of the influence of the moon on agriculture

XXXVII. The lunar seasons also must be considered. They are divided into two terms, that from the new moon to the full, and that from the full moon to the next moon, or until that day which we call *intermenstruus*, or the last and the first of a moon, whence at Athens this day is called [Greek: *henae kai nea*] (the old and the new), though the other Greeks call it [Greek: *triakas*] the thirtieth day. Some agricultural operations may be undertaken with more advantage during the increase of the moon, others during the decrease,[88] as, for example, the harvest or cutting of wood."

"I observe a practice which I learned from my father," said Agrasius, "not only never to shear my sheep, but not even to have my own hair cut on the decrease of the moon, for fear that I might become bald."

"What are the quarters of the moon," said Agrius, "and what bearing have they on agriculture?"

"Have you never heard in the country," said Tremelius, "the lore about the influence of Jana (Diana) on the eighth day before her waxing, and again on the eighth day before her waning; how certain things which ought to be done during the increase can be done to better advantage in the second quarter than the first, and that what ever is fitting to do on the wane of the moon can be better done when her light is less? This is all I know about the effect of the four quarters of the moon upon agriculture."

ANOTHER CALENDAR OF SIX AGRICULTURAL SEASONS

"There is another division of the year," said Stolo, "which takes account of both the sun and the moon, namely: into six seasons, because almost all the cultivated fruits of the earth come to maturity and reach the vat or the granary after five successive agricultural operations and are put to use by a sixth, and these are, first, the preparing (*praeparandum*); second, the planting (*serendum*); third, the cultivating of the growing crop (*nutricandum*); fourth, the ingathering (*legendum*); fifth, the storing (*condendum*), and sixth, the consuming (*promendum*)."

1° PREPARING TIME

Of tillage

In the matter of preparation there are different things to be done for different crops, as, if you wish to make an orchard or an arbustum, you trench and grub and plough; if you plant grain, you plough and harrow; while, if you cultivate trees, you mulch their roots by breaking the earth with a mattock, more or less according to the nature of the tree, for some trees, like the cypress, have a small, and others like the plane tree have a large, root system (for example, that in the Lyceum at Athens described by Theophrastus, which, when it was still a young tree, had a spread of roots to the extent of 33 cubits). If you break the ground with a plough and cattle, it is well to work the land a second time before you sow your seed. So, if you are making a meadow the preparation is to close it to the stock, and this is usually done when the pear tree is in bloom: if it is an irrigated meadow the preparation is to turn in the water at the proper time.

Of manuring

XXXVIII. As part of this same operation should be considered what places in a field need manure and what kind of manure you can use to the greatest advantage, for the several kinds have different qualities. Cassius says that the best manure is that of birds, except swamp and sea birds,[89]

but the best of all is, he claims, the manure of pigeons because it is the hottest and causes the land to ferment. This ought to be sown on the land like seed, not distributed in heaps like the dung of cattle. I myself think the best manure is that from aviaries in which thrushes and blackbirds are kept, because it is not only good for the land but serves as a fattening food for cattle and hogs: for which reason those who farm aviaries pay less rent when the owner stipulates that the manure is to be used on the farm, than those to whom it is a perquisite. Cassius advises that the manure next in value to that of doves is human feces, and third that of goats and sheep and asses. The manure of horses is of the least value on corn land, but on meadows it is the best, because, like the manure of other draught animals fed on barley, it brings a heavy stand of grass. The manure pit should be near the barn in order that it may be available with the least labour. If you plant a stake of oak wood in the manure pit it will not harbour serpents.

2° PLANTING TIME

Of the four methods of propagating plants

XXXIX. The second operation, namely that of propagating, must be considered in relation to the proper time for sowing each kind of seed, for this concerns the aspect of the field you are to sow and the season fitting for what you are to plant. Do we not see some things grow best in the spring, others in summer, some in autumn, and others again in winter? For each plant is sowed or propagated or harvested in season according to its nature: so while most trees are grafted most successfully in spring, rather than the autumn, yet figs may be grafted at the summer solstice, and cherries even in winter.

And since there are four methods of propagation of plants, by nature and by the several processes of art, namely: transplanting from one place to another, as is done in layering vines, what is called cuttage or propagating quick sets cut from trees, and graftage, which consists in transferring scions from one tree to another, let us consider at what season and in what locality you should do each of these things.

a. Seeding, and here of seed selection

XL. In the first place, the seed, which is the principle of all germination, is of two kinds, that which is not appreciable by our senses and that which is. Seed is hidden from us when it is disseminated in the air, as the physicist Anaxagoras holds, or is distributed over the land by the surface water, as Theophrastus maintains. The seeds which the farmer can see should be studied with the greatest care. There are some varieties, like that of the cypress, which are so small as to be almost invisible, for those nuts which the cypress bears, that look like little balls covered with bark, are not the seed but contain it. Nature gave the principle of germination to seed, the rest of agriculture was left for the experience of man to discover, for in the beginning before the interference of man plants were generated before they were sown, afterwards those seeds which were collected by man from the original plants did not generate until after they had been sown.

Seed should be examined to ascertain that it is not sterile by age, that it is clean, particularly that it is not adulterated with other varieties of similar appearances: for age has such effect upon seed as in some respects to change its very nature, thus it is said that rape will grow from old cabbage seed, and vice versa.[90]

b. Transplanting

In respect of transplanting, care should be taken that it is done neither too soon nor too late. The fit time, according to Theophrastus, is spring and autumn and midsummer, but the same rule will not apply in all places and to all kinds of plants: for in dry and thin clay soil, which has little natural moisture, the wet spring is the time, but in a rich and fat soil it is safe to transplant in autumn. Some limit the practice of transplanting to a period of thirty days.

c. Cuttage

In respect of cuttage, which consists in planting in the ground a live cutting from a tree, it behooves you especially to see that this is done at the proper time, which is before the tree has begun to bud or bloom: that you take off the cutting carefully rather than break it from the parent tree, because the cutting will be more firmly established in proportion as it has a broad footing which can readily put out roots: and that it is planted promptly before the sap dries out of it.

In propagating olives select a truncheon of new grown wood about a foot in length and the same size at each end: some call these *clavolae* and others call them *taleae*.

d. Graftage

In respect of graftage, which consists in transferring growing wood from one tree to another, care must be taken in selecting the tree from which the scion is taken, the tree on which it is grafted, and the time and the manner in which it is done: for the pear cannot be grafted on an oak, even though it may upon the apple. In this operation many men who have great faith in the sayings of the soothsayers give heed to their warning that as many kinds of grafts there may be on a tree so many bolts of lightning will strike it, because a bolt of lightning is generated by each graft (*ictu*).[91]

If you graft a cultivated pear upon a wild pear tree no matter how good it may be, the result will not be as fortunate as if you had grafted on another cultivated pear. Having regard for the result, on what ever kind of tree you graft, if it is of exactly the same kind, as, for instance, apple on apple, you should take care that the scion comes from a better tree than that on which it is grafted.

e. A "new" method—inarching

There is another operation recently suggested,[92] for propagating one tree from another, when the trees are neighbours. From the tree from which you wish to take a scion a branch is trained to that on which you wish to make the graft and the scion is bound upon an incision in a branch of the stock. The place of contact of both scion and stock is cut away with a knife so that the bark of one joins evenly with the bark of the other at the point of exposure to the weather. Care should be taken that the growing top of the scion is pointed straight upwards. The following year when the graft has knitted, the scion may be cut from its parent tree.

Of when to use these different methods

XLI. The most important consideration in propagating is, however, the time at which you do it: thus things which formerly were propagated in the spring now are propagated in summer, like the fig, whose wood is not heavy and so craves heat, as a consequence of which quality figs cannot be grown in cold climates. For the same reason water is dangerous to a new fig graft because its soft wood rots easily. For these reasons it is now considered that midsummer is the best season to propagate figs. On the other hand it is the custom to tie a pot of water above a graft of hard wood trees so that it may drip on the graft and prevent the scion from drying up before it has been incorporated with the stock. Care must be taken that the bark of the scion is kept intact, and to that end it should be sharpened but so that the pith (*medulla*) is not exposed. To prevent the rain or the heat from injuring it from without, it should be smeared with clay and bound with bark. It is customary to take off the scion of a vine three days before it is to be grafted so that the superfluity of moisture may drain out before the scion is inserted, or, if the graft is already in place, an incision is made in the stock a little below the graft from which the adventitious moisture may

drain off: but this is not done with figs and pomegranates, for in all trees of a comparatively dry nature the graft is made immediately. Indeed, some trees, like the fig, are best grafted when the scion is in bud.

Of the four kinds of propagation which I have discussed, that of graftage is preferred in respect of those trees which, like the fig, are slow in developing: for the natural seeds of the fig are those grains seen in the fruit we eat and are so small as scarcely to be capable of sprouting the slenderest shoots. For all seeds which are small and hard are slow in germinating, while those which are soft are more spontaneous, just as girls grow faster than boys. Thus by reason of their feminine tenderness the fig, the pomegranate and the vine are quicker to mature than the palm, the cypress and the olive, which are rather dry than humid by nature. Wherefore we some times propagate figs in nurseries from cuttings rather than attempt to raise them from seed: unless there is no other way to secure them, as happens when one wishes to send or receive seed across the sea. For this purpose the ripe figs which we eat are strung together and when they have dried out are packed and shipped wheresoever we wish, and thereafter being planted in a nursery they germinate. In this way the Chian, the Chalcidian, the Lydian, the African and other foreign varieties of figs were imported into Italy.

For the same reason olives are usually propagated in nurseries from truncheons such as I have described, rather than from its seed, which is hard like a nut and slow to germinate.

Of seeding alfalfa

XLII. You should take care not to plant alfalfa[93] in soil which is either too dry or half wet,[94] but in good order. The authorities say that if the soil is in proper condition a *modius* (peck) and a half of alfalfa seed will suffice

to sow a *jugerum* of land. This seed is sowed broad-cast on the land like grass and grain.

Of seeding clover and cabbage

XLIII. Snail clover (*cytusus*) and cabbage is sowed in beds well prepared and is transplanted from them and set out so that the plants are a foot and a half apart, also cuttings are taken from the stronger plants and set out like those which were raised from seed.

Of seeding grain

XLIV. The quantity of seed required for one *jugerum* is, of beans, four modii, of wheat five modii, of barley six modii, and of spelt ten modii: in some places a little more or a little less; if the soil is rich, more; if it is thin, less. Wherefore you should observe how much it is the custom to sow in your locality in order that you may do what the region and the quality of the soil demands, which is the more necessary as the same amount of seed will yield in some localities ten for one, and in others fifteen for one, as in Etruria. In Italy also, in the region of Sybaris it is said that seed yields as much as one hundred for one, and as much is claimed for the soil of Syria at Gadara, and in Africa at Byzacium.[95]

It is also important to consider whether you will sow in land which is cropped every year which we call *restibilis*, or in fallow land (*vervactum*), which is [ploughed in the spring and so] allowed an interval of rest."

"In Olynthia," said Agrius, "they are said to crop the land every year but to get a greater yield every third year."

"A field ought to lie fallow every other year," said Stolo, "or at least be planted with some crop which makes less demand upon the soil."

3° CULTIVATING TIME

"Tell us," said Agrius, "about the third operation which relates to the cultivation and the nourishment of the crops."

Of the conditions of plant growth

"All things which germinate in the soil," replied Licinius, "in the soil also are nourished, come to maturity, conceive, are pregnant and in due time bear fruit or ear, so each fruit after its kind yields seed similar to that from which it is sprung. Thus if you pluck a blossom or a green pear from a pear tree, or the like from any other tree, nothing will grow again in that place during the same year, because a tree cannot have two periods of fruition in the same season. They produce only as women bear children, when their time has come."

XLV. Barley usually sprouts in seven days after it has been sowed, and wheat not much later, while the legumes almost always sprout in four or five days, except the bean, which is somewhat later. Millet and sesame and the other similar grains sprout in the same time unless some thing in the nature of the soil or the weather retards them. If the locality is cold, those plants which are propagated in the nursery and are tender by nature ought to be protected from the frosts by coverings of leaves or straw, and, if rains follow, care should be taken that water is not permitted to stand any where

about them, for ice is a poison to tender roots under ground, as to sprouts above, and prevents them from developing normally. In autumn and winter the roots develop more than does the leaf of the plant because they are nourished by the warmth of the roof of earth, while the leaf above is cut down by the frosty air. We can learn this by observation of the wild vegetation which grows without the intervention of man, for the roots grow more rapidly than that which springs from them, but only so far as they are actuated by the rays of the sun. There are two causes of the growth of roots, the vitality of the root itself by which nature drives it forward, and the quality of the soil which yields a passage more easily in some conditions than in others.

Of the mechanical action of plants

XLVI. In their effect upon plants such natural forces as I have mentioned produce some curious mechanical results. Thus it is possible to determine the time of the year from the motion of the leaves of certain trees like the olive, the white poplar and the willow, for when the summer solstice has arrived their leaves turn over. Not less curious is the habit of that flower which is called the heliotrope, which in the morning looks upon the rising sun and, following its journey to its setting, never turns away its face.

Of the protection of nurseries and meadows

XLVII. Those plants, which, like olives and figs, are grown in the nursery from cuttings and are of a tender nature, should be protected by sheds built of two planks fastened at each end: moreover they should be weeded, and this should be done while the weeds are still young, for after they have become dry they offer resistance, and more readily break off in your hand than yield to your pull. On the other hand the grass which springs in the

meadows and gives you hope of forage not only should not be rooted out while it is growing, but should not even be walked upon; hence both the flock and the herd should be excluded from the meadow at this time and even man himself should keep away, for grass disappears under the foot and the track soon becomes a path.

Of the structure of a wheat plant

XLVIII. A corn plant consists of a culm bearing at its head a spike, which, when it is not mutilated, has, as in barley and wheat, three parts, namely: the grain, the glume and the beard, not to speak of the sheath which contains the spike while it is being formed. The grain is that solid interior part of the spike, the glume is its hull and the beard those long thin needles which grow out of the glume. Thus as the glume is the pontifical robe of the grain, the beard is its apex. The beard and the grain are well known to almost every one, but the glume to very few: indeed I know only one book in which it is mentioned, the translation which Ennius made of the verses of Evhemerus. The etymology of the word *gluma* seems to be from *glubere*, to strip, because the grain must be stripped from this hull: and by a like derivation the hull of the fig which we eat is called a glume. The beard we call *arista* because it is the first part of the corn to dry (*arescere*), while we call the grain *granum* from the fact that it is produced (*gerere*), for we plant corn to produce grain, not glumes or beards, just as vines are planted to produce grapes, not tendrils. The spike, which, by tradition, the country people call *specca*, seems to get its name from *spes*, hope. For men plant with hope of the harvest. A spike which has no beard is called polled (*muticus*), for, when the spike is first forming, the beard, like the horns of a young animal, is not apparent but lies hid like a sword in its scabbard under a wrapping of foliage which hence is called the sheath. When the spike is

mature its taper end above the grain is called the *frit*, while that below, where the spike joins the straw culm, is called the *urruncum*.

XLIX. When Stolo drew breath, no one asked any questions, and so, believing that enough had been said on the subject of the care of the growing crops, he resumed.

4° HARVEST TIME

"I will now speak about the gathering of the crops."

Of the hay harvest

And first of the meadows: when the grass ceases to grow and begins to dry out with the heat, then it should be cut with scythes and, as it begins to cure, turned with forks. When it is cured it should be tied in bales and hauled into the steading; then what hay was left lying should be raked together and stacked, and, finally, when this has all been done, the meadow should be gleaned, that is, gone over with the sickle to save what ever grass escaped the mowing, such as that left standing on tussocks. From this act of cutting (*sectare*) I think that the word *sicilire* (to glean with a sickle) is derived.

Of the wheat harvest

L. The word harvest (*messis*) is properly used with respect to the ingathering of those crops which are reaped, and from this action (*metere*) its name is derived, but it is mostly used in respect of corn. There are three methods of harvesting corn, one as in Umbria, where they cradle the straw close to the earth and shock up the sheaves as they are cut: when a sufficient number of shocks has been made, they go over them again and

cut each sheaf between the spikes and the straw, the spikes being thrown into baskets and sent off to the threshing floor, while the straw is left in the field and stacked. A second method of harvesting is practised in Picenum, where they have a curved wooden header[96] on the edge of which is fixed an iron saw: when this instrument engages the spikes of grain it cuts them off, leaving the straw standing in the field, where it is afterwards cut. A third method of harvesting, which is used in the vicinity of Rome and in most places, is to cut the straw in the middle and take away the upper part with the left hand (whence the word to reap [*metere*] is, I think, derived from the word *medium*—connoting a cutting in the middle). The lower part of the straw which remains standing is cut later,[97] while the rest, which goes with the grain, is hauled off in baskets to the threshing floor and there in an airy place is winnowed with a shovel (*pala*) from which perhaps the chaff (*palea*) takes its name. Some derive the name of straw (*stramentum*) from the fact that it stands (*stare*), as they think the word *stamen* is also derived, while others derive it from the fact that it is spread (*strare*), because straw is used as litter for cattle.

The grain should be harvested when it is ripe: it is considered that under normal conditions and in an easy field one man should reap almost a jugerum a day and still have time to carry the grain in baskets to the threshing floor.

The threshing floor

LI. The threshing floor should be on high ground so that the wind can blow upon it from all directions. It should be constructed of a size proportioned to your crops, preferably round and with the centre slightly raised so that if it rains the water may not stand on it but drain off as quickly as possible, and there is no shorter distance from the centre to the circumference of a circle than a radius:[98] it should be paved with well

packed earth, best of all of clay, so that it may not crack in the sun and open honeycombs in which the grain can hide itself, and water collect and give vent to the burrows of mice and ants. It is the practice to anoint the threshing floor with amurca,[99] for that is an enemy of grass and a poison to ants and to moles. Some build up and even pave their threshing floor with rock to make it permanent, and some, like the people of Bagiennae, even roof it over because in that country storms are prevalent at the threshing season. In a hot country where the threshing floor is uncovered it is desirable to build a shelter near by where the hands can resort in the heat of the day.

Threshing and winnowing

LII. The heaviest and best of the sheaves should be selected on the threshing floor and the spikes laid aside for seed. The grain is threshed from the spikes on the threshing floor, an operation which some perform by means of a sledge drawn by a yoke of oxen: this sledge consisting of a wooden platform, studded underneath with flints or iron spikes, on which either the driver rides or some heavy weight is imposed in order, as it is drawn around, to separate the grain from the chaff: others use for this purpose what is called the punic cart, consisting of a series of axle trees, equipped with toothed rollers, on which some one sits and drives the cattle which draw it, as they do in hither Spain and other places. Others cause the grain to be trodden out under the hoofs of a herd of driven cattle, which are kept moving by goading them with long poles.

When the grain has been threshed it should be tossed from the ground by means of a winnowing basket or a winnowing shovel when the wind is blowing gently, and this is done in such way that the lightest part, which is called the chaff, is blown away beyond the threshing floor, while the heavy part, which is the corn, comes clean into the basket.[100]

Gleaning

LIII. After the harvest is over the grain fields should be gleaned of shattered grain, and the straw left in the field should be gathered and housed, but if there is little to be gained by such work, and the expense is disproportionate, the stubble should be grazed: for in farming it is of the greatest importance that the expense of an operation shall not exceed the return from it.

Of the vintage

LIV. In vineyards the vintage should begin when the grape is ripe, but care must be taken with what kind of grapes and in what part of the vineyard you begin: for the early grapes and the mixed variety, which is called black, ripen some time before the others and should be gathered first, like the fruit grown on the side of the arbustum, or of the vineyard, which is exposed to the sun. During the gathering those grapes from which you expect to make wine should be separated from those reserved for the table: the choicer being carried to the wine press and collected in empty jars, while those reserved to eat are collected in separate baskets, transferred to little pots and stored in jars packed with marc, though some are immersed in the pond in jars daubed with pitch and some raised to a shelf in the store room.

The stems and the skins of the grapes which have been trodden out should be put under the press so that any must left in them may be added to the supply in the vat. When this marc ceases to yield a flow, it is chopped with a knife and pressed again, and the must expressed by this final operation is hence called *circumcisitum*[101] and is kept by itself because it smacks of the knife. The marc finally remaining is thrown into jars, to

which water is added, thus preparing a drink which is called after-wine or grape juice, and is given to the hands in the winter instead of wine.

Of the olive harvest

LV. And now of the harvest of the olive yard.[102] You should pick by hand, rather than beat from the tree, all the olives which can be reached from the ground or from a ladder, because this fruit becomes arid when it has been struck and does not yield so much oil: and in picking by hand it is better to do so with the bare fingers rather than with a tool because the texture of a tool not only injures the berry but barks the branches and leaves them exposed to the frost. So it is better to use a reed than a pole to strike down the fruit which cannot be reached by hand, for (as the proverb is) the heavier the blow, the more need there is for a surgeon. He who beats his trees should beware of doing injury, for often an olive when it is struck away brings down with it from the branch a twig, and when this happens the fruit of the following year is lost: and this is not the least reason why it is said that the olive bears fruit, or much fruit, only every other year.

Like the grape, the olive serves a two-fold function after it is gathered. Some are set aside to be eaten and the rest are made into oil, which comforts the body of man not only within but without, for it follows us into the bath and the gymnasium. Those berries from which it is proposed to make oil are usually stored in heaps on tables for several days where they may mellow a little. Each heap in turn is carried in crates to the oil jars and to the *trapetus*, or pressing mill, which is equipped with both hard and rough stones. If the olives are left too long in the heap they heat and spoil and the oil is rancid, so if you are unable to grind promptly the heaps of olives should be ventilated by moving them. The yield of the olive is of two kinds, oil which is well known and *amurca*, of the use of which many are so ignorant that one can often see it streaming from the mill and wasting upon

the ground where it not only discolours the soil, but in places where it collects even makes it sterile: while if applied intelligently it has many uses of the greatest importance to agriculture, as, for instance, by pouring it around the roots of trees, chiefly the olive itself, or wherever it is desired to destroy weeds.[103]

5° HOUSING TIME

LVI. "Up to this moment," cried Agrius, "I have been sitting in the barn with the keys in my hands waiting for you, Stolo, to bring in the harvest."

"Lo, I am here at the threshold," replied Stolo. "Open the gates for me."

Of storing hay

In the first place, it is better to house your hay than to leave it stacked in the field, for thus it makes more palatable provender, as may be proven by putting both kinds before the cattle.

Of storing grain

LVII. But corn should be stored in an elevated granary, exposed to the winds from the east and the north, and where no damp air may reach it from places near at hand. The walls and the floors should be plastered with a stucco of marble dust or at least with a mixture of clay and chaff and amurca, for amurca will serve to keep out mice and weevil and will make the grain solid and heavy. Some men even sprinkle their grain with amurca in the proportion of a quadrantal to every thousand modii of grain: others crumble or scatter over it, for the same purpose, other vermifuges like Chalcidian or Carian chalk or wormwood, and other things of that kind.

Some farmers have their granaries under ground, like caverns, which they call silos, as in Cappadocia and Thrace, while in hither Spain, in the vicinity of Carthage, and at Osca pits are used for this purpose, the bottoms of which are covered with straw: and they take care that neither moisture nor air has access to them, except when they are opened for use, a wise precaution because where the air does not move the weevil will not hatch. Corn stored in this way is preserved for fifty years, and millet, indeed, for more than a century.

On the ether hand again, in hither Spain and in certain parts of Apulia they build elevated granaries above ground, which the winds keep cool, not only by windows at the sides but also from underneath the floor.

Of storing legumes

LVIII. Beans and other legumes keep safe a long time in oil jars covered with ashes. Cato says the little Aminnean grape, as well as the large variety and that called Apician, keep very well when buried in earthen pots: or they may be preserved quite as well in boiled new wine, or in fresh after-wine. The varieties which keep best when hung up are the hard grapes and those known as the Aminnean Scantian.

Of storing pome fruits

LIX. The pome fruits, like the preserving sparrow apples, quinces and the varieties of apples known as Scantian, and 'little rounds' (*orbiculata*) and those which formerly were called winesap (*mustea*), and now are called honey apples (*melimela*), can all be kept safely in a cold and dry place when laid on straw, and so those who build fruit houses take care to have the windows give upon the north wind and that it may blow through them: but

they should not be left without shutters for fear that the fruits should lose their moisture and become shrivelled by the effect of the continuous wind.

The vaults, the walls and the pavements of these fruiteries are usually laid in stucco to keep them cool: thus rendering them such pleasant resorts that some men even spread there their dining couches: as well they may, for if the pursuit of luxury impels some of us to turn our dining rooms into picture galleries in order to regale even our eyes with works of art [while we eat], should we not find still greater gratification in contemplating the works of nature displayed in a savory array of beautiful fruits, especially if this was not procured, as has been done, by setting up in your fruiterie on the occasion of a party a supply of fruit purchased for the purpose in town?

Some think best to dispose their apples in the fruiterie on concrete tables, others on beds of straw, and some even on flocks of wool.

Pomegranates are preserved by sticking their twigs in jars of sand, quinces and sparrow apples are strung together and hung up, but the late maturing Anician pears are best preserved in boiled must. Sorbs and pears also are some times cut up and dried in the sun, though the sorb may be easily preserved intact by keeping them in a dry place: turnips are cut up and preserved in mustard, while walnuts keep well in sand, as I have explained with respect to ripe pomegranates. There is a similar way of ripening pomegranates: put the fruit, while it is still green and attached to its branch, in a pot without a bottom, bury this in the earth and scrape the soil around the protruding branch so as to keep out the air, and when the pomegranates are dug up they will be found to be not only intact but larger than if they had hung all the time on the tree.

Of storing olives

LX. With respect to preserving olives, Cato advises that table olives, both the round and the bitter berried kinds, keep best in brine both when they are dry and when they are green, but if they are bruised it is well to put them in mastich oil. Round olives will retain their black colour if they are packed in salt for five days, and then, the salt having been brushed away, are exposed for two days in the sun: or they may be preserved in must boiled down to one-third, without the use of salt.

Of storing amurca

LXI. Experienced farmers do well to save their amurca as they do their oil and their wine. The method of preserving it is this: immediately after the oil has been pressed out, draw off the amurca and boil it down to one-third and, when it has cooled, store it in vats. There are other methods also, as that in which must is mingled with the amurca.

6° CONSUMING TIME

LXII. Since no one stores his crops except to bring them out again, it remains to make a few observations upon the sixth and last operation in our round of agriculture.

Crops which have been stored are brought out either to care for them, to consume them or to sell them, and as all crops are not alike there are different times for caring for them and for consuming them.

Of cleaning grain

LXIII. Grain is taken out of store to be cleaned, when the weevil begins to damage it. When this is apparent the grain should be laid out in the sun and bowls of water placed nearby and the weevil will swarm on this water and drown themselves. Those who store their grain in the pits which are called silos should not attempt to bring out the grain for some time after the silo has been opened because there is danger of suffocation in entering a recently opened silo. The corn which, during the harvest time, you stored in the ear and which you contemplate using for food, should be brought out during the winter to be crushed and ground in the grist mill.

Of condensing amurca

LXIV. When it flows from the oil mill, amurca is a watery fluid full of dregs. It is the custom to store it in this state in earthen jars and fifteen days later to skim off the scum from the top and transfer this to other jars, an operation which is repeated at regular intervals twelve times during the following six months, taking care that the last skimming is done on the wane of the moon. Then it is boiled in a copper kettle over a slow fire until it is reduced two-thirds, when it may be drawn off for use.

Of racking wine

LXV. When the must is stored in the vat to make wine, it should not be racked off while it is fermenting nor until this process has advanced so far that the wine may be considered to be made. If you wish to drink old wine, it is not made until a year is completed; when it is a year old, then draw it out. But if your vineyard contains that kind of grape which turns sour early, you should eat the fruit, or sell it before the succeeding vintage. There are kinds of wine, like that of Falernum, which improve the longer you keep them.

Of preserved olives

LXVI. If you attempt to eat white olives immediately after you have put them up and before they are cured your palate will reject them on account of their bitterness (and the same is true of the black olive) unless you dip them in salt to make them palatable.

Of nuts, dates and figs

LXVII. The sooner you use nuts, dates and figs after they have been stored, the more palatable they will be, for by keeping figs lose their

flavour, dates rot and nuts dry up.

Of stored fruits

LXVIII. Fruits which are strung, such as grapes, apples and sorbs show by their appearance when they may be taken down for use, for by their change of colour and shrinking they reveal themselves as destined to the garbage pile unless they are eaten in time. Sorbs which have been laid by when they are already dead-ripe should be used promptly, but those which were picked green are slower to decay: for green fruit in the store house must there go through the process of ripening which was denied it on the tree.

Of marketing grain

LXIX. The spelt which you wish to have prepared for food should be taken out in the winter to be ground in the mill: but your seed corn should not be taken out until the fields are ready to receive it, a rule which obtains in respect of all kinds of seed. What you have for sale should be taken out at the appropriate time also, for some things which cannot be kept long without spoiling should be taken out and sold promptly, while others which keep should be retained so that you may sell when the price is high, for often commodities which are kept on hand a long time, will, if put on the market at the proper time, not only yield interest for the time you held them but even a double profit.

As Stolo was speaking, the freedman of the Sacristan ran up to us with his eyes full of tears and, begging our pardon for having kept us waiting so long, invited us to come to the funeral on the following day. We all sprang

up and cried out together "What? To the funeral? Whose funeral? What has happened?"

The freedman, weeping, told us that his master had been struck down by a blow with a knife, but who did it he had been unable to discover by reason of the crowd, all that he heard being an exclamation that a mistake had been made. He added that when he had carried his master home and had sent the servants to call a doctor, whom they brought back with them quickly, he trusted that it might seem reasonable to us that he had waited to attend upon the doctor rather than come to notify us at once, and while he had not been able to be of any service to his master, who had given up the ghost in a few minutes, yet he hoped we might approve his conduct.

Accepting these excuses as amply justified, we descended from the temple bewildered more by the hazard of human life than surprised that such a fate should be possible at Rome:[104] and so we went our several ways.

BOOK II

THE HUSBANDRY OF LIVE STOCK

Introduction: the decay of country life

Those great men our ancestors did well to esteem the Romans who lived in the country above those who dwelt in town. For as our peasants today contemn the tenant of a villa as an idler in comparison with the busy life of an agricultural labourer, so our ancestors regarded the sedentary occupations of the town as waste of time from their habitual rural pursuits: and in consequence they so divided their time that they might have to devote only one day of the week to their affairs in town, reserving the remaining seven for country life.[105]

So long as they persisted in this practice they accomplished two things both that their farms were fertile through good cultivation and that they themselves enjoyed the best of health: they felt no need of those Greek gymnasia which now every one of us must have in his town house, nor did they deem that in order to enjoy a house in the country one must give sounding Greek names to all its apartments, such as [Greek: prokoiton] (antechamber) [Greek: palaistra] (exercising room) [Greek: apodutaerion] (dressing room) [Greek: peristulon] (arcade) [Greek: ornithon] or (poultry

house) [Greek: peristereon] (dove cote) [Greek: oporothaekae] (fruitery) and the like.

Since now forsooth most of our gentry crowd into town, abandoning the sickle and the plough and prefer to exercise their hands in the theatre and the circus rather than in the corn field and the vineyard, it has resulted that we must fain buy the very corn that fills our bellies and have it hauled in for us, yea, out of Africa and Sardinia, while we bring home the vintage in ships from the islands of Cos and Chios!

And so it has happened that those lands which the shepherds who founded the city taught their children to cultivate are now, by their later descendants, converted again from corn fields back to pastures, thus in their greed of gain violating even the law, since they fail to distinguish the difference between agriculture and grazing.[106] For a shepherd is one thing and a ploughman another, nor for all that he may feed his stock on farm land is a drover the same as a teamster: herded cattle, indeed, do nothing to create what grows in the land, but destroy it with their teeth, while the yoked ox on the contrary conduces to the maturity of grain in the corn fields and forage in the fallow land. The practice and the art of the farmer is one thing, I say; that of the shepherd another; the farmer's object being that what ever may be produced by cultivating the land should yield a profit; that of the shepherd to make his profit from the increase of his flock; and yet the relation between them is intimate because it is much more desirable for a farmer to feed his forage on the land than to sell it, and a herd of cattle is the best source of supply of that which is the most available food of growing plants, namely, manure:[107] so it follows that whoever has a farm ought to practise both arts, that of agriculture and that of grazing cattle, indeed, also that of feeding game, as is done at our country houses, since no little profit may be derived from aviaries and rabbit warrens and fish ponds. And since I have written a book concerning the first of these

occupations—that of the husbandry of agriculture—for my wife Fundania because of her interest in that subject, now, my dear Turranius Niger, I write this one on the husbandry of live stock for you, who are so keen a stock fancier that you are a frequent attendant at the cattle market at Macri Campi, where, by your fortunate speculations, you have found means to make provision for many crying expenses.

I could do this on my own authority because I am myself a considerable owner of live stock with my flocks of sheep in Apulia and my stud of horses at Reate, but I will run through the subject, briefly and summarily rehearsing what I gathered from conversation with certain large stock feeders in Epirus at the time when, being in command of the fleet in Greece during the war with the pirates, I lay between Delos and Sicily.[108]

Of the origin, the importance and the economy of live stock husbandry

I.[109] When Menates had gone, Cossinius said to me: "We shall not let you go until you have explained those three points which you began to discuss the other day when we were interrupted."

"What three points," said Murrius. "Are they those concerning feeding cattle, of which you spoke to me yesterday?"

"Yes," replied Cossinius, "they are the considerations of what was the origin, what the importance, and what the economy of the husbandry of live stock. Varro here had begun to discourse upon them while we were calling on Petus during his illness, when the arrival of the physician interrupted us."

"Of the three divisions of the [Greek: historikon] or interpretation of this subject, which you have mentioned, I will venture," said I, "to speak only of

the first two, of the origin and of the importance of this industry. The third division, of how it should be practised, Scrofa shall undertake for us, as one, if I may speak Greek to a company of half Greek shepherds [Greek: hos per mou pollon ameinon] (who is better qualified than I am),[110] for Scrofa was the teacher of C. Lucilius Hirrus, your son-in-law, whose flocks and herds in Bruttii have such reputation."

"But," interrupted Scrofa, "you shall hear what we have to say only on condition that you, who come from Epirus and are masters of the art of feeding cattle, shall recompense us and shall give public testimony of what you know on the subject: for none of us knows it all."

Having thus assumed that my share of the discussion should be the first or theoretical part of the subject (which I did, although I have a stock farm in Italy, because, as the proverb is, not every one who owns a lyre is a musician), I began:

"Doubtless in the very order of nature both man and cattle have existed since the beginning of time, for whether we believe that there was a First Cause of the generation of animals, as Thales of Miletus and Zeno of Citium maintained, or that there was none as was the opinion of Pythagoras of Samos and Aristotle of Stagira, it is, as Dicaearchus points out, a necessity of human life to have descended gradually from the earliest time to the present day: thus in the beginning was the primitive age when man lived on whatever the virgin soil produced spontaneously; thence he descended to the second or pastoral age, when, as he had formerly gathered for his use acorns,[111] strawberries, mulberries and apples by picking them from trees and bushes, so now, to satisfy a like need, he captured in the woods such as he could of the wild beasts of the field, and, having enclosed, began to domesticate them. Among these it is considered not without reason that sheep were foremost, both because of their utility and because of their

docile nature, for this animal is the gentlest of all and most readily accommodated to the life of man, and supplies him with milk and cheese for food, and skins and wool to clothe his body.

"Finally, by the third step, man descended from the pastoral age to that of agriculture. In this there have persisted many relics of the two preceding ages, which, long remaining in their original state, are found even in our day: for in many places may yet be seen some kinds of our domestic cattle still in their wild state, such as the large flocks of wild sheep in Phrygia, and in Samothrace a species of wild goats like those which are called "big horns" (platycerotes) and abound in Italy on the mountains of Fiscellum and Tetrica. Every body knows that there are wild swine, unless you maintain that the wild boar is not a true member of the swine family.

"There are still many cattle running at large in Dardania, Medica and Thrace, while there are wild asses in Phrygia and Lycaonia, and wild horses in certain regions of hither Spain.

"I have now told you of the origin of the industry of feeding cattle. As to its importance, I have this to say:

"The most important persons of antiquity were all keepers of live stock, as both the Greek and Latin languages reveal, as well as the earliest poets, who describe their heroes some as [Greek: polyarnos] (rich in lambs), some as [Greek: polymaelos] (rich in sheep), and others as [Greek: polyboutaes] (rich in herds), and tell of flocks which on account of their value were said to have golden fleeces, like that of Atreus in Argos which he complained that Thyestes stole away from him: or that ram which Aetes sacrificed at Colchis, whose fleece was the quest of those princes known as the Argonauts: or again like those so called golden apples (*mala*) of the Hesperides that Hercules brought back from Africa into Greece, which were, according to the ancient tradition, in fact goats and sheep which the

Greeks, from the sound of their voice, called [Greek: maela]: indeed, much in the same way our country people, using a different letter (since the bleat of a sheep seems to make more of the sound of *bee* than of *me*) say that sheep "be-alare," whence by the elision of a letter as often happens, is derived the word *belare* (or *balare*), to bleat.

"If cattle had not been held in the highest esteem among the ancients the astrologers would not have called the signs of the zodiac by their names in describing the heavens: and they not only did not hesitate to place them there but many even begin their enumeration of the twelve signs with these animal names, thus giving Aries and Taurus precedence over Apollo and Hercules, whose signs, very gods as they are, are subordinated under the name of Gemini: nor did they deem that a sixth of these twelve signs was a sufficient proportion for the names of cattle, but they must even add Capricornus and make it a quarter. Furthermore, in naming the constellations they selected other names of cattle, as the goat, the kid, and the dog. And in like manner have not certain parts both of the sea and of the land taken their names from cattle, as witness the Aegean Sea, which is called after the Greek name for goat [Greek: aigeos], and Mount Taurus in Syria after the bull, and Mount Cantherius in the Sabine country after the horse, and the Thracian, as well as the Cimmerian, Bosphorus, after the ox: and again many place names on land like the town in Greece known as [Greek: hippion Argos], or horse breeding Argos. Yea, Italy itself derives its name, according to Piso, from *vitula*, our word for heifer.

"Who can deny that the Roman people themselves are sprung from a race of shepherds, for every one knows that Faustulus, the foster father of Romulus and Remus, who brought them up, was a shepherd. Is it not proof that they were shepherds that they chose the Parilia, or feast of the goddess of the shepherds, in preference to all other days, for the founding of the city; that a penalty even to this day is assessed in terms of cattle or sheep,

according to the ancient custom; that our most ancient money, the *as* of cast copper, always bore the effigy of some domestic animal; that whenever a town was founded the limits of the walls and the gates were laid off with a plough drawn by a bull and a cow yoked together; that when the Roman people are purified it is done by driving around them a boar, a ram and a bull, whence the sacrifice is known as the *Suovetaurilia*; that we have many family names among us derived from both the great and small cattle: thus from small cattle *Porcius*, *Ovinus*, *Caprilus*, and from great cattle *Equitius*, *Taurus*, and some of our families have received from cattle cognomens which signify for what they are esteemed, as, for instance, the *Annius* family are called *Capra*, the *Statilius* family are called *Taurus* and the *Pomponius* family are called *Vitulus*, and so many others are derived from cattle.

"It remains now to discuss the art of animal husbandry, and on this subject our friend *Scrofa*, to whom this age has awarded the palm for excellence in all branches of farm management, will say what ever is to be said, as he is better qualified than am I."

When all eyes had been turned upon him, *Scrofa* began:

"Doubtless the art of breeding and of feeding cattle consists in getting the maximum profit out of those things from which the very name of money is derived, for our word for money (*pecunia*) comes from *pecus*, cattle, which is the foundation of all wealth.

"Our enquiry may be divided into nine subjects, or three parts each with three subdivisions, namely: (i) concerning small cattle, of which the three kinds are sheep, goats and swine: (2) concerning large cattle, which are likewise divided by nature into three species, neat cattle, asses and horses: and (3) concerning those instruments of animal husbandry which are not kept for profit but for convenience, namely: mules, dogs and shepherds.

Each of these nine subjects must be considered under nine heads: (a) four relating to the acquisition of cattle, (b) four to the care of them, and (c) one which has to do with all the others. So there are at least eighty-one chapters for discussion of the subject, all indispensable and all of great importance.

"Under the head (a) of acquisition, it is first of all necessary, to enable you to buy good live stock, that you should know at what age it is best to buy and to keep each different kind. For instance, you may buy neat cattle for less money before they are a year old and after they are ten, because they begin to breed at two or three years and leave off soon after the tenth year, the beginning and the end of the life of all live stock being sterile. The second consideration under this head is a knowledge of the conformation of each kind of cattle and what it should be, for this is of great importance in determining the value of all animals. Thus experienced stockmen buy cattle with black horns rather than white, large goats rather than small, and swine with long bodies and short heads. The third consideration under this head is to make sure of the breeding. On this account the asses of Arcadia are celebrated in Greece, as are those of Reate in Italy, so that I remember an ass that brought sixty thousand sesterces, and a four-in-hand team at Rome that was held at four hundred thousand. The fourth consideration is of the legal precautions to be observed in buying live stock, for in order that title may pass from one to another certain formalities must intervene, since neither a contract nor even the payment of the purchase money suffices in all cases to transfer a title: thus in buying you some times stipulate that the animal is in good health, some times that it comes out of a healthy flock or herd, and some times no stipulation at all is made.

"Under the head (b) of the care of live stock, the four considerations are what should be done, after you have bought your cattle, in respect of feeding, of breeding, of raising them, and of maintaining their health. In the matter of feeding, which is the first of these considerations, the three things

to be observed are where and how much, when, and on what your cattle will graze: thus it suits goats better to graze on rough and mountain land than in fat pastures, while the contrary is true of horses. Nor are the same places fit for grazing for all kinds of cattle both in summer and winter: thus flocks of sheep are driven from Apulia a long distance into Samnium to spend the summer, and are reported to the tax farmer to be registered lest they violate the regulations of the censor.[112]

"In the same way mules are driven in the summer from the prairie of Rosea to the high mountains of Gurgures.

"The rules for feeding each kind of live stock in the barn yard must also be studied, as, for instance, that hay is fed to the horse and the ox, while it will not do for swine which require mast, and that barley and beans should at intervals be fed to some kinds of stock, lupines to draft cattle and alfalfa and clover to milch cows. Furthermore, it is desirable to feed the ram and the bull more heavily for thirty days before admitting them to the flock and the herd, the purpose being to increase their strength, while on the other hand the feed of the cows is cut down at that time because it is deemed that they breed most successfully when they are thin.

"The next consideration is concerning breeding, which I call the period between conception and birth, for these are the beginning and the end of pregnancy. First of all then we should consider the stinting and the season at which this should be accomplished, for as the season from the rising of the west wind to the vernal equinox (February-March) is considered best for swine, so that from the setting of Arcturus to the setting of Aquila (May-July) is best for sheep. Furthermore, a rule should be made that the male animals are kept apart from the females for some time before they are bred, a period which neatherds and shepherds usually fix at two months. The next consideration is of the rules to be observed while the animal is pregnant,

because the periods of gestation differ in the several domestic animals: thus the mare goes twelve months, the cow ten, the ewe and the goat five and the sow four.

"In Spain is reported a phenomenon of breeding which seems incredible, but is nevertheless true, namely: that on Mount Tagnus on that part of the coast of Lusitania near the town of Olisippo, mares are some times impregnated by the wind,[113] some thing which often happens with respect to chickens, whence their eggs are called [Greek: hypaenemios] (conceived by the wind),[114] but the foals born of such mares never live more than three years.

"When lambs are born in due season, or what we call *chordi* (that is to say those lambs which are born late and have remained beyond their season in the belly of the dam, the name *chordi*, being derived from [Greek: chorion] the Greek name for the membrane which is called the after birth), care must be taken to clean them and set them gently on their feet and to prevent the dam from crushing them.

"On the third consideration with respect to raising young animals, you must consider for how long they should be permitted to suck the dam and when and where, and if the mother has an insufficient supply of milk, how you may put the young one to nurse at the udder of another: in which case they are called *subrumi*, that is to say, under the udder, for I think that *rumis* is an old word for udder.

"Lambs are weaned usually at the end of four months, kids in three, pigs in two. Weanling pigs, from the fact that they are considered fit to be offered for sacrifice at that age, were formerly called *sacres* as Plautus calls them when he says, "What's the price of sacred pigs?"[115] In like manner stall fed cattle, which are being fattened for the public sacrifices, are called *opimi*.

"The fourth consideration relates to the health of the cattle, a subject as important as it is complex, for a single beast which may be sick or infected and ailing often brings a great calamity on an entire herd. There are two degrees of the healing art, one which requires consultation with a surgeon, as for men: the other which the skilful shepherd can himself practise, and this consists of three parts, namely: the consideration of what are the causes, the symptoms and the treatment which should be followed in relation to each malady. The common causes of disease in cattle are excess of heat or of cold, overwork, or its opposite lack of exercise, or, if when they have been worked, you give them food and drink at once without an interval of rest. The symptoms of fever due to heat or overwork are a gaping mouth, heavy humid breath and a burning body. The cure when such is the malady is this: bathe the animal with water, rub it with a warm mixture of oil and wine, put it on a nourishing diet, blanket it as protection against chills and give it tepid water when it is thirsty.[116] If this treatment does not suffice, let the blood, chiefly from the head.

"So there are different causes and different symptoms of the maladies peculiar to each kind of cattle, and the flock master should have them all written down.

"It remains to speak of the ninth head (c), which I mentioned, and this relates to the number of cattle to be kept and so concerns both of the other heads.

"For whoever buys cattle must consider the number of herds and how many in each herd he can feed on his land, lest his pastures prove short or more than he need, as so in either case the profit be lost. Further more, one should know how many breeding ewes there are in the flock, how many rams, how many lambs of each sex, how many culls to be weeded out. Thus, if a ewe has more lambs at a birth than she can nourish, you should

do what some shepherds practise—take part of them away from her, which is done to the end that those remaining may prosper."

"Beware!" put in Atticus, "that your generalisations do not lead you astray, and that your insistence on the rule of nine does not contradict your own definition of small and large cattle: for how can all your principles be applied to mules and to shepherds, since those with respect to breeding certainly cannot be followed so far as they are concerned. As to dogs I can see their application. I admit even that men may be included in them, because they have their wives on the farm in winter, and indeed even in their summer pasture camps, a concession which is deemed beneficial because it attaches the shepherds to their flocks, and by begetting children they increase the establishment and with it the profit on your investment."

"If Scrofa's number cannot be measured with a carpenter's rule," said I, "neither can many other generalisations, as, for instance, when we say that a thousand ships sailed against Troy, or that a certain court of Rome consists of a hundred judges (*centumviri*). Leave out, if you wish, the two chapters relating to breeding in so far as mules are concerned."

"But why should we," exclaimed Vaccius, "for it is related that on several occasions at Rome a mule has had a foal."

To back up what Vaccius had said, I cited Mago and Dionysius as writing that when mules and mares conceive they bear in the twelfth month. "If," I added, "it is considered a prodigy in Italy when a mule has a foal, it is not necessarily so in all countries. For is it not true that swallows and swans breed in Italy, which do not lay in other lands, and don't you know that the Syrian date palm, which bears fruit in Judea, does not yield in Italy?"

"If you prefer," said Scrofa, "to make out the entire eighty-one chapters without any on the care of mules during the breeding season, there are

subjects with which you can fill this double vacancy by adding those two kinds of extraordinary profit which is derived from live stock. One of these is the fleece which men shear or pull from sheep and goats, the other, which is more widely practised, that from milk and cheese: the Greek writers indeed actually treat this separately under the title [Greek: turopoiia], and have written extensively about it."

Of sheep

II. "And now, since I have completed my task and the economy of live stock husbandry has been defined, do you, men of Epirus, requite us by expounding the subject in detail, so that we may see of what the shepherds of Pergamis and Maledos are capable."

At this challenge, Atticus (who then was known as T. Pomponius but now as Q. Caecilius retaining the same cognomen)[117] began as follows:

"I gather that I must make the beginning since you seem to turn your eyes upon me: so I will speak of those cattle which you, Varro, have called primitive, for you say that sheep were the first of the wild beasts of the field which were captured and domesticated by man.

"In the first place you should buy good sheep, and they are so judged primarily in respect of their age, that they are not what is known as aged nor yet undeveloped lambs, because neither can yield you any profit, the one no longer, the other not yet: but you may deem that age which holds out a promise preferable to that whose only future is death. So far as concerns conformation, a sheep should have a round barrel, wool thick and soft and with long fibre, and, while heavy all over the body, it should be thickest on the back and neck, and yet the belly also should be covered, for unless the belly was covered our ancestors were wont to call a sheep *apica* and throw

it out. They should have short legs,[118] and, if they are of the Italian breed, long tails, or short tails if they come from Syria. The most important point to guard is that your flock is headed by a good sire. The quality of a ram can usually be determined from his conformation and from his get. So far as concerns conformation, a ram should have a face well covered with wool, horns twisted and converging on the muzzle, tawny eyes, woolly ears, a deep chest, wide shoulders and loin, a long and large tail. You should see also whether he has a black or a spotted tongue,[119] for such rams usually get black or spotted lambs. You may judge them by their get, if their lambs are of good quality. In buying sheep we practise the formalities which the law requires, following them more or less strictly in particular cases. Some men in fixing a price per head stipulate that two late lambs or two toothless ewes shall be counted as one. In other respects the traditional formula is employed thus: the buyer says to the seller, "Do you sell me these sheep for so much?" And the seller answers, "They are your sheep," and states the price. Whereupon the buyer stipulates according to the ancient formula: "Do you guarantee that these sheep, for which we have bargained, are in such good health as sheep should be; that there is none among them one-eyed, deaf or bare-bellied; that they do not come out of an infected flock and that I will take them by good right and title?"

"Even when this is done the title to the flock does not pass until they have been counted, but, nevertheless, the purchaser can hold the seller to the bargain if he does not make delivery, even though the purchase money has not passed, and by a like right the seller can hold the buyer if he does not pay up.

"I will next speak about those other four subjects which Scrofa outlined, namely: the feeding, breeding, raising and physicking of sheep. In the first place, one should see that provision is made for feeding the flock throughout the entire year, as well indoors as out. The stable should be in a

suitable location, protected against the wind, looking rather to the East than the South, on cleared and sloping ground so that it can be easily swept out and kept clean, for moisture not only rots the wool of the sheep but their hoofs as well and causes scab. When sheep have stood for several days you should strew the stable with new bedding, so that they may be more comfortable and be kept cleaner, and thus eat with more appetite. You should also contrive stalls separated from the others in which you may segregate the ewes about to year, as well as any which may be ailing. This precaution is practicable, however, only with sheep fed at the steading, but those who graze their sheep in the mountain pastures and far from cover, carry with them wicker hurdles or nets, and other such conveniences with which they contrive folds for such separation. Sheep indeed are grazed far and wide so that often it happens that their winter quarters are many miles from their summer pastures."

"I know that to be true," said I, "for my flocks winter in Apulia and spend the summer in the mountains above Reate: thus the public cattle drifts between these two localities balance the separated pastures, as a yoke balances two baskets."[120]

Atticus resumed: "When sheep are fed continually in the same locality distinction must be made in the times of feeding them according to the seasons: thus in summer they are driven out[121] to pasture at day break because then the dewy grass is more appetizing than at midday, when it is dry. At sunrise they are driven to water, to make them more lickerish on their return. About noon and during the heat of the day they are permitted to lie in the shade of rocks or under broad spreading trees until the fresher evening air invites them to feed again until sunset.[122] A sheep should always graze with the sun behind it, because its head is very sensitive to heat. At sunset the flock should be given a short rest and then driven again to water, and so brought back to feed again until it is dark, for at that time of

day the grass has renewed its pleasant savour. This routine is usually followed from the rising of the Pleiades until the autumn equinox.

"After the harvest it is of two-fold advantage to turn the flock in on the stubble, as they will fatten on the shattered grain and improve the land for next year's planting by spreading their manure in the trampled straw.

"The rules for pasturing sheep in winter and spring differ from the summer rules in this, that at those seasons the flock is not driven to pasture until the hoar frost has evaporated and they feed all day long, one watering about noon being enough.

"This is about all there to say on the subject of feeding sheep, so I pass to the consideration of breeding. The rams which you are about to use for breeding should be separated from the flock for two months before the season, and fed heavily by giving them a ration of barley when they come into the stable from the pasture: it will make them stronger for their duty.

"The best breeding season is from the setting of Arcturus to the setting of Aquila, (May-July) because lambs begotten later are apt to be born runts, and weak. As a ewe is pregnant for one hundred and fifty days, this arrangement causes her to drop her lambs at the end of autumn when the temperature is mild and the grass is renewed by the first rains. During the breeding season the flock should drink only the same kind of water, since a change not only makes spotted wool but injures the offspring. When all the ewes have been stunted, the rams should be separated from them again, because it injures ewes to be teased while they are pregnant. Ewe lambs should never be bred before they are two years old, as they cannot earlier produce strong lambs, but will themselves degenerate: indeed, it is better to keep them until the third year. To this end some shepherds protect their ewe lambs from the ram by tying baskets made of rushes or something of that kind over their rumps, but it is better to feed them apart from the flock.

"I come now to the consideration of how lambs should be raised.

"When the ewes begin to yean they are driven into a stable which has stalls set apart for the purpose, where the new born lambs can be placed near a fire to strengthen them, and there the ewes are kept two or three days until the lambs know their dams and are able to feed themselves. Thereafter the lambs are still kept up but the ewes are driven out to pasture with the flock, being brought back to them in the evening to be suckled and then once more separated, lest the lambs be trampled by the ewes at night. In the morning before the ewes go out to pasture they are given access to their young again until the lambs are satisfied with milk. After about ten days have elapsed the lambs are picketed out of doors, being tethered with fibre or such other light material, to stakes planted some distance apart so that the little fellows may not injure themselves as they frisk together all day.

"If a lamb will not suck, it should be held up to the teat and its lips greased with butter or suet, and so made to smell at the milk. A few days later some soft vetch or tender grass may be given them before they go out to pasture and after they come in. And so they are nursed until they are four months old.

"There are some shepherds who do not milk the ewes during the nursing period, but those who do not milk them at all do better, as thus they bear more wool and more lambs.

"When the lambs are weaned great attention is necessary to prevent them from wasting away in their longing for the dam: they should be tempted to eat by giving them appetizing food, and care should be taken that they do not suffer from cold or heat. When at last they have forgotten the taste of milk and no longer yearn for the dam, they may be driven out with the flock.

"A ram lamb should not be altered until he is five months old, nor yet in very hot or very cold weather. Those which you wish to keep for rams should be chosen as far as possible from dams who are in the habit of having twin lambs.

"Most of these recommendations apply equally to those fine wool sheep which are called *pellitae*, because they are jacketed with skins, as is done at Tarentum and in Attica, to protect their wool from fouling, for by this precaution the fleece is kept in better plight for dyeing, washing or cleaning. Greater diligence is required to keep clean the folds and stables of such sheep than is necessary for the ordinary breeds: so they are paved with stone to the end that no urine may stand anywhere in the stable.

"Sheep eat whatever is put before them—fig leaves, marc, even straw. Bran should be fed to them in moderation, lest they eat either too much or too little of it, in either of which cases it is bad for the digestion, but clover and alfalfa agree with them best and make both fat and milk with the utmost facility.

"So far as concerns the health of the flock, there are many things I might add, but, as Scrofa has said, the flock master keeps his prescriptions written down in a book and carries with him what he needs in the way of physic.

"It remains to speak of the number of sheep in a flock. Some make this more, some less, for there is no natural limit. In Epirus almost all of us have a rule not to allow more than one hundred short wool sheep or fifty fine wool jacketed sheep to a shepherd."

Of goats

III. As Atticus stopped, Cossinius took him up. "Come, my dear Faustulus," he cried, "you have bleated long enough. Take now from me, as from a late born Homeric Melanthius,[123] a small offering from my flock of goats, and at the same time learn a lesson in brevity. He who wishes to form a flock of goats should consider in choosing them: first of all that they are of an age capable of breeding, and that for some time to come, for a tiro is more useful for that purpose than a veteran. As to conformation, see to it that they are strong and large, with a smooth body and thick coat: but beware of the short haired goat, for there are both kinds. The she goat should have two excrescences, like little teats, hanging under the muzzle: those which have them are fecund:[124] the larger the udder the more milk and butter fat she will yield. The qualities of a buck are that his coat should be largely white: his crest and neck short and his gullet long. You will have a better flock if you buy at one time goats which have been accustomed to run together, rather than by putting together a lot of goats picked up here and there.

"Concerning breeding, I refer to what Atticus has said about sheep, with this difference: that while you select a breed of sheep which are slow of foot, because they are of quieter disposition, all goats are as excitable as they are agile. Of, this last characteristic Cato records in his book *Origines*: 'In the mountains of Socrate and Fiscellus there are wild goats which leap from rock to rock a distance of more than sixty feet.' For as the sheep which we feed are sprung from wild sheep, so the goats which we herd are sprung from wild goats: and it is from them that the island of Caprasia, near the coast of Italy, gets its name.

"As it is recognized that the best breed of goats is one which bears two kids at a birth, breeding bucks are chosen from such a race whenever possible. Some fanciers even take the trouble to import bucks from the

island of Melia, where are bred what are considered the largest and most beautiful specimens of the race.

"I hold that the formula for buying sheep cannot altogether apply to goats because no sane man ever guaranteed that goats are without malady, for the fact is that they are forever in a fever. For this reason the usual stipulation has had a few words cut out of it for use in respect of goats, and, as Manilius gives it in his treatise on the law of Sales, runs as follows: 'Do you guarantee that these goats are well today; that they are able to drink, and that I will get good title to them?'

"There is a wonderful fact concerning goats which has been stated by certain ingenious shepherds and is even recorded in the book of Archelaus, namely, that they do not breathe through their nostrils, like other animals, but through their ears.[125]

"Upon Scrofa's four considerations which relate to the care of goats I have this to say. The flock is better stabled in the winter if its quarters look toward the Southeast, because goats are very sensitive to cold. So also, as for most cattle, the goat stable should be paved with stone or brick that the flock may be less exposed to damp and mud. When the flock passes the night out of doors, a place should be selected having the same exposure and the fold strewn with leaves to protect the flock from fouling themselves.

"There is not much difference in the method of handling goats in the pasture from sheep, but goats have this characteristic, that they prefer the mountain woodland pastures to meadows, for they feed eagerly on the brushwood and in cultivated places crop the shrubbery; indeed, their name *caprae* is derived from *carpere*, to crop. For this reason it is customary to stipulate in farm leases that the tenant shall not graze any goat on the leased land, for their teeth are the enemies of all planted crops: wherefore the astrologers were careful to station them in the heavens outside of the pale of

the twelve signs of the zodiac, but there are two kids and a goat not far from Taurus.

"So far as concerns breeding, it is the custom to separate the bucks from the pastured flock at the end of autumn and confine them apart, as has been said with respect to rams. The nannies which conceive at this time drop their kids in four months, and so in the spring. In what regards rearing the kids, it is enough to say that when they are three months old they are raised and may join the flock. What shall I say of the health of these animals who never have any? yet the flock master should have written down what remedies are used for certain of their maladies and especially for the wounds which often befall them by reason of their constant fighting among themselves and their feeding in thorny places. It remains to speak of number: this is less to the herd in the case of goats than with sheep because of the wantonness and wandering habit of the goat: sheep, on the other hand, are wont to flock together and keep in one place.

"For another reason it is the custom in Gaul to divide the goats into many flocks rather than concentrate them in large ones, because a pestilence quickly takes possession of a large herd and sweeps it to destruction. About fifty goats is considered to be a large enough flock.

"The experience of Gaberius, a Roman of the equestrian order, will illustrate the reason for this: for he, who had a thousand jugera of land near Rome, met one day a certain goatherd leading ten goats to town, and heard him say that he made a denier^[126] a day out of each goat, whereupon Gaberius bought a thousand goats, hoping that he might thereby derive from his property an income of a thousand deniers a day: but so it fell out that he lost all his goats after a brief illness. On the other hand, among the Sallentini and near Casinum they graze their goats in flocks of one hundred.

"Almost the same difference of opinion exists as to the relative number of bucks to nannies, for some, and I am among them, allow a buck to every ten nannies, but others, like Menas, make it fifteen, and some even twenty, like Murrius."

Of swine

IV. "And now," concluded Cossinius, "which of you Italian swine breeders will stand forth and tell us of his herd? Surely he should be able to speak with the most authority whose cognomen is Scrofa."

At this pleasantry, Tremelius turned upon Cossinius and said: "You seem to be ignorant why I am called Scrofa, but, in order that our friends sitting beside you may understand, you should know my family did not always bear this swinish cognomen, nor am I of the race of Eumaeus. The first of us to be called Scrofa was my grandfather who, when he was quaestor under the praetor Licinius Nerva, and was left in command of the army in the province of Macedonia during the absence of the praetor, it so happened that the enemy thought they had an opportunity to gain a victory and began to attack the camp. My grandfather, in exhorting the soldiers to take up their arms and go out against the enemy, exclaimed that he would soon scatter them as a sow (scrofa) does her pigs, and he was as good as his word. For in that battle he so overwhelmed and discomfited the enemy, that on account of it the praetor Nerva was hailed Imperator and my grandfather obtained his cognomen and so was called Scrofa.[127] So, while neither my great grandfather nor any of my ancestors of the Tremelian family was ever called Scrofa, yet as I am not less than the sixth of our family in succession who has attained praetorian rank, it ill becomes me to run away in the face of your challenge, so I will tell you what I know about swine. Indeed from my youth I have been devoted to agriculture, so that I am perhaps as well acquainted with that animal as is any of you great stockmen: for who of us

cultivates a farm but keeps hogs, and who has not heard his father say that that man is either lazy or a spendthrift who hangs in the meat house a fitch of bacon obtained from the butcher rather than from his own farm.

"He who wishes to have a proper herd of swine ought to choose them, in the first place, of the right age, and in the second place, of good conformation: which means large everywhere except in the head and feet and of a solid colour rather than spotted: but the boar should have without fail a thick neck in addition to these other qualities. Swine of good breed may be known from their appearance, if both boar and sow are of good conformation; from their get, if they have many pigs at a birth; and from their origin, if you buy them in a place with a reputation for producing fat rather than lean hogs. The usual formula for buying runs thus: 'Do you warrant that these hogs are in good health; that I shall take good title to them; that they have committed no tort, and that they do not come out of a diseased herd?'

"Some add a particular stipulation that they are not affected with cholera.

"In the matter of pasture, a marshy place is well fitted for hogs, because they delight not only in water, but in mud, the reason for which appears in the tradition that when a wolf has fallen upon a hog he always drags the carcass into the water because his teeth cannot endure the natural heat of hog flesh.

"Swine are fed mostly on mast, though also on beans, barley and other kinds of corn, which not only make them fat but give the meat an agreeable relish. In summer they go out to pasture early in the morning and before the heat of the day: at midday they are brought into some shady place, preferably where there is water: in the afternoon, when the heat has abated, they are fed again. In the winter time they do not go out to pasture until the hoar frost has evaporated and the ice has melted.

"In the matter of breeding, the boar should be separated from the herd for two months before the season, which should be arranged between the rising of the west wind and the vernal equinox, for thus it will befall that the sows (which are big for four months) will have their litters in summer when forage is plenty. Sows should not be bred under a year old, but it is better to wait until the twentieth month so that they may have pigs at two years. They are said to breed regularly for seven years after the first litter. During the breeding season they should be given access to muddy ditches and sloughs, so that they may wallow in the mud, which is the same relaxation to them that a bath is to a man. When all the sows are stunted, the boars should be segregated again. A boar is fit for service at eight months and so continues until his prime, after which his vigor decreases until he is fit only for the butcher to make of his flesh a dainty offering for the people. Our name for the hog, *sus*, is called [Greek: hus] in Greek, but formerly it was [Greek: thus], derived from [Greek: thuein], meaning to offer as a sacrifice, for it seems that victims were chosen from the race of swine for the earliest sacrifices; evidence of which remains in the tradition that pigs are sacrificed at the initiation to the mysteries of Ceres, that when a treaty is ratified peace begins with the slaughter of a pig, and that in solemnizing a marriage the ancient kings and mighty men of Etruria caused the bride and the bridegroom to sacrifice a pig at the beginning of the ceremony, a practice which the earliest Latins and the Greek colonists in Italy seem also to have followed: *nam et nostrae mulieres, maxime nutrices, naturam qua feminae sunt in virginibus appellant porcum, et graecae* [Greek: choiron], *significantes esse dignum insigni nuptiarum.*[128]

"The hog is said to be created by nature for the food of man[129] and so life and salt perform the same functions for him, as they both preserve his flesh.

"The Gauls[130] are reputed to put up not only the largest quantity but the best quality of pork: evidence of its quality being that even now hams, sausage,[131] bacon and shoulders are imported every year from Gaul to Rome: while Cato writes concerning the amount of pork cured by the Gauls: 'In (northern) Italy the Insubres are wont to put up three or four thousand cuts of pork [the bulk of which can be appreciated from the fact that among that people][132] the hog some times grows so fat that it is not able to stand on its feet or to walk, so that it is necessary to put it on a cart to move it any where.' Atilius the Spaniard, who is a truthful man and learned in many things, tells of a hog which was killed in further Spain or Lusitania from which two chops, sent to the Senator L. Volumnius, were found to weigh three and twenty pounds, the fat on them being so thick that it measured a foot and three fingers from the skin to the bone."

"I can testify to some thing not less extraordinary than what you have related," said I, "for in Arcadia I saw with my own eyes a hog which was so fat that not only was it unable to get up but a shrew mouse having eaten a hole in its back had there made its nest and was rearing a family. I have heard that this same thing happened in the country of the Veneti."

"Usually," resumed Scrofa, "the fecundity of a sow may be learned from her first litter, for in later litters she does not vary much from the number of pigs in the first."

"In the matter of rearing young swine, which we call *porculatio* it is customary to leave pigs with the sow for two months, and then when they are able to feed themselves to separate them. Pigs born in the winter are apt to be runts on account of the cold and because the sow refuses to suckle them, partly by reason of her lack of milk at that season and partly to protect her teats from the teeth of the hungry pigs."

"Each sow should suckle her pigs in her own sty, because a sow will not drive strange pigs away from her, and it results that if the litters are mingled the breed deteriorates. The year is naturally divided for the sow into two parts, because they breed twice a year, being heavy in pig for four months and suckling for two. The sty should be built about three feet deep and a little more in width and such a height from the ground as will permit a pregnant sow to get out without straining herself, as that might cause her to abort. A good measure of the proper height from the ground is what is necessary to enable the swineherd to keep watch that no little pigs are crushed by the sow, and to clean out the bedding easily. There should be a door to the sty with the lower sill elevated a foot and a palm high so as to prevent the pigs from following the sow when she goes out. As often as the swineherd cleans out the sty he should strew the floor with sand, or some thing else to absorb moisture.

"When a sow has had her pigs she should be fed liberally to enable her to make milk: for this the ration is usually two pounds of boiled barley, indeed some feed this both at morning and at night if other feed is lacking. When pigs are taken from their dam they are sometimes called *delici* or weanlings being then no longer *lactantes* or sucklings.

"Pigs are considered to be clean ten days after birth, and for that reason were then called by the ancients sacred, as being then first fit for sacrifice: and so in the *Menaechmi* of Plautus, when a character thinking some one in Epidamnus to be out of his wits and seeking to purify him, asks: 'How much are sacred pigs here.'

"If the farm affords them, pigs should be fed grape husks and stalks.

"After they have lost the name of *lactantes* the shoats are called *nefrendes* because they are not yet able to break down (*frendere* that is

frangere) the bean stalks. *Porcus* is the ancient Greek name for them but is fallen into disuse, for the Greeks now call them [Greek: *choiros*].

"While she is giving suck the sow should be watered twice a day to promote the flow of milk. A sow should bear as many pigs as she has teats: if she has less it is considered that she is unprofitable, but if more, a prodigy. In this respect there is the ancient tradition that the sow of Aeneas bore thirty white (*albos*) pigs at Lavinium,[133] which portended that after thirty years the inhabitants of Lavinium would found the town of Alba: indeed, vestiges of this sow and of her pigs may still be seen at Lavinium where there is a brazen image of them now in the public square, and the true body of the sow is shown by the priests, preserved in pickle.

"Sows are able at first to suckle eight little pigs, but as they grow larger half of them are usually taken away by experienced swineherds, because the sow cannot supply milk enough for all, and too many pigs fed together do not prosper in any event. A sow should not be driven out of the sty for ten days after having her litter except for water, but after that time she is permitted to graze in a paddock so conveniently near at hand that she may return to the sty frequently to suckle the pigs. When the pigs are large enough they are permitted to follow the sow to pasture, but at home they should be penned apart from the sow and fed by themselves until they overcome their yearning for the dam, which usually happens in ten days. The swineherd should train his shoats to do every thing at the sound of the trumpet. This training is begun by letting the shoats hear the trumpet outside their pens and then at once come out to a place where barley has been scattered broad cast (for thus less is wasted than if the feed is put in heaps and more of the shoats can get to it easily). By such education it is possible to collect pasturing hogs at the sound of a trumpet and prevent their being lost when scattered in the woods.[134]

"Boars are altered most successfully when they are a year old, but in no case should this be done when they are less than six months old. After the operation they are no longer called boars, but barrows.

"Concerning the health of swine, I will say one thing only by way of example: if the sow is not able to supply milk the sucking pigs should be fed, until they are three months old, on roasted wheat (for when it is raw it loosens the bowels) or on barley boiled in water.

"As to number: it is considered that ten boars to an hundred sows is enough; some even reduce this proportion.

"The practice varies as to the number to a herd, but my judgment is that a hundred is a moderate number: some make it more, say 150: some feed two herds together, and some do even more than that. A small herd is less expensive than a large one because the swineherd requires less assistance. A swinefeeder should fix the number to be fed as a herd on a principle of utility, not by the number of boars he may happen to have, for that is determined by nature."

So far Scrofa.

Of neat cattle

V. At this point we were joined by the Senator Q. Lucienus, a man as learned as he is agreeable and intimate with us all. "Hail, my fellow citizens of Epirus," he exclaimed in Greek,[135] "and you, my dear Varro, 'shepherd of men,' for I have already greeted Scrofa this morning."

While one saluted him, another reproached him for having come so late to our club.

"I will see to that, my merry men, for I am about to offer you my back and a scourge: or else, Murrius, you who are my friend: come with me while I pay a forfeit to the goddess Pales, so that you may bear me witness if our friends here seek to make me do it again."

"Tell him," said Atticus, turning to Murrius, "what we have been talking about and what is still on the programme, so that when his turn comes he may be prepared. In the meantime we will take up the second order of domestic live stock and proceed to a discussion of the larger cattle."

"In this," said Vaccius, "my name would seem to assign me a part, since cows (*vaccae*) are included in that category. Wherefore I will tell what I know about neat cattle, so that he who knows less may learn, while he who knows more may correct me when I fall down."

"Be careful what you do, Vaccius," said I, "for the genus *Bos* is of the first importance among cattle, certainly in Italy, which is thought to have taken its very name from that family, for, as Timaeus records, in ancient Greece a bull was called [Greek: italos], whence is derived our word *vitula*, and from this Italy is supposed to have taken its name because of the number and beauty of its breed, of cattle (*vituli*). Others claim that the name comes from that of the famous bull Italus which Hercules drove out of Sicily into this country.

"The ox is indeed the companion and fellow labourer of man and the minister of Ceres: wherefore the ancients, holding him inviolable, made it a capital offence to kill an ox.[136] Both Attica and Peloponnesus bear witness of the regard in which the ox was held: for he who first yoked oxen to the plough is celebrated at Athens under the name Buzyges and at Argos under that of Homogyros."

"I know," replied Vaccius, "the importance of the ox and that his very name is used to signify that quality, as in words like [Greek: bousukon](big fig), [Greek: boupais](a big boy), [Greek: boulimos] (a ravenous hunger), [Greek: boopis] (large eyed), and again that a certain large grape is called *bumamma* (cow teat). Furthermore, I know it was the form of a bull that Jupiter assumed when he wooed Europa and bore her across the sea from Phoenicia: that it was a bull which protected the children of Neptune and Melanippe from being crushed in a stable by a herd of cattle: I know too that the bees which give the sweetest honey are generated from the carcass of an ox, whence the Greeks call them [Greek: bougeneis] (born of an ox), an expression which Plautius latinized on the occasion where the praetor Hirrius, was accused at Rome of having libeled the Senate. 'But be of good cheer, I will give you at least as great satisfaction as did he who wrote the Bugonia.'[137]

"In the first place there are said to be four ages of cattle, during which they are known by the successive designation of calf (*vitulus*), yearling (*juvencus*), prime (*novellus*) and aged (*vetulus*). These designations are further divided according to sex, as bull-calf and heifer-calf, or bull and cow.

"A cow which is sterile is called *taura*: when pregnant, *horda*, from which last name a certain festival is called the *hordicalia* (*Fordicidia*) because cows in calf are sacrificed upon it.

"He who wishes to buy a herd of neat cattle should take care first that they are of an age to produce, rather than past breeding; that they are well set up, clean limbed, square bodied, large, with black horns and broad brows, large black eyes, hairy ears, flat cheek bones, snub-nosed, not hump-backed but rather with the back bone slightly roached, wide nostrils, blackish lips, a neck muscular and long with dew laps hanging from it, the

barrel large and well ribbed, the shoulders broad and the quarters good, a tail sweeping the heels, the end being frizzled in a heavy brush, the legs rather short and straight with knees projecting a little and well separated, the feet narrow and not inclined to spread in walking, the hoofs not being splayed but consisting of light and even bones, and a hide which is not rough and hard to the touch. The best colour is black, next red, third chestnut and last white: for a white coat indicates weakness, as black indicates endurance: of the other two colours red is more common than chestnut, and both than black and white. In addition you should be particular that the bull is of good breed, which is determined from his conformation and his get, as calves usually reproduce the qualities of their sire. And, finally, it is of importance whence they come. Gallic cattle are considered in Italy to be the best for work, while on the other hand Ligurian cattle are worthless. The foreign cattle of Epirus are not only better than all the Greek cattle but even than the Italian: nevertheless, there are those who choose Italian cattle for victims and to serve as offerings to the gods on account of their size: and without doubt they may be preferred for such holy offices, so great is the distinction of their majestic bulk and their candid coats: and they are the more suitable for such use because white cattle are not so common in Italy as in Thrace at the gulf of Melas, where there are few of any other colour.

"When cattle are bought already broken for work we stipulate thus: 'Do you guarantee these cattle to be in good health and warrant me against liability for any tort committed by them?'

"When we buy them unbroken, we say: 'Do you guarantee these yearlings to be in good health and to come out of a healthy herd, and warrant me against liability for tort?'

"When butchers buy for the shambles they use a fuller formula recommended by Manilius: but those who buy for the altar do not usually stipulate for health in their victims.

"Neat cattle pasture best in groves where there is brushwood and much leafage: and so when they are wintered by the sea they are driven up to pasture in summer in the hills where shrubbery abounds.

"These are my breeding rules:

"For a month before breeding I cut down the food and drink of the cows because it is deemed that they breed more certainly when they are thin. On the other hand, I fatten the bulls up on grass and straw and hay for two months before the breeding season, and during that time I keep them apart from the cows. Like Atticus, I have two for seventy cows, one a yearling, the other two years old. When that constellation has risen which the Greeks call Lyra, and we Romans, Fides, I turn the bull into the herd again. The bull indicates whether a male or a female calf has been conceived by the side on which he leaves the cow: if male, on the right; if female, on the left. "Why this is so," said Vaccius, turning to me, "I leave to you who read Aristotle."

"A cow should not be served under two years, so that she may have her first calf in the third year: it would be better in the fourth. Most cows bear for ten years, some even more. The most suitable time for stinting cows is during the forty days following the rising of the Dolphin, or even a little later, for thus they will drop their calves at the most temperate season of the year, for a cow goes ten months pregnant. On this subject I have come upon an extraordinary statement in a book that a bull which has just been altered can get a cow with calf.

"Breeding cows should be pastured where there is abundant grass and plenty of water, and care should be taken to protect them from crowding too close together, and from being struck, or from fighting with one another: moreover, to protect them against being worried in summer by cattle flies and those minute insects which get under their tails, some farmers shut them up during the heat of the day in pens, which should be strewn with leaves or some other bedding on which they can rest comfortably. In summer they are driven to water twice a day, in winter once. Against the time when they are due to drop their calves you should arrange to give them access to fresh forage near the stable which they can eat with appetite as they go out, for at that time they are very dainty about their food. A watch out must be kept to prevent their frequenting chilly places, for cold depresses the vitality as much as hunger.

"These are the rules for raising neat cattle: the suckling calves should not be suffered to sleep with their dams, for they might crush them, but should be given access to them in the morning and when they return from pasture. When the calves are weaned the dams should be comforted by having green stuff thrown into their stalls for them to eat. The floor of a calf stable, like most others, should be paved with stone to keep their hoofs from rotting. The calves may be pastured with their dams after the autumn equinox. Bull calves should not be altered before they are two years old, as they recover with difficulty if the operation is performed sooner, while if it is done later they are apt to be stubborn and useless.

"As in the case of other cattle, the herd should be gone over every year and the culls thrown out because they occupy the room of those which might be profitable. If a cow loses her calf she should be given another to nurse, taken from a cow which has not a sufficient supply of milk. Calves six months old are fed wheat bran and barley meal and young grass, and care should be taken that they are watered morning and evening.

"The rules for taking care of the health of neat cattle are many. I have those which Mago has recorded written out and I take care that my herdsman reads them frequently.

"I have already said that a yearling and a two-year old bull should be provided for every sixty cows, though some have more or less cows in the herd: thus Atticus has two bulls for every seventy cows. Some observe one rule as to the number of cattle to the herd, some another. I am among those who think that one hundred is enough, but Atticus here, like Lucienus, has one hundred and twenty."

So far Vaccius.

Of asses

VI. While Vaccius was speaking, Murrius had returned with Lucienus and now began:

"I propose to tell about asses as well I may, because I am from Reate where the best and the largest are found; indeed, I have sold to the Arcadians themselves asses of this race and of my own breeding. He who wishes to establish a good herd of asses should see in the first place that he procures jacks and jennies of prime age so that they may breed as long as possible, strong, well made in all parts, of full body and of a good breed, that is to say derived from those localities whence the best specimens come; thus the Peloponnesians, so far as possible, buy asses bred in Arcadia and we in Italy those from the valley of Reate. For if the best of those delicious fish we call *muraenae flutae* are taken on the coast of Sicily and the best sturgeons at Rhodes, it does not follow that they are of equal delicacy in all seas.

"There are two kinds of asses, one wild, which is called the onager, of which there, are many herds in Phrygia and Lycaonia; the other domestic, as they are all over Italy. The onager is fit for use for breeding because he is easily tamed and once domesticated never reverts to a wild life.[138]

"Because their young take after their parents, it is important to choose both jack and jenny of good conformation. The conditions of buying and selling asses are much the same as for other kinds of cattle and include stipulations as to their health and against tort. They are best fed on corn and barley bran. The jennies are bred before the solstice so that they may have their foals at the same season in the following year, for their period of gestation is twelve months. The jennies should be relieved from work while in foal for fatigue at that time injures the offspring: but the jacks, on the contrary, are worked all the time, because it is lack of exercise which is bad for them.

"In the matter of rearing, practically the same rules apply to asses as to horses. The foals are not separated from their dams for the first year after they are born: during the second year they are permitted to stay with their dams at night, but they should then be tied with a loose halter or some other such restraint. In the third year you begin to break them for whatever service they are intended.

"As to the number: they are not usually kept in herds unless it may be for transport service; generally they are used to turn the mill, or for carrying about the farm, or even for the plough where the soil is light, as in Campania. Herds of asses are some times employed by merchants, like those who transport wine, or oil, or corn, or any other commodity, from Brundisium or Apulia to the sea, by pack trains."

Of horses

VII. Here Lucienus took up the discourse. "It is my turn," he said, "to open the barrier and drive in my horses: and they are not only stallions, of which, like Atticus, I keep one for every ten breeding mares, but mares as well, such as Q. Modius Equiculus, that gallant soldier, was wont to esteem for use even in war nearly as much as stallions.[139]

"He who wishes to have such studs of stallions and mares as may be seen in Peloponnesus and in Apulia should first consider age and see that he obtains them not less than three nor more than ten years old. The age of a horse, as also of nearly all animals whose hoofs are not cloven, even horned animals, may be known from the condition of the teeth: thus at thirty months of age a colt is said to lose the milk incisors from the middle of his mouth, two above and two below. At the beginning of the fourth year, in like manner he sheds the same number, being the incisors adjoining those previously lost, and at that age also the teeth called canine begin to appear. At the beginning of the fifth year he loses two more incisors, and at that time the new teeth show hollow. In the sixth year the new teeth begin to fill out their cavities, and by the seventh usually all have been renewed and the permanent mouth is made. What is the age of a horse beyond this point it is not possible to determine accurately, except that when the teeth project and the eye brows are white and have hollows under them, it is considered that a horse is sixteen years old.

"A breeding mare should be of medium size, for it is not fitting that they should be either very large or very small, but the quarters and belly should be broad.

"A breeding stallion on the other hand should be chosen with a large body, well made and all his parts in harmony. What sort of horse it will turn out to be can be determined from the points of the foal, for it should exhibit a small head: limbs well knit together: a black eye, wide nostrils: ears well

pricked: a mane which is thick, dark and curly, of fine hairs and falling on the right side of the neck: a breast broad and well developed: strong shoulders: a moderate belly: the loins flat and rising to the quarters: long shoulder blades: a back bone well doubled [with ridges of meat] but if these are not prominent in no event should the bone itself stand out: a tail large and curly: legs straight and even and rather long: knees round and small and not turned in as you look at them: hard hoofs: veins visible all over the body (for a horse of this kind is fit for treatment when he is sick).

"The breed is of the greatest importance, for there are many. In this respect the celebrated breeds take the names of the countries from which they come: thus in Greece we have the Thessalian breed: in Italy the Apulian from Apulia, and the Rosean from Rosea.[140]

"It is a sign that they will make good horses if, when at pasture with the herd, the colts contend with one another for superiority in running or in any thing else, or if when a stream is to be crossed they leap it at the head of the herd and do not look back for the others.

"Horses are bought in almost the same manner as cattle or asses, because they change ownership by similar formalities, all of which are set forth in the book of Manilius.

"Horses should be pastured whenever possible in meadows of grass, and in the stable and stall they are fed on hay.

"When a mare has foaled she should be fed on barley and watered twice a day.

"In the matter of breeding, the period of service is from the vernal equinox to the solstice so that the foal may come at a suitable season, for they are supposed to be born on the tenth day of the twelfth month after the

mare was stinted. Those which are born after the time are usually defective and unfit for use. When the season has come the stallion should be admitted to the mare twice a day, in the morning and in the evening, under the direction of the *origa* (so the studgroom is called), for a mare held in hand is stinted more quickly, nor does the stallion waste his seed by excess of ardor. When a mare is stinted she makes it known by defending herself. If the stallion shows an aversion for a mare, her parts should be smeared when she is in heat with the marrow of a shrimp macerated in water to the consistency of honey, and the stallion allowed to smell of it.

"Although it may seem incredible, what I am about to relate is true and should be remembered. Once upon a time a studgroom tried to make a stallion cover his mother, but could never get him to come near her: so one day the groom muffled the stallion's head and put him to his mother successfully: but when the bandage was removed and the stallion saw what he had done, he fell upon the groom and killed him with his teeth.

"When the mares have been stinted it must be seen to that they are worked only in moderation and are kept out of cold places, because cold is of the greatest prejudice to a mare in that condition. For this reason the floor of their stable should be kept dry and the windows and doors should be kept shut: and furthermore the mares should be separated one from another by long poles fastened back from the manger so that they may not fight.

"Mares in foal should neither be over-fed nor starved.

"There are some who breed their mares only every other year and claim they get better colts, on the same principle that as corn land is exhausted by continuous cropping, so is a mare which is bred every year.[141]

"The foal should be led out to pasture with its dam on the tenth day after it is born, so to avoid burning its tender hoofs by standing on manure in the

stable. When five months old a colt should be fed, whenever he is brought into the stable, a ration of barley meal whole with its bran, or any other product of the earth which he will eat with appetite. When they are a year old they may be fed barley in the grain mixed with bran, and this should be kept up as long as they suckle, for they should not be weaned until they have completed the second year. From time to time while they are still with their dams they should be handled so that they may not be wild after they are separated. To the same end it is well to hang bridles in their stalls so that while they are still colts they may become accustomed to the sight of them and the sound of their clanking as well. When a colt has learned to come to an outstretched hand you should put a boy on his back, for the first two or three times stretched out flat on his belly, but afterwards sitting upright. The time to do this is when the colt is three years old, for then he has his full growth and is beginning to develop muscles.

"There are those who say that a colt may be broken at eighteen months, but it is better to wait until the third year. Then is the time too to begin to feed him that mixture of grain in the milk which we call *farrago*, for this is very good for a horse as a purgative. It should be fed for ten days to the exclusion of all other food. On the eleventh day and until the fourteenth you should feed barley, adding a little to the ration every day for four days and then maintaining that quantity for the ten days succeeding: during this period the horse should be exercised moderately, and when in a sweat rubbed down with oil. If it is cold a fire should be lit in the stable.

"As some horses are suitable for military service, some for the cart, some for breeding, some for racing, and others for the carriage, it follows that the methods of handling and looking after them all are not the same. Thus the soldier chooses some and rears and trains them for his particular use, and so in turn does the charioteer and the circus rider. Nor does he who wishes a cart horse choose the same conformation or give the same training as to a

horse intended for the saddle or the carriage: for as the one desires mettle for military service, the other prefers a gentle disposition for use on the road. It was to provide for this difference of use that the practice of castrating horses was inaugurated, for horses that are altered are of a quieter disposition: they are called geldings, as hogs in the same state are called barrows and chickens are called capons.

"As to medicine for the horse, there are so many symptoms of their maladies and so many cures that the studgroom must have them written down: indeed, on this account in Greece the veterinarians are mostly called [Greek: hippiatroi] (horse leeches)."

Of mules

VIII. While we were talking a freedman came from Menas and said that the sacrificial cakes were cooked and every thing ready for the sacrifice—that whoever wishes to take part had only to come.

"But I will not suffer you to go," I protested, "until you have fulfilled your promise and given me the third chapter of our subject, that concerning mules and dogs and shepherds."

"What is to be said about mules,"[142] replied Murrius, "may be said briefly. Mules and hinnies are mongrels and grafts as it were on a stock of a different species, for a mule is got by an ass out of a mare, and a hinny by a horse out of a she ass. Both have their uses, but neither is fit to reproduce its kind. For this purpose it is the custom to put a newborn ass colt to nurse to a mare because mares' milk will make it more vigorous: it is considered better than asses' milk, or indeed than any other kind of milk. Later they are fed on straw, hay and barley. The foster mother must be given good attention also, as she must bring up her own colt in addition to her service as a wet nurse.

An ass raised in this way is fit to get mules when he is three years old, nor will he condemn the mares because he has become used to their kind. If you use him for breeding earlier he will quickly exhaust himself and his get will be poor.

"If you have no ass foal to have brought up by a mare and you wish a breeding jackass, you should buy the largest and handsomest you can find; the best breed, as the ancients said, was that of Arcadia, but nowadays we who know maintain that the breed of Reate is best: where breeding jacks have brought thirty and even forty thousand sesterces (\$1,800-\$2,000).

"Jacks are bought like horses, with the same stipulations and guarantees. We feed them principally on hay and barley, increasing the ration at the breeding season so as to infuse strength into their get by means of their food. The breeding season is the same as for horses, and, like them again, we have the jack handled by a studgroom.

"When a mare has dropped a mule colt or filly we bring it up with care. Those which are born in marshy and swampy country have soft hoofs, but if they are driven up into the mountain in summer, as we do at Reate, their hoofs become hardened.

"In buying mules you must consider age and conformation, the one that they may be able to work under a load, the other that the eye may have pleasure in looking at them: for a team of two good mules is capable of drawing any kind of a wagon on the road.

"You, my friend from Reate," Murrius added, turning to me, "can vouch for what I have said, as you yourself have herds of breeding mares at home and have bred and sold many mules.

"The get of a horse out of a she ass is called a hinny: he is smaller in the body and usually redder in colour than a mule, and has ears like a horse, but mane and tail like an ass. Hinnies are carried by the dam twelve months, like a horse, and, like the horse too, they are raised and fed, and their age can be told by their teeth."

Of herd dogs

IX. "It remains," said Atticus, "to speak of the last of the quadrupeds on our programme, that is to say, of dogs, which are of the greatest importance to us who feed the woolly flock, for the dog is the guardian of such cattle as lack the means to defend themselves, chiefly sheep and goats. For the wolf is wont to lie in wait for them and we oppose our dogs to him as defenders. Hogs can defend themselves, as well pigs, boars, barrows and sows, for they are near akin to the wild boar, which we know often kills dogs in the woods, with their tusks. What shall I say of large cattle? I know of an instance of a herd of mules pastured together, which, when they were attacked by a wolf, joined in forming a circle about him and killed him with blows of their hoofs: and again, bulls often stand together, rump to rump, and drive off wolves with their horns. But of dogs there are two kinds, hunting dogs, which are used against wild beasts and game, and herd dogs, which are used by the shepherd. I will discuss the latter methodically, following Scrofa's nine heads.

"Of the first importance is the choice of dogs of suitable age, for puppies and old dogs cannot protect themselves, much less the sheep, and so often become themselves the prey of wild beasts.

"In appearance they should be handsome, of good size, with black or tawny eyes: a symmetrical nose: lips blackish or ruddy, neither drawn back above nor hanging underneath: a short muzzle, showing two teeth on either

side, those of the lower jaw projecting a little, those above rather straight and not so apparent, and the other teeth, which are covered by the lips, very sharp: a large head, ears large and turned over: a thick crest and neck: long joints: straight legs, rather bowed than knock-kneed: feet large and well developed, so that in walking they may spread out: toes slightly splayed: claws hard and curved: the pad of the foot neither horny nor hard but as it were puffed and soft: short-coupled: a back bone neither projecting nor roached: a heavy tail: a deep bark, and wide gaping chops. The colour to be preferred is white because it gives the dog a lion-like aspect in the dark. [143] Finally, the females should have large teats equally distributed. Care should be taken that they are of good breed, such as those called for their place of origin, Laconian, Epirot and Sallentian. Be careful not to buy a sheep dog from a professional hunter or a butcher, because the one is apt to be lazy about following the flock, while the other is more likely to make after a hare or a deer which it might see, than to tend the sheep.

"It is better either to buy, from a shepherd, dogs which are accustomed to follow sheep or dogs which are without any training at all. While a dog does readily whatever he has been trained to do, his affection is apt to be stronger for the shepherds than for the flock.[144]

"Once P. Aufidius Pontianus of Amiternum bought certain flocks of sheep in further Umbria, the dogs which herded them being included in the bargain, but not the shepherds, who were, however, to make the delivery at the Saltus of Metapontum and the market of Heraclea: when these shepherds had returned home, their dogs, longing for their masters, a few days later of their own will came back to the shepherds in Umbria, having made several days journey without other food than what the fields afforded. Nor had any one of those shepherds done what Saserna advises in his books on agriculture,

'Whoever wishes to be followed by a dog should throw him a cooked frog.'[145]

"It is of importance that all your dogs should be of the same breed, for when they are related they are of the greatest aid to one another.

"Now as to Scrofa's fourth consideration, that concerning the manner of buying: this is accomplished by delivery by the former owner to the purchaser.

"The same stipulations as to health and against liability for tort are made as in the case of cattle, leaving out whatever is inapplicable to dogs. Some make a price on dogs at so much per head, others stipulate that the puppies shall go with the mother, others that two puppies shall count as one dog—as two lambs usually count as a sheep. Usually it is provided that all the dogs which have been accustomed to be together should be included in the bargain.

"The food appropriate for dogs is more like that of man than of sheep, for they are fed on scraps and bones rather than on grass and leaves. Care must be taken that they are fed regularly, for, if food is not provided, hunger will lead them in search of it away from the flock, unless, indeed, they shall find it in one another, thereby contradicting the old proverb,[146] or perchance they may realize the fable of Actaeon and turn their teeth against their master himself. You would do well to feed them on barley bread soaked in milk, because when they have become accustomed to that diet they will not readily desert the flock. They should never be suffered to taste the flesh of a carrion sheep lest the relish should tempt them to indulge in such food again. They may be fed also broth made out of bones, or bones themselves when broken up, for that makes their teeth stronger and the mouth wider: and thereby the jaws are stretched, while the zest of the marrow makes the

dog fiercer. They should be accustomed to take their food in the day time where the flock is feeding and at night where the flock is folded.

"In the matter of breeding it is the practice to line the bitch at the beginning of spring, for then she is said to be in heat, that is to say, to show a readiness for breeding. When they are lined at this season they pup about the solstice, for they go three months. While they are in pup they should be fed barley bread rather than wheat bread, for it is more nourishing and makes more milk.

"In the matter of bringing up the puppies after birth: if there are many in the litter you should choose those you wish to keep and destroy the others: the fewer you keep the better they will be nourished, for then their portion of the mother's milk will be larger.

"Chaff or some thing else of that sort should be spread under them, because the better they are bedded the more easily they are brought up. Puppies open their eyes twenty days after birth.[147] During the first two months they are not separated from their mother, but wean themselves gradually. A number of puppies should be kenneled together, where they may be encouraged to fight, which will make them fiercer, but they should never be suffered to tire themselves since weariness develops cowardice. They should also be accustomed to be tied, at first with a light leash, and if they attempt to gnaw it they should be punished by whipping, so that they may not get the habit. On rainy days their kennels should be bedded with leaves or grass, for two reasons: that they may not soil themselves or suffer from cold. Some castrate their puppies thinking them less likely to leave the flock, but others do not, thinking that the operation makes them less fierce. Some rub their ears and between their toes with a suffusion of bitter almonds steeped in water because flies, ticks and fleas usually develop sores in those parts, unless it is your practice to so anoint them. To protect

them from wounds from wild beasts we place collars on them, of the kind which we call *melium*, which is a girth around the neck made from strong leather studded with nails and lined with soft leather to protect the neck from being chafed by the hard iron heads of the nails: for if a wolf or other wild beast is once wounded by these nails all the other dogs are safe from his attack, even if they have no collars.

"The number of dogs to be kept is determined by the size of the flock, usually one dog for every shepherd is considered enough, but the practice varies. Thus there should be more in localities where wild beasts are plentiful, and those increase the number also who are wont to drive their flocks over the long forest drift ways to their summer or their winter feeding grounds.

"But two dogs are enough for a flock kept on a farm: in which case they should be male and female, for they are more attached and, by emulation, fiercer, and if one is sick for a protracted time the flock will not be without a dog."

Here Atticus looked around as if to enquire whether he had omitted any thing.

"This is the silence," said I, "which summons another player on the boards."

Of shepherds

X. "The rest of this act," I added, "relates to how many and what kind of shepherds are necessary."

Cossinius took the cue. "For large cattle," he said, "men of full age are required; for small cattle boys will do: but in either case those who drive

their flocks and herds on the drift ways must be stouter than those who remain on the farm and return to the steading every day.

"So in the wood pastures (*saltus*) it behooves one to have young men and usually armed men, while on the farm boys or even girls may tend the flock. Those who use the distant feeding grounds should require their shepherds to feed their flocks together all day, but at night to remain each one with his own flock. They should all be under the supervision of one flock master, who should be older and more experienced than the others, because they will obey more cheerfully one who surpasses them in age and knowledge; and yet the flock master should be of such years that he may not be prevented by age from hard work: for neither old men nor boys can endure the steepness of the drift ways, nor the ardours and roughness of the mountains, which must be suffered by those who follow flocks, especially cattle and goats, to whom the rocks and the forests are pleasant grazing places.

"So far as concerns the conformation of the men chosen for these occupations, they should be strong and swift and active, with ready limbs not only able to follow the cattle but to defend them from the incursions of wild beasts and of brigands: men who can load the packs on the sumpter beasts: can run and throw a javelin.[148]

"Every nation is not fit for tending cattle, especially the Basculi and the Turduli [of Spain]. The Gauls are the best of all, particularly for draught cattle.

"In the matter of the purchase of shepherds, there are six usual methods of obtaining lawful title to a slave: (i) by inheritance, (2) by due form of mancipation, which is delivery of possession by one who has the legal right, (3) by the legal process called surrender in court (*cessio in jure*) from one who has that right, the transfer taking place where it should, (4) by

prescriptive use (*usucapion*), (5) by purchase of a prisoner of war "under the crown" (6) by auction at the distribution of some one's property by order of court under the process known as *bonorum emptio*. [149]

"The *peculium* or personal property of the slave usually passes with him to a new master unless it is specially excepted in the terms of sale: there is also the usual guaranty as to the health of the slave and that he has committed no theft or tort for which his master is legally responsible, and, unless the purchase is by mancipation, the bargain is bound by an obligation of double indemnity, or in the amount of the purchase price alone, if that is the agreement.

"The shepherds should take their meals separately during the day, each one with his flock, but in the evening they should meet at a common supper under the supervision of the flock master. [150] It should be the duty of the flock master to see that every thing is provided which may be required by the flock or by the shepherds, chiefly the victuals for the men and medicine for the flock: for which the master should provide beasts of burden, either horses or some thing else which can carry a load on its back.

"As to what relates to the breeding of shepherds, it is easy, so far as concerns those who remain on the farm all the time because they can have a fellow servant to wife at the farmstead, for Venus Pastoralis demands no more. Some hold that it is expedient also to furnish women [151] for those who pasture the flocks in the Saltus and the forests and have no residence but find their shelter from the rain under improvised sheds: that such women following the flocks and preparing the food for the shepherds keep the men better satisfied and more devoted to their duty. But they must needs be strong though not deformed, and not less capable of work than the men themselves, as they are in many localities and as may be seen throughout Illyricum, where the women feed the flocks or carry in wood for the fire

and cook the food, or keep watch over the household utensils in their cottages.

"As to the method of raising their children, it suffices to say that the shepherd women are usually both mothers and nurses at the same time."

At this Cossinius looked at me and said: "I have heard you relate that, when you were in Liburnia, you saw women big with child bringing in fire wood and at the same time carrying a nursing child, or even two of them, thus putting to shame those slender reeds, the women of our class, who are wont to lie abed under mosquito bars for days at a time when they are pregnant."

"That is true," I replied, "and the contrast is even more marked in Illyricum, where it often happens that a pregnant woman whose time has come will leave her work for a little while and return with a new born child which you would think she had found rather than borne.[152]

"Not only this, the custom of that country permits the girls as much as twenty years of age, whom they call virgins, to go about unprotected and to give themselves to whomever they wish and to have children before marriage."

"As to what pertains to the health of man and beast," resumed Cossinius, "and the leech craft which may be practised without the aid of a physician, the flock master should have the rules written down: indeed, the flock master must have some education, otherwise he can never keep his flock accounts properly.[153]

"As to the number of shepherds, some make a narrow, some a broad, allowance. I have one shepherd for every eighty long wool sheep: Atticus here has one for every hundred. One can reduce the number of men

required in respect of large flocks (like those containing a thousand head or more) much more readily than in respect of comparatively small flocks, like Atticus' and mine, for I have only seven hundred head of sheep, and you, Atticus, have, I believe, eight hundred, though we are alike in providing a ram for every ten ewes. Two men are required to care for a herd of fifty mares: and each of them should have a mare broken for riding to serve as a mount in those localities where it is the custom to drive the mares to pasture, as often happens in Apulia and Lucania."

Of milk and cheese and wool

XI. "And now that we have fulfilled our promise, let us go," said Cossinius.

"Not until you have added some thing," I cried, "concerning that supplemental profit from cattle which was promised; namely, of milk and cheese and the shearing of wool."

So Cossinius resumed:

"Ewes' milk, and, after it, goats' milk, is the most nourishing of all liquids which we drink. As a purgative, mares' milk ranks first, and, after it, in order, asses' milk, cows' milk and goats' milk, but the quality depends upon what has been fed to the cattle, upon the condition of the cattle, and upon when it is milked.

"So far as concerns the food of the cattle, milk is nourishing which is made from barley and stover and other such kinds of dry and hard cattle food.

"So far as concerns its purgative qualities, milk is good when made from green stuff, especially if it is grass containing plants which, taken by

themselves, have a purgative effect upon the human body.

"So far as concerns the condition of the cattle, that milk is best which comes from cattle in vigorous health and from those still young.

"So far as concerns the time of milking, that milk is best which comes neither from a 'stripper' nor from a recently fresh dam.

"The cheese made of cows' milk is the most agreeable to the taste but the most difficult to digest: next, that of ewes' milk, while the least agreeable in taste, but the most easily digested, is that of goats' milk.

"There is also a distinction between cheese when it is soft and new made and when it is dry and old, for when it is soft it is more nourishing and digestible, but the opposite is true of old and dry cheese.

"The custom is to make cheese from the rising of the Pleiades in spring to their rising in summer, and yet the rule is not invariable, because of difference in locality and the supply of forage.

"The practice is to add a quantity of rennet, equal to the size of an olive, to two *congi* of milk to make it curdle. The rennet taken from the stomachs of the hare and the kid is better than that from lambs, but some use as a ferment the milk of the fig tree mixed with vinegar, and some times sprinkled with other vegetable products. In parts of Greece this is called [Greek: opos], elsewhere [Greek: dakruos]."

"I am prepared to believe," I said, "that the fig tree standing beside the chapel of the goddess Rumina[154] was planted by shepherds for the purpose you mention, for there is it the practice to make libations of milk rather than of wine or to sacrifice suckling pigs. For men used to use the word *rumis* or *ruma* where we now say *mamma*, signifying a teat: hence

even now suckling lambs are called *subrumi* from the teat they suck, just as we call suckling pigs *lactantes* from *lac*, the milk that comes from the teat."

Cossinius resumed:

"If you sprinkle your cheese with salt it is better to use the mineral than the marine kind.

"Concerning the shearing of sheep, the first thing to be looked into before you begin is that the sheep are not suffering from scab or sores, as it is better to wait, if necessary, until they are cured before shearing.

"The time to shear is between the vernal equinox and the summer solstice, when the sheep begin to sweat (it is the sweat which gives new clipped wool its name *sucida*). As soon as the sheep are sheared they are smeared with a mixture^[155] of wine and oil, some add white wax and hogs' grease. If they are sheep which are kept blanketed, the inside of the blanket should be anointed with this mixture before it is put on again.

"If the sheep has suffered any wound during the shearing, it should be treated with liquid tar.

"Long wool sheep are usually sheared about the time of the barley harvest: in some places before the hay harvest.

"Some men shear their sheep twice a year, as in hither Spain, investing double work because they think they get more wool, just as some men mow their meadows twice a year. Careful shepherds are wont to shear on a mat so as not to lose any of the wool. A clear day should be chosen for the shearing and it is usually done between the fourth and the tenth hours (10 a.m.-4 p.m.) since wool sheared in the hot sun is softer, heavier and of better colour by reason of the sweat of the sheep. Wool which has been

collected and packed in bags is called *vellera* or *velamina*, words derived from *vellere*, to pull, whence it may be concluded that the practice of pulling wool is older than shearing. Those who pull the wool today make a practice of starving their sheep for three days before, because when they are weak the wool yields more readily."

"Speaking of shearing," I said, "it is reported that the first barbers were brought into Italy from Sicily in the year 453 after the foundation of Rome (B.C. 300) by P. Ticinius Menas, as appears from the inscription in the public square of Ardea. The statues of the ancients show that formerly there were no barbers because most of them have long hair and a heavy beard."
[156]

Cossinius resumed:

"As the wool of the sheep serves to make clothes, so the hair of goats is employed: on ships, in making military engines and certain implements of industry. Certain nations, indeed, are clad in goat skins, as in Gaetulia and Sardinia. Their use for this purpose by the ancient Greeks is apparent, because old men in the tragedies are called [Greek: diphtheriai], from the fact that they were clad in goat skins: and it is the custom also in our comedies to dress rustic characters in goat skins, like the youth in the *Hypobolimaeus* (the Counterfeit) of Caecilius, and the old man in the *Heautontimorumenos* (the Self Tormentor) of Terence.

"It is the practice to shear goats in the greater part of Phrygia because there the goats have heavy coats, of which cilicia (so called because the practice of shearing goats began in the city of that name) and other hair cloth materials of that kind are made."

With this Cossinius stopped, and, while he was waiting for criticism of what he had said, Vitulus' freedman, coming into town from the gardens [of

his master] turned to us and said, "I was on my way to your house to invite you to come early so as not to shorten the holiday."

And so, my dear Turranius Niger, we separated: Scrofa and I going to the gardens of Vitulus; the others, some home and some to see Menas.

BOOK III

THE HUSBANDRY OF THE STEADING

Introduction: the antiquity of country life

I

There are two modes of human life, my dear Pinnius, which are manifestly as different in the time of their origin as they are in their habitat, that of the country and that of the town. Country life is much the more ancient, for time was when men lived altogether in the country and had no towns: indeed, the oldest town in Greece, according to the tradition, is the Boeotian Thebes, which was founded by King Ogyges, and in our own land that of Rome, founded by King Romulus of which now it may be affirmed with confidence, as was not possible when Ennius wrote:

"'Tis seven hundred years, or more or less,
Since first illustrious Rome began her sway,
With hallowed augury."

Now, if it is admitted that Thebes was founded before the deluge, which is known by Ogyges' name, its age is not more than about twenty-one hundred years: and if that period is compared with the lapse of time since men began to cultivate the land and to live in huts and hovels, knowing naught of city walls and gates, it is evident that life in the country preceded

life in town by a tale of immemorial years. Nor is this to be wondered at since 'God made the country and man made the town.'[157] While the tradition is that all the arts were invented in Greece within a thousand years, there never was a time when the earth could not be cultivated. And, as life in the country is the more ancient, so it is the better life: for it was not without good reason that our ancestors were wont to plant colonies of citizens in the country, because by them they were both fed in times of peace and protected in times of war: nor was it without significance that they called both the Earth and Ceres by the common name of Mother and esteemed that those who worshipped her lead a life at once pious and useful and were the sole representatives left on earth of the race of Saturn. A proof of this is that the mysteries peculiar to the cult of Ceres were called *Initia*, the very name indicating that they related to the beginning of things.

A further proof that country life was earlier than that of town is found in the name of the town of Thebes, which was bestowed from the character of its situation rather than from the name of its founder: for in the ancient language, and among the Aeolians who had their origin in Boeotia, a small hill is called *tebas* without the aspirate; and in the Sabine country, where Pelasgians from Greece settled, they still have the same locution: witness that hill called Tebae which stands in the Sabine country on the via Salaria not far from the mile stone of Reate. At first agriculture was conducted on so small a scale that it had little distinction, since those who followed it, being sprung from shepherds, at once sowed their corn and pastured their flocks on the same land, but as later this art grew in importance the husbandry of live stock was separated, and it befel that some men were called farmers and others shepherds.

The art of feeding live stock should really be divided into two branches, as is not yet fully appreciated, one relating to the stock kept at the steading, the other to the stock pastured in the fields. The latter, which is designated

by the name *pecuaria*, is well known and highly esteemed so that rich men, either lease or buy much pasture land in order to carry it on: the other, which is known as *villatice*, has, because it seemed to be of less importance, been treated by some as an incident of the husbandry of agriculture, when in fact it should be made a part of the husbandry of live stock: nor has it been described separately and at length by any one, so far as I know.

And so, as I think that there are three branches of farm management which are undertaken for profit, namely: agriculture, live stock and the industries peculiar to the steading, I have planned three books, of which I have already written two, the first concerning the husbandry of agriculture, which I dedicated to my wife Fundania, and the second concerning the husbandry of live stock to Turranius Niger: the third, relating to the profits of those industries which are carried on at the steading, I now send herewith to you; for the fact that we are neighbours and entertain a mutual affection seems to demand that it should be dedicated to you above all others.

Although you have a villa, which is remarkable for the beauty of its workmanship within and without, and for the splendour of its mosaic pavements, still you deem it to be bare unless you have the walls decorated also with books: so in like manner that your villa may be more distinguished by the profits you derive from it than by the character of its construction, and that I may be of assistance to that end, so far as may be, I have sent you this book, which is a summary of some conversations which we have had on the subject of what makes the perfectly equipped villa: and so I begin as follows:

Of the definition of a Roman villa

II. The Senator Q. Axius, my fellow tribesman, and I had cast our votes at the comitia for the election of aediles, and, although it was the heat of the

day, we wished to be on hand when the candidate whom we were supporting should go home. So Axius said to me: "What would you think of taking shelter in the *villa publica*[158] while the votes are being sorted rather than in the booth of our candidate." "I hold," said I, "not only with the proverb that bad advice is worst for him who gives it, but that good advice is good for both the giver and the taker."

And so we made our way to the *villa publica*, where we found Appius Claudius,[159] the Augur, seated on a bench waiting for any call for his services by the Consul: on his left was Cornelius Merula (blackbird) of the Consular family of that name, and Fircellius Pavo (pea-cock) of Reate, and on his right Minutius Pica (mag-pie) and M. Petronius Passer (sparrow). When we had approached them Axius, smiling, said to Appius: "May we come into your aviary where you are sitting among the birds?"

"By all means," replied Appius, "and especially you who set before me such birds as still make my mouth water, when I was your guest a few days ago at your Reatine villa on my way to lake Velinus to settle the controversy between the people of Interamna and Reate.[160]

"But" he added, "is not this villa, which our ancestors constructed, simpler and so better than that elaborate one of yours at Reate: do you see any where here any furniture of citrus wood or ormolu, any decorations of vermilion or blue, any tessellations or mosaic work, all of which on the other hand were displayed in your house? And while this is open to the entire people, yours is available to you alone: this is the resort for the citizens after the comitia in the Campus Martius, and for all alike, while yours is reserved for mares and asses. And furthermore it should be considered that this building is useful in carrying on the public business, for here the consuls review the army on parade, here the arms are inspected, here the censors enumerate the people."

"Tell me," retorted Axius, "which is useful, this villa of yours giving on the Campus Martius, more extravagantly arrayed with objects of art than all Reate put together, so bedizened is it with pictures and garnished with statues, or mine where there is no trace of the artists Lysippus or Antiphilus, but there are many of the farm hand and the shepherd?"

"And since there can be no villa where there is no farm and that well cultivated, how can you call this house of yours a villa which has no land appurtenant to it and no cattle or horses? Again, tell me, pray, how does your villa compare with that of your grandfather and great grandfather, for one cannot see at yours, as one could always see at theirs, cured hay in the mows, the vintage in the cellar, and the harvest in the granary? Because, forsooth, a house is situated out of town, it is no more a villa for that reason than the houses of those who dwell beyond the Porta Flumentaria or in the Aemiliana suburb."

"Since it appears that I do not know what a villa is," replied Appius, smiling, "I wish you would be good enough to instruct me, so that I may not make a fool of myself, as I am planning to buy from M. Seius his villa at Ostia: for if a mere house is not a villa unless it is equipped with a jackass costing forty thousand sesterces (\$2,000), like that you showed me at your place, I fear that I would be making a mistake in buying Seius' house on the shore at Ostia in the belief that it is a villa. But it was our friend Merula here who put me in mind of buying this house, for he told me that he had spent several days there and that he had never seen a more delightful villa, and yet he saw there no paintings, nor any bronze or marble statues, neither did he see any wine press, or oil mill, or oil jars."

"And what kind of a villa is this," said Axius, turning to Merula, "where there are neither the ornaments of a town house nor the utensils of a farm?"

"Do you consider," said Merula, "that your house on the bank of Velinus, which neither painter nor architect has ever seen, is any less a villa than the one you have in Rosea so elegantly decorated with the work of an architect and which you share with your famous jackass?"

Axius admitted, with a nod, that a simple farm house was as much entitled to be called a villa as any house which united the characteristics of both town and country, and asked what he deduced from this.

"What?" said Merula. "Why, if your estate in Rosea is to be approved by reason of the husbandry which you carry on, and is properly called a villa because there cattle are fed and stabled, then, by the same reasoning, all those houses should be called villas in which large profits are derived from husbandry: for what difference does it make whether you derive your profit from sheep or from birds? Is the income any sweeter which comes from cattle in which bees are generated, than from the bees themselves, such as work in their hives at the villa of Seius? Do you sell to the butcher the hogs which you raise at your farm for more than Seius sells his wild boars to the meat market?"

"Am I any less able," replied Axius, "to have these things at my farm at Reate: is Sicilian honey made at Seius' place and only Corsican honey at Reate,[161] and does the mast which he buys for his wild boars make them fat while that which I get for nothing from my woods makes mine lean?"

"But," said Appius, "Merula does not deny that you *can* carry on at your villa the kind of husbandry which Seius does at his, yet I myself have seen that you don't.

"For there are two kinds of husbandry of live stock: one in the fields, as of cattle; and the other at the steading, as of chickens and pigeons and bees and other such things which are usually kept at a villa.

"About the latter, Mago the Carthaginian, and Cassius Dionysius and others have treated specially in different parts of their books, and it would seem that Seius has read their precepts and so has learned how to make more profit from his villa alone by such husbandry than others make out of an entire farm."

"Certainly," agreed Merula, "for I have seen there great flocks of geese, chickens, pigeons, cranes and pea-cocks: also dormice, fish, wild boars and other such game.[162] The freedman who keeps his books which Varro has seen, assured me when he was doing the honours in the absence of his master, that Seius derives an income of more than fifty thousand sesterces (\$2,500) per annum from his villa."

As Axius seemed astonished, I asked him: "Surely you know the estate of my aunt in the Sabine country which is at the twenty-fourth mile stone from Rome on the via Salaria."

"Of course, I do," Axius replied, "for it is there that I am wont to divide the day in summer on my way from Reate to town and to spend the night when I come thence in winter."

"Well," I continued, "in that villa there is an aviary from which I know that there were taken in one season five thousand thrushes, which, at three deniers apiece, means that that department of the establishment brought in a revenue of sixty thousand sesterces that year, or twice the yield of the entire two hundred jugera of your farm at Reate." [163]

"What, sixty thousand," exclaimed Axius, "sixty thousand: you are making game of me!"

"Sixty thousand," I affirmed, "but in order that you might realize such a lucky throw you will require either a public banquet or a triumph on the

scale of that of Scipio Metellus, or club dinners, which indeed have now become so frequent as to raise the price of provisions of the market."

"You will perchance expect this return every year," said Merula, "so I trust that your aviary may not lead you into a loss. But surely in such good times as these it could not happen that you would fail, except rarely, for what year is there that does not see such a feast or a triumph, or club dinners, such as now-a-days consume victuals without number. Nay," he added, "it seems that in our habit of luxury such a public banquet is a daily occurrence within the gates of Rome."[164]

To supplement the examples of such profits: L. Albutius, a learned man and, as you know, the author of certain satires in the manner of Lucilius, has said that the returns from feeding live stock on his Alban farm are always less than his income from his villa, for the farm yields less than ten thousand sesterces and the villa more than twenty. He even maintains that if he should establish a villa near the sea in such a place as he might choose he could derive from it an income of more than a hundred thousand sesterces. Did not M. Cato recently sell forty thousand sesterces worth of fishes from the fish ponds of Lucullus after he had accepted the administration of his estate?"

"My dear Merula," exclaimed Axius, "take me, I beg of you, as your pupil in the art of the husbandry of the steading."

"I will begin," replied Merula, "as soon as you promise me a minerval in the form of a dinner."[165]

"You shall have it," said Axius, "both today, and hereafter as well, off those delicacies you will teach me to rear."

"I fear," replied Merula, "that what you may offer me at the beginning of your experience with villa feeding will be dead geese or deceased peacocks."

"And what difference will it make to you," retorted Axius, "if I do serve you fish or fowl which has come to an untimely end: for in no event could you eat them unless they were dead: but I beg you," he added, "matriculate me in the school of villa husbandry and expound to me the theory and the practice of it."

Merula accepted the invitation cheerfully.

Of the Roman development of the industries of the steading

III. "In the first place," he said, "you should know what kind of creatures you may raise or feed in or about a villa, either for your profit or for your pleasure. There are three divisions for this study: poultry houses, warrens and fish ponds.

"I include under the head of poultry houses the feeding of all kinds of fowls which are usually kept within the walls of a steading: under the head of warrens not merely what our great grandfathers meant—places where rabbits were usually kept—but any enclosure adjoining a villa in which game animals are enclosed to be fed. In like manner I include under the head of fish ponds all those places in which fish are kept at a villa either in fresh or salt water.

"Each of these divisions may be separated into at least two parts: thus the first, that with respect to poultry houses, should be treated with reference to a classification of fowls as between those which are content on land alone, such as peacocks, turtle doves, thrushes; and those which require access to

water as well as land, such as geese, widgeons and ducks. So the second division, that relating to game, has two different classifications: one which includes the wild boar, the roe buck and hares; the other bees, snails and dormice.

"The third, or aquatic division, likewise has two classifications, one including fresh water fish, the other salt water fish.

"In order to secure and maintain a supply of these six classes of stock it is necessary to provide a force of three kinds of artificers, namely: fowlers, hunters and fishermen, or else you may buy breeding stock from such men, and trust to the diligence of your servants to rear and fatten their offspring until they are ready for market. Certain of them, such as dormice, snails and chickens, may, however, be obtained without the aid of a hunter's net, and doubtless the business of keeping them began with the stock native to every farm: for the breeding even of chickens has not been a monopoly of the Roman augurs, to make provision for their auspices, but has been practised by all farmers from the beginning of time.[166] From such a start in the kind of husbandry we are now discussing, the next step was to provide masonry enclosures near the steading to confine game, and these served as well for shelter for the bee-stand, for originally the bees were wont to make their hives under the eaves of the farm house itself.

"The third division, that of keeping fish, had its origin in simple fresh water ponds in which fish taken in the streams were kept.

"There have been two steps in the development of each of these three conveniences; the earlier distinguished by the ancient simplicity, the later by our modern luxury. The earlier stage was that of our ancestors, who had but two places for keeping poultry: one the court yard of the steading in which chickens were fed and their profit derived from eggs and pullets, the

other above ground, for their pigeons were kept in the dormers or on the roof of the farm house.

"Now-a-days, on the contrary, what our ancestors called hen-houses are known as *ornithones*, and serve to house thrushes and pea-cocks to cater to the delicate appetite of the master: and indeed such structures now have larger roofs than formerly sufficed to cover an entire farm house.

"Such has been the progress in respect of warrens also: your father, Axius, never saw any game but rabbits, nor did there exist in his time any such extensive enclosures as now are made, many jugera in extent, to hold wild boars and roe bucks. You can witness," he said, turning to me, "that you found many wild boars in the warren of your farm at Tusculum, when you bought it from M. Piso."

In respect of the third class, who was there who used to have any kind of a fish pond, except of fresh water, stocked merely with cat fish and mullets, while today our elegants declare that they would as soon have a pond stocked with frogs as with those fish I have named. You will recall the story of Philippus when he was entertained at Casinum by Ummidius: a pickerel caught in your river, Varro, was put before him, he tasted it and forthwith spat it out, exclaiming "May I perish, but I thought it was fish!"[167]

As the luxury of this age has enlarged our warrens, so has it carried our fish ponds even to the sea itself and has herded shoals of sea fish into them. Have not Sergius Orata (goldfish) and Licinius Murena (lamprey) taken their cognomens from fishes for this reason? And who does not know the fame of the fish ponds of Philippus, of Hortensius, and of the brothers Lucullus?

"Where, then, Axius, do you wish me to begin?"

Of aviaries

IV. "I prefer," replied Axius, "that you should begin with the sequel—*postprincipia*, as they say in the camps—that is, with the present day rather than with the past, because the profits from pea-cocks are greater than those from hens, I will not dissemble that I wish to hear first of *ornithones* because the thrushes which are kept in them make the very name sound like money: indeed, the 60,000 sesterces of Fircelina have consumed me with avarice."

"There are two kinds of *ornithones*," replied Merula; "one for pleasure, like that so much admired which our friend Varro here has at his villa near Casinum: the other for profit, such as are maintained commercially, some even indoors in town, but chiefly in the Sabine country which abounds in thrushes. There is a third kind, consisting of a combination of the two I have mentioned, such as Lucullus maintained at his Tusculan villa, where he contrived a dining room under the same roof as his aviary to the end that he might feast delicately, satisfying two senses, now by eating the birds cooked and spread on a platter, now by seeing them flying about the windows: but the truth is that he was disappointed, for the eyes did not take as much pleasure from the sight of the flying birds as the nostrils were offended by their odour."

a. For profit

V. "But, as I gather you would prefer, Axius, I will speak of that kind of *ornithon* which is established for profit, whence, but not where, fat thrushes are served.

"For this purpose is built a dome, in the form of a peristyle, with a roof over it and enclosed with netting, sufficiently large to accommodate several

thousand thrushes[168] and blackbirds; indeed, some also include other kinds of birds, such as ortolans and quail, which sell for a good price when fat. Into this enclosure water should be conducted through a conduit and so disposed as to wind through the aviary in channels narrow enough to be cleaned easily (for if the water spreads out it is quickly polluted and rendered unfit to drink) and draining like a running stream to find its vent through another conduit, so that the birds may not be exposed to the risk of mud. The door should be low and narrow and well balanced on its hinges like the doors they have in the amphitheatres where bulls are fought: few windows and so placed that the birds cannot see trees and wild birds without, for that makes the prisoners pine and grow thin. The place should have only so much light as may be necessary to enable the birds to see where they are to perch and to eat and drink. The doors and the windows should be lightly stuccoed round about to keep out rats and other such vermin.

"Around the wall of the building on the inside are fastened many perches where the birds can sit, and another such convenience should be contrived from poles set on the ground and leaning against the walls and tied together with other poles fastened transversely at regular intervals, thus giving the appearance of the rising degrees of a theatre. Down on the ground near the drinking water you should place the birds' food, which usually consists of little balls of a paste made out of figs and corn meal: but for twenty days before you intend to market your thrushes it is customary to feed them more heavily, both by giving them more food and that chiefly of finer meal.

"In this enclosure there should also be cages with wooden floors which may serve the birds as resting places supplementing the perches.

"Next to the aviary should be contrived a smaller structure, called the *seclorium*, in which the keeper may array the birds found dead, to render

an account of them to his master, and where he may drive the birds which are ready for market from the larger aviary: and to this end this smaller room is connected with the main cage by a large door and has more light: and there, when he has collected the number he wishes to market, the keeper kills them, which is done secretly, lest the others might despond at the sight and themselves die before they are ready for market.

"Thrushes are not like other birds of passage which lay their eggs in particular places, as the swan does in the fields and the swallows under the roof, but they lay anywhere: for, despite their masculine name (*turdus*) there are female thrushes, just as there are male blackbirds, although they have a purely feminine name (*merula*).

"All birds are divided as between those which are of passage, like swallows and cranes, and those which are domestic, like chickens and pigeons: thrushes are birds of passage and every year fly from across the sea into Italy about the time of the autumn equinox, returning about the spring equinox. At another season doves and quail do the same in immense numbers, as may be seen in the neighbouring islands of Pontia, Palmaria and Pandataria, for there they are wont to rest a few days on their arrival and again before they set out across the sea from Italy."

b. For pleasure

"So," said Appius to Axius, "if you enclose five thousand thrushes in such an aviary as Merula has described and there happens to be a banquet or a triumph, you will gain forthwith that sixty thousand sesterces which you so keenly covet and be able to lend the money out at good interest." And then, turning to me, he added, "Do you tell us of that other kind of ornithon, namely: for pleasure merely, for it is said that you have constructed one near Casinum which surpasses not only the original built by

the inventor of such flying cages, our friend M. Laenius Strabo of Brundisium (who was the first to keep birds confined in the chamber of a peristyle and to feed them through the net), but also the vast structures of Lucullus at Tusculum."

"You know," I said, "that there flows through my estate near Casinum[169] a stream which is both deep and clear and fifty-seven feet wide between the masonry embankments, so that it is necessary to use bridges to get from one part of the property to the other. On the upper reach of this stream is situated my Museum[170] and at a distance of 950 feet below is an island formed by the confluence of another stream. Along the bank for this distance is an uncovered walk ten feet broad and between this walk and the field is the location of my aviary enclosed on both sides, right and left, with high masonry walls. The *ornithon* itself is built in the shape of a writing tablet with a capital on it, the main quadrangle being forty-eight feet wide and seventy-two feet long, the capital semi-circular with a radius of twenty-seven feet. To this a covered walk or portico is joined, as it were across the bottom of the page of the tablet, with passages leading on either side of the *ornithon* proper which contains the cages, to the upper end of the interior quadrangle [*adjoining the capital*]. This portico is constructed of a series of stone columns between which and the main outside walls are planted dwarf shrubs, a net of hemp being stretched from the top of the walls to the architrave of the portico, and thence down to the stylobate or floor. The exterior spaces thus enclosed are filled with all kinds of birds which are fed through the net, water being provided by a small running stream. On the interior sides of the porticos, and adjoining them at the upper end of the interior quadrangle, are constructed on both sides two narrow oblong basins. Between these basins a path leads to the *tholus*, or rotunda, which is surrounded with two rows of columns, like that in the house of Catulus, except that I have substituted columns for walls. Beyond these columns at the end is a grove of large transplanted trees forming a roof of

leaves, but admitting light underneath, as that is entirely cut off by the high walls on the sides. Between the exterior row of columns of the *tholus*, which are of stone, and the interior row, which are of pine, there is a narrow space, five feet in width. The exterior columns are filled in with a transparent net instead of walls, thus permitting the birds to look out upon the grove and the wild birds there but without escaping: the interior columns being filled in with the net of the main aviary. The space between the two rows of columns thus enclosed is equipped with perches for the birds in the form of many rods let into all the columns in ascending array like the degrees of a theatre; and here are enclosed all kinds of birds, but chiefly singing birds, like nightingales and blackbirds, for whom water is conducted by means of a small canal and food is supplied under the net. [*Under the lantern of the tholus is a basin of water: and around this*] a foot and nine inches below the stylobate or pedestal of the interior row of columns, runs a stone platform. This is five feet in width and two feet above the level of the basin, thus affording a space on which my bird guests may hop about from the cushions to the little columns [*which are there provided for them*]. [171]

"The basin is immediately surrounded with a quay a foot in width adjoining [but below the level of] the platform and has a little island in the middle. Around the platform and the quay are contrived docks for ducks. On the island is a little column arranged to turn on its axis and carrying a wheel-shaped table with hollow drum-like dishes fashioned at the ends of the spokes two and a half feet wide and a palm in depth. This is turned by a boy whose business that is, so that meat and drink is put before all my bird guests in turn. From the elevation of the platform, where mats are usually placed, the ducks go out to swim in the basin, and from this streams flow into the two basins I have already described, and little fish may be seen darting from one to the other, while warm or cold water may be turned on

the guests from the circumference of the revolving table, which I have described as equipped with spokes.

"Within the dome is an arrangement to tell the hours by marking the position in the heavens of the sun by day and Hesperus by night: and furthermore, as in the clock which [Andronicus] Cyrrestes constructed at Athens, the eight winds are depicted on the dome, and, by means of an arrow connecting with a vane, the prevailing wind is indicated to those within." [172]

As we were talking an uproar was heard on the Campus Martius. While this did not astonish old parliamentary hands [173] like ourselves, who knew the enthusiasm of an election, yet we were anxious to know what it meant, and at this moment Pantuleius Parra came up and told us that while the votes were being sorted some one was caught stuffing the ballot box [174] and had been haled before the consul by the supporters of the rival candidate. Pavo rose to go, for it was understood that he who had been arrested was the campaign manager of Pavo's own candidate.

Of pea-cocks

VI. "Now that Fircellius is gone you can speak freely of pea-cocks," said Axius, "for if you should say any thing to their disadvantage in his presence, you might perchance have a crow to pluck with him on account of his relationship." [175]

"Within my memory," said Merula, "the practice of keeping commercial flocks of pea-cocks has largely developed and it has so developed that M. Aufidius Lurco is said to derive an income of sixty thousand sesterces per annum from them. If you keep them for profit it is well to have somewhat fewer males than females; while the contrary is true if you keep them for

pleasure, for the pea-cock far surpasses his hen in beauty. With us they are fed in the country, but abroad it is said that they are kept on islands, as at Samos in the grove of Juno and at Planasia, the island of M. Piso. In setting up a flock age and beauty must be considered, for nature has given the palm of beauty to the pea-cock among all the birds. The hens are not fit for breeding under two years of age, nor when they are aged. They are fed all kinds of grain but chiefly barley. Scius makes a practice of feeding them a modius of barley apiece for the month before they begin to breed, his purpose being to make them more productive. He expects his overseer to raise three pea fowl for every hen, and he sells them when matured for fifty deniers (\$10) a piece, a price such as one never obtains for a sheep.[176]

"Furthermore, he buys eggs and sets them under dunghill hens, transferring the young pea fowls so hatched to the shelter set apart for their kind. This house should be built large enough for the number of pea fowl to be kept and should be equipped with separate roosting places smoothly stuccoed, so that snakes and such vermin may not be able to get into it: and, furthermore, it should have attached to it a run in which the pea fowl may feed on sunny days, and both these places should be kept clean, as this kind of fowl demands. The keeper should make the rounds often with a shovel to collect and preserve their manure, which is not only fit for use in agriculture but serves also as bedding for your pea chicks.

"It is said that Q. Hortensius was the first to serve pea-cocks at dinner, on the occasion of his inauguration as an augur, an evidence of prodigality which was more approved by the luxurious than by good men of simple manners: but many others quickly followed his example, so that the price of pea fowl was raised until an egg sold for five deniers (\$1) and a pea fowl itself readily for fifty (\$10), thus a flock of an hundred of them easily yields an income of forty thousand sesterces, (\$2,000), or even sixty (\$3,000), if, as Abuccius advises, one obtains three chickens from every pea hen."

Of pigeons

VII. In the meanwhile an apparitor came to Appius from the Consul and said that the augurs were summoned. As Appius went out from the *villa publica*, a flock of pigeons flew in, whereupon Merula said to Axius: "If you had established a [Greek: peristerogropheion] you would think that these were your pigeons, although they are wild, for it is the custom to keep both kinds in a [Greek: peristerotropheion]. One is the wild dove (or, as some call them the rock dove, or *saxatilis*), such as live in the towers and dormers (*columines*) of a farm house, whence they get the name *columbae*, because, on account of their natural timidity, they seek the highest places on the roof. On this account wild doves usually frequent towers, to which they may fly from the fields of their own accord, and return.[177] The other kind of pigeons is tamer and are wont to seek their food at the very threshold of a house. This kind is usually white in colour, the wild variety being mottled but without any white. From these two stocks a third or mixed variety has been developed for commercial profit and these are collected in the place which some call a *peristereon* (pigeon house), and others a *peristerotropheion* (place for raising pigeons), where there are often confined as many as five thousand at a time.

"A pigeon house is made like a great dome, with arched roof, a narrow entrance, and grilled windows or with wider lattices on all sides so that the interior may be well lighted and yet no snake or other such pest may have access. The walls and the dome within and the edges of the windows without should be smeared with light stucco to keep out rats and lizards, for nothing is so timid as a pigeon. A round nest should be provided for each pair of pigeons and these should be arranged in close order so that there may be established as many as possible of them ranked from the ground to the very dome. Each nest should have a door no bigger than necessary to enable the pigeons to go in and out but within should be of three palms in

diameter. Under each rank of nests should be fastened planks two palms broad for the use of the pigeons as a vestibule on coming out. Water should be led into the pigeon house, both for them to drink and to bathe in, for pigeons are very clean birds. For this reason the keeper of the pigeons should sweep out the house several times a month, for that which soils it has so great a value in agriculture that some writers even claim that it is the best of all manures. Furthermore, the keeper in these rounds may tend any pigeon which is ailing, remove any which are dead, and take out such squabs as are fit for market. Likewise, those which are setting should be transferred to a particular place, separated from the others by a net but from which the mothers may be free to get out of doors: which is done for two reasons: first, because if they become weary or decrepit from being cooped too long, they will be refreshed by the free air when they go abroad: secondly, because they serve as decoys for other pigeons, for their squabs will always bring them home themselves unless they are struck down by a crow or cut off by a hawk. Pigeon breeders rid themselves of the last mentioned pests by planting in the ground two rods smeared with birdlime and bent in one upon the other, and then tie on some bait so disposed that when the hawk falls upon his prey he finds himself entangled in the birdlime and is taken.

"It may be noted that the pigeon has a homing instinct, as is proved by the practice of many in letting pigeons loose from their bosoms in the theatre expecting them to return home, for if they did not return the practice would not persist.

"The food for pigeons is placed in mangers fastened around the walls and filled from the outside by means of conduits. They thrive on millet, wheat, barley, peas, beans and vetch. This regimen should be followed also, as far as possible, in the care of the wild pigeons, which live on the towers and the roofs of the barn.

"In equipping a [Greek: peristereon] pigeons of good age should be secured, neither squabs nor veterans, and as many males as females. Nothing is more prolific than the pigeon, for in forty days they conceive, lay, hatch and raise a brood, and they keep this up nearly all the year, stopping only from the winter solstice until spring. Squabs are hatched in pairs, and as soon as they have grown up and have strength breed with their own mothers. Those who fatten squabs in order to sell them dearer, make a practice of isolating them as soon as they are covered with feathers, then they cram them with white bread which has been chewed:[178] in winter this is fed twice a day, in summer three times a day, morning, noon and night, the midday meal being omitted in winter. Those which are just beginning to have feathers are left in the nests, but their legs are broken, and, in order that they may be crammed, the food is put before the mothers, for they will feed themselves and their squabs on it all day long. Squabs which are reared in this way become fat more quickly than others and have whiter flesh.

"A pair of pigeons will commonly sell at Rome for two hundred *nummi*, if they are well made, of good colour, without blemish, and of good breed: some times they even bring a thousand *nummi*, and there is a report that recently L. Axius, a Roman of the equestrian order, declined that sum, refusing to sell for less than four hundred deniers." [179]

"If I could procure a fully equipped [Greek: peristereon]," cried Axius, "as readily as I have bought a supply of earthen ware nests, I would have had it already on the way to my farm."

"As if," remarked Pica, "there were not many of them here in town. But perhaps those who have pigeon houses on their roofs do not seem to you to be justified in calling them [Greek: peristereonas] even though some of them represent an investment of more than one hundred thousand sesterces.

I advise you to buy out one of them and learn how to pocket a profit here in town, before you build on a large scale in the country."

Of turtle doves

VIII. "So much for that then," said Axius. "Proceed, please, to the next subject, Merula."

"For turtle doves," said Merula, "in like manner a house should be constructed proportioned to the number you intend to feed, and this, like the pigeon house, I have described, should have a door and windows and fresh water and walls and a vaulted roof, but in place of breeding nests the mutules should be extended through the walls or poles set in them in regular order with hempen mats on them, the lowest rank being not more than three feet from the floor, the rest at intervals of nine inches, the top rank six inches from the vault, and of equal breadth as the mutule stands out from the wall. On these the doves are fed day and night. For food they are given dry wheat, usually a half modius for every one hundred and twenty doves. Every day the house should be cleaned out, that they may not be injured by the accumulation of manure, and because also it has its place in the economy of the farm. The best time for fattening doves is about the harvest, for then the mothers are in their best condition and produce young ones not only in the largest number but the best for cramming: so that is the time when they are most profitable."

Of poultry

IX. "Tell me now, if you please, Merula," said Axius, "what I should know of raising and fattening poultry and wood pigeons, then we can proceed to the discussion of the remainder of our programme."

"There are three kinds of fowls usually classed as poultry," replied Merula, "dunghill fowl, jungle fowl and guinea fowl. The dunghill fowl are those which are constantly kept in the country at farms.

"He who wishes to establish an [Greek: ornithoboskeion] from which, by the exercise of intelligence and care, he can take large profits, as the people of Delos do with such great success,[180] should observe five principal rules: 1° in regard to buying, what kind and how many he will keep: 2° in regard to breeding: 3° in regard to eggs, how they are set and hatched: 4° in regard to chicks, how and by whom they are reared, and 5°, which is a supplement of all the foregoing, how they are fattened.

"The females of the dunghill fowl are called hens, the breeding males cocks, and the males which have been altered capons. Cocks are caponized by burning the spurs[181] with a hot iron until the skin is broken, the wound being poulticed with potters' clay.

"He who wishes to have a model [Greek: ornithoboskeion] should equip it with all three kinds of fowls, though chiefly the dunghill variety. In purchasing these last it is important to choose fertile hens, which are indicated by red feathers, black wings, unequal toes, large heads, combs upstanding and heavy, for such hens are more likely to lay.

"A lusty cock may be known by his muscular carriage, his red comb, a beak short, strong and sharp, eyes tawny or black, wattles a whitish red, neck spotted or tinged with gold, the second joint of his legs well covered with feathers, short legs long spurs, a heavy tail, and profuse feathers, also by his spirit and his frequent crowing, his readiness to fight, and that he is not only not afraid of such animals as do the hens harm, but even goes out to fight them. You must be careful, however, not to buy for breeding any fowls of the breeds known as Tanagran, Medean and Chalcidean, for, while

they are beautiful to look at and are fit for fighting with one another, they are practically sterile.

"If you wish to keep a flock of two hundred, choose an enclosed place and there construct two large poultry houses side by side and looking to the East, each about ten by five feet and a little less than five feet in height, and furnished with windows three by four feet in which are fitted shutters of wickerwork, which will serve to let in plenty of fresh air and light and yet keep out such vermin as prey upon chickens.

"Between the two houses should be a door by which the *gallinarius* who takes care of them, may have access. Within the houses enough poles are arranged to serve as roosts for all the chickens: opposite each roost a nest should be set in the wall. In front of the house should be an enclosed yard to which the fowls may have access in the day time and where they can dust themselves,[182] and there should be constructed the keeper's house, which should be equipped all about with nests, either set into the walls or firmly fastened to them, for the least disturbance injures eggs when they are setting.

"When the hens begin to lay, straw should be spread in their nests and this should be renewed when they begin to set, for in such bedding are bred mites and other insects which will not suffer the hen to be quiet, with the result that the eggs are hatched unequally or rot.

"A hen should not be allowed to set on more than twenty-five eggs, although such is her fecundity that she lays more than that in a season. The best time for hatching is from the spring to the autumn equinox. Eggs laid before or after this season, or the first eggs laid by a pullet, should never be set. Hens used for setting should be old rather than young, without sharp beaks and claws, for those so equipped are better employed in laying than in setting. Hens a year or two years old are better fitted for laying.

"If you set pea-cock eggs under a hen, you should wait ten days before adding hen eggs to the nest, to insure them all hatching together, for the period of incubation of chicken eggs is thrice seven days and that of the eggs of pea-fowl is thrice nine. Sitting hens should be shut up day and night, except for a time in the morning and evening, when they are let out to eat and drink.

"The keeper should make the rounds every few days and turn the eggs, so that they may be kept warm all over. It is said that you can tell whether an egg is fertile or sterile by putting it in water: for if it is sterile it will float, while if it is fertile it will sink. Those who shake their eggs to ascertain this fact make a mistake for thereby they destroy the germ in them. It is also said that you can tell a sterile egg by the fact that it is transparent when held against the light.

"To preserve eggs they should be rubbed with fine salt or soaked for three or four hours in brine, and then cleaned off or packed in chaff or straw. Care should be taken to set eggs only in uneven numbers. The keeper can tell whether an egg is fertile or not four days after it is set, by holding it to the light, when he should throw it out if it is found to be empty and substitute another for it.

"The new hatched chickens should be taken from every nest and given to a hen who has only a few to care for. When in this way a setting hen has less than half her eggs left unhatched, they should be taken from her and put under another hen which has eggs still unhatched. It is not well to give more than thirty chicks to a hen. Chicks should be fed for the first fifteen days in the dust to protect them from injuring their tender beaks on the hard ground: their diet being crushed barley mixed with cress seed and soaked in wine, for prepared in this way the grain is digestible. They should be kept away from water in the beginning. When they begin to have feathers on their legs

the mites should be carefully picked off their heads and necks, for these banes often destroy them. Deer's horn should be burnt around their coops to keep snakes away, for the very smell of those vermin is fatal to young chickens. They should be allowed to run in the sun and to scratch in a dung heap, which serves to develop them. This rule applies not only to young chickens but also to the entire [Greek: ornithoboskeion], and should be practised all summer and even in winter on mild and sunny days. A net should be stretched over the chicken yard to keep the fowls themselves from flying out and to protect them from hawks and other birds of prey. Fowls should be protected from heat as well as cold, for both are harmful to them. When the chicks have got their feathers it is best to accustom them to follow one or two hens, leaving the other hens free to go to laying, in which occupation they are more useful than in rearing chicks.

"A hen should be set after the new moon, for those which begin earlier seldom hatch many chicks.

"They hatch usually in twenty days.

"And now since I have discussed the dunghill fowl at some length, I will make up to you by brevity with respect to the other kinds of fowls.

"Jungle fowl are rarely seen at Rome, and then usually in cages. They resemble guinea chickens more than dunghill fowls. When perfect in form and appearance they are often carried in the public processions with parrots and white blackbirds and other such rarities. They do not usually lay or raise their chickens on a farm, but in the forests. The island of Gallinaria, which lies in the Tuscan sea off the coast of Italy, opposite the Ligurian mountains (and the towns of Intermelii and Alba Ingannua) derives its name from them, though some maintain that the name comes from dunghill fowl which were carried to that island by sailors and have there run wild. Guinea fowl (*gallinae africanae*) are large, mottled and have their humps in their

backs. The Greeks call them [Greek: meleagrís].[183] They are the last fowls which the culinary art has introduced to our dining tables, on account of their gamy flavour.[184] By reason of their rarity they sell for a high price.

"Of the three kinds of fowls, the ordinary dunghill fowl is used chiefly for cramming. For this purpose they are shut up in a small confined and darkened coop, because both exercise and light are enemies of fat. Any large chickens may be selected for this operation, not necessarily of that breed which the peasants call Melica incorrectly, for as the ancients said Thelis when they meant Thetis, so the country people still say Melica for Medica. This name was given at first to the fowls which were imported from Medea on account of their great size and then to all of that breed, but now the name is given indiscriminately to all large fowls by reason of their general resemblance. After the feathers have been pulled from their tails and wings they are crammed with balls of barley paste, with which may be mixed darnel meal, or flax seed soaked in soft water. They are fed twice a day but care must be taken to see that the last meal is digested before another is put before them. After they have been fed and their heads have been cleaned of mites, they are shut up again. This process is kept up for twenty-five days, when they will be fat.

"Some cram them on wheat bread soaked in water, or even in wine of good flavour and bouquet, claiming that they are thereby made fat and tender in twenty days.[185]

"If in the process of cramming the fowls lose their appetite from too much food, the ration should be reduced daily during the last ten days in the same proportion as it was increased during the first ten days, so that the ration will be the same on the twentieth as on the first day.

"Wood pigeons are crammed and fattened in the same way."

Of geese

X. "Let us now pass," said Axius, "to that tribe which cannot live in the barn yard all the time, or even on land, but requires access to ponds. I mean those whom you philhellenes call amphibia. I understand that you call the places in which geese are kept by the Greek name [Greek: chaenoboskeion], and that Scipio Metellus and M. Seius have several large flocks of geese."

"It is Seius' practice," said Merula, "to maintain his flocks of geese[186] in accordance with the five rules I have laid down for poultry, namely: with respect to choice of individuals, breeding, eggs, goslings and the process of cramming.

"On the first point he requires the slave who buys his geese to select them of good size and of white plumage, because they reproduce their own qualities in their goslings. This is necessary for there is another kind of geese of variegated plumage, which are called wild, and do not flock freely with the other kind and are domesticated with difficulty.

"The best time for breeding geese is at the end of winter and for laying and hatching from the beginning of February or March until the summer solstice. They breed usually in the water, diving to the bottom of the stream or pond.[187] A goose lays only three times a year: and each one should be furnished with a coop about two and a half feet square and bedded with straw: each of their eggs should be marked for identification, for they will not hatch any eggs but their own. They are usually set on nine or eleven eggs, never more than fifteen, nor less than five. In cold weather they set for thirty days, in warm weather twenty-five. When they are hatched the goslings are suffered to remain with their mother for five days, and then daily, when the weather is fine, they are driven out to the meadows or to the ponds or some swampy place. The gosling houses may be built either above

or below ground, but never more than twenty should be housed together and care must be taken lest the floor be damp and that they are bedded on chaff or some thing of that kind, and that the house is so constructed as to keep out weasels and other beasts which prey on goslings. Geese are fed in wet places and it is the practice to sow especially for their food supply, using for this purpose any kind of grain, but particularly that salad plant called endive[188] which keeps green wherever there is water, freshening at the mere contact of water however dry it may be. This is gathered to be fed to them, for if they have access to the place where it is growing they will destroy the plant by trampling on it, or else kill themselves by eating too much of it, for they are greedy by nature. For this reason they must be watched, as often in feeding their greediness leads them to seize a root and to break their own necks in attempting to pull it from the ground: for the neck is weak, as the head is soft.

"If there is none of this plant they should be fed barley or some other grain. When the farrago season is on, feed that to them, but in the same manner as I have described in respect of endive. While they are setting they may be fed ground barley soaked in water. The goslings may be fed for the first two days on barley cake (*pollenta*) or raw barley, and for the next three days fresh water cress chopped fine in a dish. When they are of an age to be kept by themselves in flocks of twenty, in the kind of house I have described, they are fed on barley meal or farrago or some kind of young herbage cut up.

"For cramming, goslings are picked out when they are about six months old, and are shut up in the fattening pen and there are fed three times a day as much as they will eat, of crushed barley and flour dust mixed with water, and after meals they should be made to drink copiously. Kept on this diet they will be fat in about two months.[189] After every meal the feeding

place must be cleaned, for, while geese like a clean place, they never leave any place clean in which they have been."

Of ducks

XI. "Whoever wishes to keep a flock of ducks and to establish a [Greek: naessotropheion], should choose for it, above all others if it is possible, a swampy location because that is most agreeable to the ducks, but, if not, then a situation sloping to a natural lake or pool, or to an artificial pond, with steps leading down to it, practicable for the ducks. The enclosure where they are kept should have a wall fifteen feet high, such as you saw at Seius' villa, with only one door opening into it. All around the wall on the inside should run a broad platform on which are built against the wall the duck houses, fronting on a level concrete vestibule in which is constructed a permanent channel in which their food can be placed in water, for ducks are fed in that way. The entire wall should be given a smooth coating of stucco to keep out polecats[190] and other animals of prey, and the enclosure should be covered with a net of large mesh to prevent eagles from pouncing in and the ducks themselves from flying out.[191]

"For food they are given wheat, barley, grape marc, and some times even lobsters and other such aquatic animals. The pond in the enclosure should be fed with a large head of water so that it may be kept always fresh.

"There are other kinds of similar birds, like teals and coots which may be fed in the same way.

"Some even keep partridges, which, as Archelaus writes, conceive when they hear the voice of the male bird. By reason of the natural abundance and the delicacy of their flesh, these last are not crammed like those domestic fowls I have described, but they are fattened by feeding in the ordinary way.

"And now, as I think that I have completed the first act of the drama of the barn yard, I am done."

Of rabbits

XII. At this point Appius returned and, after an exchange of questions and answers as to what had been said and done during his absence, he said: "Here beginneth the second act of those industries which are wont to be practised at a villa, namely of those enclosures which are still known as *leporaria* from their ancient special designation. Today a warren no longer means an acre or two in which hares are kept, but some times forests of vast extent in which troops of red deer and roe deer are enclosed. Q. Fulvius Lippinus is said to have forty jugera enclosed in the neighbourhood of Tarquinii[192] where he keeps not only those animals I have named but wild sheep as well. Parks of still larger extent are found in the territory of Statonia (in Etruria) and in certain other places: indeed, in transalpine Gaul T. Pompeius has so great a game preserve that the enclosure is about four miles in extent.[193]

"It is the practice to keep in such enclosures not only the animals I have named, but also snail houses and bee hives and jars in which dormice are fed, but the care and the increase and the feeding of all these things are easy, except in the case of bees. Who does not know that a *leporarium* should be enclosed with masonry walls which are at once smooth and high the one to keep out wild cats and badgers and other such beasts: the other to prevent wolves from getting over. Within should be coverts where the hares may lurk in the day time under bushes and grass, and trees with broad spreading branches to ward off the attacks of the eagle.

"Who does not know also that if he introduces only a few hares of both sexes in a short time the place will be full of them, for such is the fecundity

of this quadruped that two pair are enough to stock an entire warren in a short time. Often a mother who has just had her litter is found to be big with another: indeed, Archelaus says that if you want to know how old a hare is you have only to count the number of openings in her belly, for without doubt there is one for every year of her life.

"It has recently become the practice to cram hares as well as poultry, and for this purpose they are taken out of the warren and shut up in small hutches where they are fattened. There are three kinds of hares: the first, our common Italian kind, which has short front legs and long hind legs, the upper part of the body dark coloured, the belly white, and long ears. Some say that our hare conceives a second time while it is still big. In transalpine Gaul and Macedonia they grow to a great size, but in Spain and in Italy they are not so large. The second kind is native in Gaul near the Alps, and is white all over the body: these are brought to Rome, but rarely. The third kind is native in Spain and is like our hare in every way except that it is smaller and is called rabbit (*cuniculus*).[194] L. Aelius thinks that the hare (*lepus*) gets his name from his swiftness, as it were that he is light of foot (*levipes*), but I think the name is derived from the ancient Greek, because the Aeolians of Boeotia call him [Greek: leporis]. The rabbits derive their latin name of *cuniculi* from the habit of making underground burrows to hide in [for *cuniculus* is a Spanish word for mine]. If possible you should have all these three kinds in your warren. I am sure you already have the first two kinds," Apicius added, turning to me, "and, as you were so many years in Spain doubtless some rabbits followed you home."

Of game preserves

XIII. Then addressing himself again to Axius, Appius continued:

"You know, of course, that wild boars are kept in game parks, and that those which are brought in wild are fattened with as little trouble as the tame ones which are born in the park, for you have doubtless seen at the farm near Tusculum, which Varro here bought from M. Pupius Piso, wild boars and roe bucks assemble at the sound of the trumpet to be fed at regular hours, when from a platform, the keeper scatters mast to the wild boars and vetch or some such forage to the roe bucks."

"I saw this done," put in Axius, "more dramatically when I was a visitor at the villa of Q. Hortensius in the country near Laurentum. He has there a wood of more than fifty jugera in extent, all enclosed, but it might better be called a [Greek: theriotropheion] than a warren; there on high ground he caused his dinner table to be spread, and while we supped Hortensius gave orders that Orpheus be summoned: when he came, arrayed in his long robe, with a cithara in his hands, he was desired to sing. At that moment a trumpet was sounded and at once Orpheus was surrounded by a large audience of deer and wild boars and other quadrupeds: it seemed to be not less agreeable a spectacle than the shows of game, without African beasts, which the Aediles provide in the Circus Maximus."

Of snails

XIV. And turning to Merula, Axius continued: "Appius has lightened your task, my dear Merula, so far as concerns the matter of game, and briefly the second act of our drama may be brought to an end, for I do not seek to learn any thing about snails and dormice, which is all that is left on the programme, for there can be no great trouble in keeping them."

"It is not so simple as you seem to think, my dear Axius," replied Merula, "for a place suitable for keeping snails[195] I must be not only in the open air but entirely surrounded by water, otherwise you will be kept running not

only after the children but also the parents which you have supplied for breeding."

"In other words," said I, "they must be enclosed by water to save the maintenance of a slave catcher."

"A place which is not baked by the sun and on which the dew remains is preferable," continued Merula. "If the place you use for your snails is not supplied with dew naturally, as often is the case in sunny situations, and there is no available shady recess, such as is found under rocks or hills whose feet are laved by a lake or a stream, then you must supply dew artificially. This may be done by leading into the snailery a pipe on the end of which is fixed a rose nozzle, through which water is forced against a rock so that it scatters in spray. The problem of feeding snails is small, for they supply themselves without help, finding what they require as they creep over the level ground and also while clinging to the sides of a wall, if no running water prevents their access to it. On the hucksters' stands they keep alive a long time, as it were chewing their own cud, all that is done for them being to supply a few laurel leaves and scatter a little bran over them: so a cook never knows whether he is cooking them alive or dead.

"There are many kinds of snails, such as the small white ones, which come from Reate: the large variety which are imported from Illyricum, and the medium size which come from Africa: but they vary in size in certain localities of each of those countries. Thus, there is found in Africa a variety which are called *solitannae* of so great size that their shells will hold ten quarts:[196] and so in the other countries I have named they are found together of all sizes. They produce an innumerable progeny, which at first are very small and soft but develop their hard shell with time. If you have large islands in the enclosure you may expect a rich haul from your snails.

"Snails are fattened by placing them in a jar smeared with boiled must and corn meal, on which they feed, and pierced with holes to admit the air, but they are naturally hardy."

Of dormice

XV. "Dormice[197] are preserved on a different system than snails, for while the one is confined by barriers of water, the other is kept in by a wall which must be coated on the inside with smooth stone or stucco to prevent their escape. Young nut trees should be planted in the enclosure, and when these are not bearing, mast and chestnuts should be thrown in to the dormice, for that is what makes them fat. Roomy cages should be provided for them in which to rear their young.[198] Little water is necessary, for dormice do not require much water, but on the contrary affect dry places. They are fattened in jars which are usually kept indoors. The potters make these jars in different shapes, but with paths for the dormice to use contrived on the sides and a hollow to hold their food, which consists of mast, walnuts and chestnuts.[199] Covers are placed on the jars and there in the dark the dormice are fattened."

Of bees

XVI. "It remains now," said Appius, "to rehearse the third and last act of our drama of the husbandry of the steading and to discuss the keeping of fishes."

"The third, indeed," exclaimed Axius, "shall we deprive ourselves of honey because in your youth you never drank mead in your own house, such was your practice of frugality?"

"He speaks the truth," said Appius, to us, "for I was indeed left a poor orphan with two brothers and two sisters to provide for, and it was not until I had married one of them to Lucullus without portion and he had named me his heir that I began to drink mead in my own house and to supply it to my household: but there never was a day when I did not offer it to all my guests. But apart from that, it has been my fortune, not yours,[200] Axius, to have known these winged creatures whom nature has endowed so richly with industry and art, and that you may appreciate that I know more than you do of their almost incredible natural art, listen to what I am to say. It will then be for Merula to develop the practice of the bee keeper, or, as the Greeks call it, [Greek: melittourgia], as methodically as he has his other subjects.

"To begin then,[201] bees are generated partly by other bees and partly from the decaying carcase of an ox: so Archelaus in one of his epigrams calls them

'flitting offspring of decaying beef,'

and else where he says,

'wasps spring from horses, bees from calves.'

"Bees are not of a solitary habit like eagles, but are of a social nature, like men, a characteristic they share with daws, but not for the same reason, for bees live in colonies, the better to work and build, while daws congregate for gossip. Thus the life of a bee is one of intelligence and art, for man has learned from them to manufacture, to build, and to store his food: three occupations which are not the same but are diverse in their nature, for it is one thing to provide food, another to manufacture wax and honey, and still another to build a house. Has not each cell in a honey comb six sides, or as many as a bee has feet, the art of which arrangement appears in the teaching

of the geometricians that of all polygons the hexagon covers the largest area within a circle.[202] Bees feed out of doors, but it is at home that they manufacture that which is the sweetest of all things, acceptable to gods and men alike: for honey comb is offered on the altars and honey is served at the beginning of a dinner and again at dessert.

"Bees have institutions like our own, consisting of royalty, government and organized society. Cleanliness in all things is their aim: and so they never alight in any place where there is filth or an evil odour, or even where there is a strong savour of such an unguent as we may consider agreeable. For the same reason if one who approaches them is covered with perfume, [203] they do not lick him as flies do, but they sting him, and by the same token no one ever sees bees crawling on meat and blood and grease, as flies do. And so they only settle in places of sweet savour. They do a minimum of damage because in their harvesting they leave what they touch none the worse.[204] They are not so cowardly as not to resist who ever attempts to disturb them, and yet they are fully conscious of their own weakness. They are called the Winged Servants of the Muses, because when they swarm they are quickly brought together by the music of cymbals and the clapping of hands: and as men assign Helicon and Olympus to be the haunts of the Muses, so nature has attributed the flowery and uncultivated mountains to the bees. They follow their king[205] wheresoever he goes, supporting him when he is tired and even taking him upon their backs if he is unable to fly, so do they wish to serve him.[206] As they are not idlers themselves, so do they hate those who are, and thus driving out the drones, they exclude them from the hive, because they are of no service but merely consume honey: and it happens that a few bees, buzzing with wrath, will drive out a number of drones.

"They smear every thing about the entrance to the hive with a gum which is found between the cells which the Greeks call [Greek: erithakae]. They

live under the discipline of an army, taking turns in resting and all doing their equal share of work, and they send out colonies and carry out the orders of their leaders, given with the voice, but as it were with a trumpet: and in like manner they have signs of peace and of war.

"But, Merula, now in my course I pass on the torch to you, as our Axius here is doubtless languishing while he has listened to all this natural history, for I have said nothing of profit."

"I do not know," said Merula, "whether what I can say on the subject of the profit to be derived from bees will satisfy you, Axius, but I have as my authorities not only Seius, who takes five thousand pounds of honey every year from the hives he leases,[207] but also our friend Varro here, for I have heard him tell of two brothers Veiani, from the Falerian territory, whom he had under his command in Spain and who, although their father left them only a small house with a curtilage of not exceeding a jugerum in extent, nevertheless made themselves rich. They set bee hives all about the house and planted part of the land in a garden and filled up the rest with thyme and clover and that bee plant known to us as *apiastrum*, though some call it [Greek: meliphullon], others [Greek: mellissophullon] and still others *melittaena*: and by this means they were wont to derive, as they estimated, an average income of not less than ten thousand sesterces per annum from honey; but they did this by being willing to wait until they could sell at their own time and price rather than by forcing the market."

"Tell me," exclaimed Axius, "where and how I should establish a beestand to make such a handsome profit."

"The apiary," replied Merula, "which some call by the Greek names [Greek: melitton] and [Greek: melittotropheion], and others *mellarium*, should preferably be placed near the house[208] in a location where there is no echo (for such sounds are deemed to put them to flight, as timid men are

by the din of a battle) and where the temperature is mild, exposed neither to the heat of summer nor the cold of winter, giving preferably to the Southeast and near of access to places where their food is abundant and there is a supply of fresh water. If there is no natural supply of food available you should plant such things as best serve bees for pasture, namely: roses, thyme, bee balm,[209] poppies, beans, lentils, peas, basil, gladiolus, alfalfa, and especially clover which is of great service to the bees which are sick, for it begins to bloom at the vernal equinox and lasts until that of autumn. As clover is the best food for sick bees, so thyme is the best for making honey, and it is because Sicily abounds in good thyme that it takes the palm for producing honey. On this account some men bruise thyme in a mortar and mix warm water with it and then spray all their nursery plants with it for the sake of the bees.

"The hives should be set as near the house as convenient: some men even put them under the very portico for greater safety. Hives are made in various shapes and sizes and of different material;[210] thus some make them round out of wicker work: others of frame covered with bark: others use hollow tree trunks: others vessels of pottery: some even build them square out of rods, allowing about three feet in length and a foot in height, but these dimensions should be reduced where you have not enough bees to fill a hive of that size, for fear that the bees might become discouraged by too large an empty space.

"The bee hive derives its name *alvus*, which is the same as our word for belly, from the fact that it holds food, that is to say, honey; and it is on this analogy that hives are usually shaped to imitate the form of the belly, small in the waist and bulging out below. When the hives are made of wicker work they should be coated evenly within and without with ox dung[211] so that the bees may not be driven away by the roughness of their roof. The hives should be so ordered under the shelter of a wall that they may not be

disturbed nor touch one another when arranged in ranks, for it is the practice to place hives in two and some times three separated ranks, but the opinion is that it is better to reduce the ranks to two than to increase them to four. In the middle of the hive small openings are made on the right and the left to serve as entrances for the bees, and on top is placed a practicable cover, which may be removed to give access to the honey comb. This is best when made of bark, and worst of pottery, because that is strongly affected both by the cold of winter and the heat of summer. In spring and summer the bee keeper should inspect each hive at least three times a month, fumigating them lightly, cleaning and throwing out dirt and worms. At the same time he should take precautions to keep down the number of princes, for they keep the bees from work by stirring up sedition. There are said to be three kinds of royalties among the bees: the black, the red and the mottled, or, as Menecrates writes, two: the black and the mottled: and as the latter is the better it behooves the bee keeper, when he finds both kinds in a hive, to kill the black one, as he is forever playing politics[212] against the other king, whereby the hive must suffer, for inevitably one of the kings will flee or be driven out, in either case taking his party with him.

"Of working bees the small round mottled variety is considered the best. The drone, or, as some call him, the thief,[213] is black with a large belly. The wasp, which has some resemblance to a bee, is not, however, a fellow labourer, but attacks the bees with his sting, wherefore the bees keep him at a distance.

"Bees are themselves distinguished as wild and tame. I call those wild which feed in the forests, and those tame which feed in cultivated places. The forest bees are smaller in size and hairy but better workmen.

"In buying bees it behooves the purchaser to see whether they are well or ailing. The signs of health are a thick swarm, well groomed appearance and

a hive being filled in a workmanlike manner. The signs of lack of condition on the other hand are a hairy and bristling appearance and a dusty coat, unless this last is caused by a pressure of work, for under such circumstances they often wear themselves down and become thin.

"If the hives are to be transferred from one place to another it is necessary to choose a fit time to make the move and a suitable place to receive them. As to time, spring is preferable to winter because in winter they have difficulty in adjusting themselves to a new location and so often run away, as they do also if you move them from a good location to a place where proper pasture is not available. Nor is a transfer from one hive to another in the same place to be undertaken carelessly, but that to which the bees are to be transferred should be rubbed with bee balm, which will serve as a bait for them, and some pieces of honey comb should be placed in it, not far from the entrances, for fear that the bees might run away if they found the larder of their new home empty.

"Menecrates says that bees contract a malady of the bowels from their first spring pasture on the blossoms of the almond and the cornel cherry and are cured by giving them urine to drink.[214]

"That gummy substance which the bees use, chiefly in summer to construct a sort of curtain between the entrance and the hive, is called *propolis*, and by the same name is used by physicians in making plasters: by reason of which use it sells in the Via Sacra for more than honey itself. That substance which is called *erithacen*, and is used to glue the cells together, is different from both honey and *propolis*: it is supposed to have a quality of attraction for bees and is accordingly mixed with bee balm and smeared on the branch or other place on which it is desired to have a swarm light. The comb is made of wax and is multicellular, each cell in it having six sides or as many as nature has given the bee feet. It is said that bees do not gather

from the same plants all the materials which enter in these four substances which they manufacture, namely: propolis, erithacen, wax and honey. Thus from the pomegranate and the asparagus they gather food alone, wax from the olive tree, honey from the fig, but not of good quality: other plants like the bean, the bee balm, the gourd and the cabbage serve a double purpose and yield both wax and food: while the apple and the wild pear serve a similar double purpose but for food and honey and the poppy again for wax and honey.

"Others again provide material for three purposes, food, honey and wax, such as the almond and the charlock.[215] In like manner there are flowers from each of which they derive a different one of these substances, and others from which they derive several of them: while they make distinctions in respect of plants according to the quality of the product they yield,—or rather the plants make the distinction for them—as with respect to honey, some yield liquid honey, like the skirwort,[216] and others thick honey like the rosemary. So again honey of insipid flavour is made from the fig, good honey from clover, and the best of all from thyme.

"And since drink is part of a bee's diet and water is the liquid they use, there should be provided near the stand a place for them to drink, which may be either a running stream or a reservoir not more than two or three fingers deep in which bricks or stones are placed in such a way as to project a little from the water, and so furnish a place for the bees to sit and drink; but the greatest care must be taken to keep this water fresh, as it is of high importance to the making of good honey.

"As the bees cannot go out to distant pasture in all weathers, food must be prepared for them, as otherwise they will live on their supply of honey and so deplete the store in the hive. For this purpose ten pounds of ripe figs may be boiled in six congii of water and bits of the paste thus prepared

should be set out near the hives. Others provide honey water in little dishes and float flocks of clean wool on them through which the bees may suck without risk of either getting more than is good for them or of being drowned. One such dish should be provided for each hive and they should be kept filled. Others again bray dried grapes and figs together and, mixing in some boiled must, make a paste of which bits are exposed near the hives during such part of the winter as the bees are still able to go forth in search of food.

"When a swarm is about to come out of the hive (which happens when a number of young bees have matured, and the hive determines to send their youth out to found a colony, as formerly the Sabines often were compelled to do on account of the number of their children)[217] there are two signs by which the intention may be known: one that for several days beforehand, and especially in the evening, many bees weave themselves together and hang upon the entrance of the hive like grapes: the other that when they are about to go forth or have already begun to go they buzz together lustily, as soldiers do when they break camp. Those who have come forth first fly about the hive waiting for the others, who have not yet collected, to join them. When the bee keeper notices this he has only to throw dust on them and at the same time beat upon some copper vessel to collect them, thoroughly frightened, where he desires in some nearby place on which he has smeared erithacen and bees' balm and other things in which they delight. When they have settled down he should place near them a hive smeared within with the same baits, and then, by blowing a light smoke around them, compel them to enter the hive. When thus introduced into their new abode the swarm makes itself at home cheerfully, so that even if placed next to the parent hive they will prefer their new colonial settlement.

"And now, having told you all I know about the care of bees, I will speak of that for which the industry is carried on, that is to say, of the profit.

"The honey is taken off when the hive is full, as may be determined by removing the cover of the hive, for if the openings of the combs are seen to be sealed, as it were with a skin, then the hive is full of honey: but the bees themselves give notice of this condition by keeping up a loud buzzing within, by their agitation when they go in and out and by driving out the drones.

"In taking off honey some say that you should be content with nine parts, leaving the tenth, because if you take it all the bees will desert the hive: others leave a still larger proportion than I have mentioned.

"As those who crop their corn land every year obtain good yields only at intervals, so it is with bee hives: you will have more industrious and more profitable bees if you do not exact of them the same tribute every year.

"It is considered that honey should be taken off for the first time at the rising of the Pleiades, for the second time at the end of summer before Arcturus has reached the zenith, and for the third time after the setting of the Pleiades, but this last time beware not to take more than one-third of the store even if the hive is full, leaving the other two-thirds for the winter supply, but if the hive is only partially filled nothing should be taken off. In any event, when a large amount of honey is to be taken off a hive it should not be done all at once or ostentatiously lest the bees be discouraged. Those combs which, on being taken off, are found to be partly unfilled with honey or to be soiled, should be pared with a knife.

"Care must be taken that the weaker bees in a hive are not oppressed by the stronger, for this diminishes the profit: to this end the minority party[218] may be colonized under another king. When bees are given to fighting with one another, you should sprinkle them with honey water, upon which they will not only cease fighting but will crowd together and kiss one another: and this will prove the case even more if they are sprinkled with

mead, for the savour of the wine in it will cause them to apply themselves so greedily that they will fuddle themselves in sucking it. If the bees seem lazy about coming out to work and any part of them get the habit of remaining in the hive, they should be fumigated and odoriferous herbs, like bees' balm and thyme, should be placed near the hive. Watchful care is necessary to protect them from ruin by heat or cold. If the bees are overtaken by a sudden rain or cold while at pasture (which rarely happens for they usually foresee such things) and are stricken down by the heavy rain drops and laid low and stunned, you should gather them in a dish and place them under cover in a warm place until the weather has cleared, when they should be sprinkled with ashes of fig wood (making sure that the ashes are rather hot than warm) the dish should then be shaken gently without touching the bees with your hand, and placed in the sun. When the bees feel this warmth they revive and get on their feet again, just as flies do after they have been apparently drowned. This should be done near the hive so that when the bees have come to themselves they may return home and to work."

Of fish ponds

XVII. Here Pavo returned and said: "You may weigh anchor now if you wish. The drawing of the lots of the tribes to determine a tie vote is over and the herald is announcing the result of the election."

Appius arose without delay and went to congratulate his candidate, and escort him home.

Merula said: "I will leave the third act of our drama of the husbandry of the steading to you, Axius," and went out with the others, leaving Axius with me to wait for our candidate whom we knew would come to join us. Axius said to me: "I do not regret Merula's departure at this point, for I am

quite well up on the subject of fish ponds, which still remains to complete our programme.

"There are two kinds of fish ponds, of fresh water and salt water. The former are commonly maintained by farmers and without much expense, for the Lymphae, the homely goddesses of the Fountains, supply the water for them, while the latter, the sea ponds, are the play things of our nobles and are furnished with both water and fishes, as it were by Neptune himself: serving more the purposes of pleasure than of utility, their accomplishment being rather to empty than to fill the exchequers of their lords. For in the first place they are built at great expense, then they are stocked at great expense, and finally they are maintained at great expense.

"Hirrus was wont to derive an income of twelve thousand sesterces from the buildings surrounding his fish ponds, all of which he spent for food for his fishes: and no wonder, for I remember that on one occasion he lent two thousand *murenae* to Caesar[219] by weight (stipulating for their return in kind), so that his villa (which was not otherwise extraordinary) sold for four million sesterces on account of the stock of fish.

"In sooth, the inland ponds of our farmer folk may well be called *dulcis*, and those other *amara*. [220]

"A single fish pond suffices us simple folk, but those amateurs must have a series of them linked together: for as Pausias and other painters of his school have boxes with as many compartments as they have different coloured wax, so must they fain have as many ponds as they have different varieties of fish.

"These fish are furthermore sacred, more sacred, indeed, than those fish which you, Varro, say you saw in Lydia, (at the same time that you saw the dancing isles)[221] which came to the shore, where the altar was erected for

a sacrifice, in shoals at the sound of the Greek pipe, because no one ever ventured to molest them; so no cook has ever been known to have 'sauced' one of these fishes.[222]

"When our friend Hortensius had those fish ponds at Baulii, which represented so large an investment, he was wont to send to Puteoli to buy the fish he served on his table, as I have often seen when I was visiting him. And it was not enough that his fishes did not supply his table, but he was at pains to supply theirs, taking greater precautions lest his mullets (*mulli*) should go hungry than I do for my mules in Rosea, and it was not at less cost that he supplied meat and drink to his stock than I do to mine. For I raise my asses, which bring such fancy prices, at the cost of one servant, a little barley and the water which springs from my land, while Hortensius must needs maintain a fleet of fishermen to keep him supplied with small fry to feed to his fish, or, when the sea runs high and such deep sea forage is cut off by a storm, and it is not possible even to draw live bait ashore in a net, he is fain to buy in the market for the delectation of the denizens of his ponds the very salt fish which is the food of the people."

"Doubtless," said I, "Hortensius would prefer to have you take the carriage mules out of his stable than one of his barbel mules from the fish pond."

"Yes, indeed," agreed Axius, "and he would rather have a sick slave drink cold water than that his beloved fish should be risked in that which is fresh. On the other hand, M. Lucullus was reputed to be so careless and neglectful of his fish ponds that he did not provide any suitable quarters for his fishes in hot weather, but permitted them to remain in ponds which were unhealthy with stagnant water: a practice very different from that of his brother L. Lucullus, who yielded nothing to Neptune himself in his care of his fishes, for he pierced a mountain at Naples, and so contrived that the sea

water in his fish ponds should be renewed by the action of the tides. Furthermore, he has arranged that his beloved fishes may be driven into a cool place during the heat of the day, just as the Apulian shepherds do when they drive their flocks along the drift ways to the Sabine mountains: for so great was his ardour for the welfare of his fishes that he gave a commission to his architect to drive at his sole cost a tunnel from his fish ponds at Raise to the sea, and by throwing out a mole contrived that the tide should flow in and out of his fish ponds twice a day, from moon to moon, and so cool them off."

At this moment, while we were talking, there was a sound of foot steps on the right and our candidate came into the *villa publica* arrayed in the broad purple of his new rank as an aedile. We went to meet him and, after congratulations, escorted him to the Capitol, whence he departed for his home and we to ours.

So there, my dear Pinnius, is the brief record of our discourse on the husbandry of the stading.

FOOTNOTES:

[Footnote 1: "The manner in which the ancients managed their fallow is certainly most worthy of our attention: their care in ploughing, according to the situation of the land, and nature of the climate, and their manner of adapting the kind of ploughing to answer the purposes intended by the operation, are also most worthy of our imitation. Their exactness in these things exceeds any thing of the kind found amongst the moderns, and is even beyond what any practical writer on agriculture has proposed. This is an evidence that tillage is not even in this age brought to that perfection of which it is capable: and that, notwithstanding all the improvements lately introduced, we may yet receive some instruction from a proper attention to the precepts and practices of the ancients. I am desirous to add that this attention may be useful by preventing improvers from running into every specious scheme of agriculture produced by a lively imagination and engaging them to study the great variety of soils and even climates in this island, and to be careful in adapting to these their several operations." Dickson *Husbandry of the Ancients*, XXIII.

The Rev. Andrew Dickson, who died in 1776, was minister of Aberlady in the county of East Lothian, the son of a progressive and successful Scots farmer, and had experience in practical agriculture, as well as in scholarship, as his book shows.]

[Footnote 2: The compilation of rural lore, known as the *Geoponica*, which exists in Greek, was made at Byzantium for the Emperor Constantine VII about the middle of the tenth century A.D. It is very largely a paraphrase of the Roman authors, and is useful principally in elucidating their textual difficulties.]

[Footnote 3: Donald G. Mitchell made an interesting collation, in his *Wet Days at Edgewood*, of the large number of books on agriculture which have been written in old age and by men of affairs, in many lands and many languages.]

[Footnote 4: It is interesting to record, however, that Varro received the *Navalis Corona* for personal gallantry in the war against the pirates. This distinction was even more rare than our modern Medal of Honor or Victoria Cross, and was awarded only to a commander who leapt under arms on the deck of an enemies' ship and then succeeded in capturing her.]

[Footnote 5: Caesar did not live to accomplish this, but some years after his death a public library was established at Rome by Asinius Pollio, which Pliny says (H.N. VII, 31) was the first ever built, those at Alexandria and Pergamus having been private institutions of the kings.

In a land where public libraries have been every where founded out of the accumulations of Big Business, it is interesting to note that Pollio derived the funds with which this the first of their kind was endowed, from the plunder of the Illyrians!]

[Footnote 6: Cf. Sellar, *Roman Poets of the Augustan Age*. Virgil Ch. V. Boissier, *Etudes sur M.T. Varron*, Ch. IX. Servius *Comm. in Verg. Georg.* I, 43.

It does not appear that many of the commentators on Virgil have taken the trouble to study Varro thoroughly. They are usually better scholars than farmers.]

[Footnote 7: It is not remarkable that Virgil failed to make acknowledgment to Varro in the *Georgics* when he failed to make acknowledgment to Homer in the *Aeneid*. See Petrarch's *Epistle to Homer* for a loyal but vain attempt to justify this neglect.]

[Footnote 8: Cf. W.H. Myers' *Classical Essays*, p. 110: "For in the face of some German criticism it is necessary to repeat that in order to judge poetry it is, before all things, necessary to enjoy it. We may all desire that historical and philological science should push her dominion into every recess of human action and human speech, but we must utter some protest when the very heights of Parnassus are invaded by a spirit which surely is not science, but her unmeaning shadow; a spirit which would degrade every masterpiece of human genius into the mere pabulum of hungry professors, and which values a poet's text only as a field for the rivalries of sterile pedantry and arbitrary conjecture."]

[Footnote 9: It was perhaps this encomium upon the farmer at the expense of the banker which inspired Horace's friend Alfius to withdraw his capital from his banking business and dream a delicious idyl of a simple carefree country life: but, it will be recalled (Epode II, the famous "Beatus ille qui procul negotiis") that Alfius, like many a modern amateur farmer, recruited from town, soon repented that he had ever listened to the alluring call of "back to the land" and after a few weeks of disillusion in the country, returned to town and sought to get his money out again at usury.

Columella (I, praef.) is not content with Cato's contrast of the virtue of the farmer with the iniquity of the banker, but he brings in the lawyer's

profession for animadversion also. This, he says, the ancient Romans used to term a canine profession, because it consisted in barking at the rich.]

[Footnote 10: The Roman numerals at the beginning of the paragraphs indicate the chapters of Cato from which they are translated. If Cato had not pretended to despise every thing which smacked of Greek literary art he might have edited and arranged his material, in which event his book would have been easier to read than it is, and no less valuable. Modern scholarship would not now venture to perform such an office for such a result, because it involves tampering with a text (as who should say, shooting a fox!) and yet modern scholarship wonders at the decay of classical studies in an impatient age. At the risk of anathema the present version has attempted to group Cato's material, and in so doing has omitted most of those portions which are now of merely curious interest.]

[Footnote 11: This, of course, means buying at a high price, except in extraordinary cases. There is another system of agriculture which admits of the pride of making two blades of grass grow where none was before, and the profit which comes of buying cheap and selling dear. This is farming for improvement, an art which was well described two hundred years before Cato. Xenophon (*Economicus* XX, 22) says:

"For those who are able to attend to their affairs, however, and who will apply themselves to agriculture earnestly, my father both practised himself and taught me a most successful method of making profit; for he would never allow me to buy ground already cultivated, but exhorted me to purchase such as from want of care or want of means in those who had possessed it, was left untilled and unplanted. He used to say that well cultivated land cost a great sum of money and admitted of no improvement, and he considered that land which is unsusceptible of improvement did not give the same pleasure to the owner as other land, but he thought that

whatever a person had or bought up that was continually growing better afforded him the highest gratification."]

[Footnote 12: Every rural community in the Eastern part of the United States has grown familiar with the contrast between the intelligent amateur, who, while endeavoring earnestly to set an example of good agriculture, fails to make expenses out of his land, and the born farmer who is self-supporting in the practice of methods contemned by the agricultural colleges. Too often the conclusion is drawn that scientific agriculture will not pay; but Cato puts his finger on the true reason. The man who does not depend on his land for his living too often permits his farm to get what Cato calls the "spending habit." Pliny (*H.N.* XVIII, 7) makes some pertinent observations on the subject:

"I may possibly appear guilty of some degree of rashness in making mention of a maxim of the ancients which will very probably be looked upon as quite incredible, 'that nothing is so disadvantageous as to cultivate land in the highest style of perfection.'"

And he illustrates by the example of a Roman gentleman, who, like Arthur Young in eighteenth century England, wasted a large fortune in an attempt to bring his lands to perfect cultivation. "To cultivate land well is absolutely necessary," Pliny continues, "but to cultivate it in the very highest style is mere extravagance, unless, indeed, the work is done by the hands of a man's own family, his tenants, or those whom he is obliged to keep at any rate."]

[Footnote 13: In this practice has been the delight of men of affairs of all ages who turn to agriculture for relaxation. Horace cites it with telling effect in the ode (III, 5) in which he describes the noble serenity of mind with which Regulus returned to the torture and certain death which awaited him at Carthage: and Homer makes an enduring picture of it in the person of the

King supervising his fall ploughing, which Hephsestus wrought upon the shield of Achilles (*Iliad*, XVIII, 540). "Furthermore, he set in the shield a soft fresh ploughed field, rich tilth and wide, the third time ploughed, and many ploughers therein drove their yokes to and fro as they wheeled about. Whensoever they came to the boundary of the field and turned, then would a man come to each and give into his hands a goblet of sweet wine: while others would be turning back along the furrows, fain to reach the boundary of the deep tilth, ... and among them the King was standing in silence, with his staff, rejoicing in his heart."]

[Footnote 14: This advice to sell the worn out oxen and the sick slaves justly excited Plutarch's generous scorn, and has been made the text of a sweeping denunciation by Mommsen of the practice of husbandry by men of affairs in Cato's time. "The whole system," says Mommsen, "was pervaded by the utterly unscrupulous spirit characteristic of the power of capital." And he adds, "If we have risen to that little-to-be-envied elevation of thought which values no feature of an economy save the capital invested in it, we cannot deny to the management of the Roman estates the praise of consistency, energy, punctuality, frugality and solidity." Without any desire to defend Cato, one may suggest, out of an experience in a kind of farm management not very different from that Cato pictures, that it is doubtful whether even Cato himself was quite as economical and efficient, and so as capitalistic in his farming, as he advises others to be: certainly a whole race of contemporary country gentlemen was not equal to it. It is much easier to write about business-like farming than to practise it.]

[Footnote 15: Hesiod (W. & D. 338) had already given this same advice to the Greek farmer:

"Invite the man that loves thee to a feast, but let alone thine enemy, and especially invite him that dwelleth near thee, for if, mark you, any thing

untoward shall have happened at home neighbours are wont to come ungirt, but kinsfolk gird themselves first." This agreement of the Socialist Hesiod with the Capitalist Cato is remarkable only as it illustrates that both systems when wisely expounded rest on human nature. That upon which they here agree is the foundation of the modern European societies for rural co-operative credit which President Taft recommended to the American people. These societies, says the bulletin of the International Institute of Agriculture published at Rome in 1912, rest on three chief safeguards:

(a) That membership is confined to persons residing within a small district, and, therefore, the members are personally known to one another;

(b) That the members, being mutually responsible, it will be to the interest of all members to keep an eye upon a borrower and to see that he makes proper use of the money lent to him;

(c) That in like manner, it is to the interest of all members to help a member when he is in difficulties.]

[Footnote 16: This was an estate of average size, probably within Virgil's precept, (*Georgic* II, 412). "Laudato ingentia rura, exiguum colito." Some scholars have deemed this phrase a quotation from Cato, but it is more likely derived from Mago the Carthaginian who is reported to have said: "Imbecilliozem agrum quam agricolam, esse debere,"—the farmer should be bigger than his farm.]

[Footnote 17: The philosophy of Cato's plan, of laying out a farm is found in the agricultural history of the Romans down to the time of the Punic wars. Mommsen (II, 370) gives the facts, and Ferrero in his first volume makes brilliant use of them. There is sketched the old peasant aristocrat living on his few acres, his decay and the creation of comparatively large estates worked by slaves in charge of overseers, which

followed the conquest of the Italian states about B.C. 300. This was the civilization in which Cato had been reared, but in his time another important change was taking place. The Roman frontier was again widened by the conquest of the Mediterranean basin: the acquisition of Sicily and Sardinia ended breadstuff farming as the staple on the Italian peninsular. The competition of the broad and fertile acres of those great Islands had the effect in Italy which the cultivation of the Dakota wheat lands had upon the grain farming of New York and Virginia. About 150 B.C. the vine and the olive became the staples of Italy and corn was superseded. Although this was not accomplished until after Cato's death, he foresaw it, and recommended that a farm be laid out accordingly, and his scheme of putting one's reliance upon the vine and the olive was doubtless very advanced doctrine, when it first found expression.]

[Footnote 18: Pliny quotes Cato as advising to buy what others have built rather than build oneself, and thus, as he says, enjoy the fruits of another's folly. The *cacoethes aedificandi* is a familiar disease among country gentlemen.]

[Footnote 19: Columella (I,4) makes the acute observation that the country house should also be agreeable to the owner's wife if he wishes to get the full measure of enjoyment out of it. Mago, the Carthaginian, advised to, "if you buy a farm, sell your house in town, lest you be tempted to prefer the cultivation of the urban gods to those of the country."]

[Footnote 20: According to German scholarship the accepted text of Cato's version of this immemorial epigram is a model of the brevity which is the test of wit, "Frons occipitio prior est." Pliny probably quoting from memory, expands it to "Frons domini plus prodest quam occipitium." Palladius (I, 6) gives another version: "Praesentia domini proventus est agri." It is found in some form in almost every book on agriculture since

Cato, until we reach the literature in which science has taken the place of wisdom—in the Byzantine *Geoponica*, the Italian *Crescenzi*, the Dutch *Heresbach*, the French *Maison Rustique*, and the English *Gervase Markkam*. *Poor Richard's Almanack* gives it twice, as "the foot of a master is the best manure" and "the eye of a master will do more work than both his hands." It is perennial in its appeal. The present editor saw it recently in the German comic paper *Fliegende Blätter*. But the jest is much older than Cato. It appears in Aeschylus, *Persae*, 171 and Xenophon employs it in *Oeconomicus* (XII, 20):

"The reply attributed to the barbarian," added Ischomachus, "appears to me to be exceedingly to the purpose, for when the King of Persia having met with a fine horse and wishing to have it fattened as soon as possible, asked one of those who were considered knowing about horses what would fatten a horse soonest, it is said that he answered 'the master's eye.'"]

[Footnote 21: The English word "orchard" scarcely translates *arbustum*, but every one who has been in Italy will recall the endless procession of small fields of maize and rye and alfalfa through which serried ranks of mulberry or feathery elm trees, linked with the charming drop and garland of the vines, seem to dance toward one in the brilliant sunlight, like so many Greek maidens on a frieze. These are *arbusta*.]

[Footnote 22: Cato was a strong advocate of the cabbage; he called it the best of the vegetables and urged that it be planted in every garden for health and happiness. Horace records (*Odes*. III, 21, 11) that old Cato's virtue was frequently warmed with wine, and Cato himself explains (CLVI) how this could be accomplished without loss of dignity, for, he says, if, after you have dined well, you will eat five cabbage leaves they will make you feel as if you had had nothing to drink, so that you can drink as much more as you wish—"bibesque quantum voles!"

This was an ancient Egyptian precaution which the Greeks had learned.
Cf. Athenaeus, I, 62.]

[Footnote 23: Henry Home, Lord Kames, a Scots judge of the eighteenth century, whom Dr. Johnson considered a better farmer than judge and a better judge than scholar, but who had many of the characteristics of our *priscus* Cato, argues (following an English tradition which had previously been voiced by Walter of Henley and Sir Anthony Fitzherbert) in his ingenious *Gentleman Farmer* against the expense of ploughing with horses and urges a return to oxen. He points out that horses involve a large original investment, are worn out in farm work, and after their prime steadily depreciate in value; while, on the other hand, the ox can be fattened for market when his usefulness as a draught animal is over, and then sell for more than his original cost; that he is less subject to infirmities than the horse; can be fed per tractive unit more economically and gives more valuable manure. These are strong arguments where the cost of human labour is small and economical farm management does not require that the time of the ploughman shall be limited if the unit cost of ploughing is to be reasonable. The ox is slow, but in slave times he might reasonably have been preferred to the horse. Today Lord Kames, (or even old Hesiod, who urged that a ploughman of forty year and a yoke of eight year steers be employed because they turned a more deliberate and so a better furrow) would be considering the economical practicability of the gasoline motor as tractive power for a gang of "crooked" ploughs.]

[Footnote 24: Cato adds a long list of implements and other necessary equipment.]

[Footnote 25: The Roman overseer was usually a superior, and often a much indulged, slave. Cf. Horace's letter (*Epist.* I, 14) to his overseer.]

[Footnote 26: This was the traditional wisdom which was preached also in Virginia in slave times. In his *Arator* (1817) Col. John Taylor of Caroline says of agricultural slaves:

"The best source for securing their happiness, their honesty and their usefulness is their food.... One great value of establishing a comfortable diet for slaves is its convenience as an instrument of reward and punishment, so powerful as almost to abolish the thefts which often diminish considerably the owner's ability to provide for them."]

[Footnote 27: Reading "compitalibus in compito," literally "the cross roads altar on festival days."]

[Footnote 28: It is evident that Cato's housekeeper would have welcomed a visit from Mr. Roosevelt's Rural Uplift Commission. We may add to this Sir Anthony Fitzherbert's description of the duties of a farmer's wife in sixteenth century England:

"It is a wyues occupation to wynowe all maner of cornes, to make malte, to wasshe and wrynge, to make heye, shere corne, and in tyme of nede to helpe her husbande to fyll the mucke-wayne or dounge-carte, dryue the ploughe, to loode hey, corne and suche other. And to go or ride to the market, to sel butter, chese, mylke, egges, chekyns, capons, hennes, pygges, gese, and all maner of cornes. And also to bye all maner of necessarye thynges belongynge to houssholde, and to make a trewe rekenynge and acompte to her husbande what she hath payed."

Sir Anthony Fitzherbert (1470-1538) was the English judge whose law books are, or should be, known to all lawyers. His *Boke of Husbandry*, published in 1534, is one of the classics of English agriculture, and justly, for it is full of shrewd observation and deliberate wisdom expressed in a virile style, with agreeable leaven of piety and humour. Fitzherbert

anticipated a modern poet, Henley, in one of his most happy phrases: "Ryght so euery man is capitayne of his owne soule". The Husbandry is best available to the modern reader in the edition by Skeat published for the English Dialect Society in 1882.]

[Footnote 29: Cato is careful not to undertake to say how this may be assured; another evidence of his wisdom.]

[Footnote 30: In his instructive discourse on ploughing, Columella (II, 4) gives the key to Cato's warning against ploughing land when it is in the condition he calls rotten (*cariosa*):

"Rich land, which holds moisture a long time, should be broken up (*proscindere*) at the season when the weather is beginning to be warm and the weeds are developing, so that none of their seed may mature: but it should be ploughed with such close furrows that one can with difficulty distinguish where the plough share has been, for in that way all the weeds are uprooted and destroyed.

"The spring ploughing should be followed up with frequent stirring of the soil until it is reduced to dust, so that there may be no necessity, or very little, of harrowing after the land is seeded: for the ancient Romans said that a field was badly ploughed which had to be harrowed after the seed had been sown.

"A farmer should himself make sure that his ploughing has been well done, not alone by inspection, for the eye is often amused by a smooth surface which in fact conceals clods, but also by experiment, which is less likely to be deceived, as by driving a stout stick through the furrows: if it penetrates the soil readily and without obstruction, it will be evident that all the land there about is in good order: but if some part harder than the rest resists the pressure, it will be clear that the ploughing has been badly done.

When the ploughmen see this done from time to time they are not guilty of clod hopping.

"Hence wet land should be broken up after the Ides of April, and, when it has been ploughed at that season, it should be worked again, after an interval of twenty days, about the time of the solstice, which is the eighth or ninth day before the Kalends of July, and again the third time about the Kalends of September, for it is not the practice of experienced farmers to till the land in the interval after the summer solstice, unless the ground shall have been soaked with a heavy down-pour of sudden rain, like those of winter, as does some times happen at this season. In that event there is no reason why the fallow should not be cultivated during the month of July. But when you do till at this season beware lest the land be worked while it is muddy: or when, having been sprinkled by a shower, it is in the condition which the country people call *varia* and *cariosa*, that is to say, when, after a long drought, a light rain has moistened the surface of the upturned sod but has not soaked to the bottom of the furrow.

"Those plough lands which are cultivated when they are miry are rendered useless for an entire year—they can be neither seeded nor harrowed nor hoed—but those which are worked when they are in the state which has been described as *varia*, remain sterile for three years on end. We should, therefore, follow a medium course and plough when the land neither lacks moisture nor yet is deep in marsh."]

[Footnote 31: Columella (II, 13) justly says about manure, "Wherefore if it is, as it would seem to be, the thing of the greatest value to the farmer, I consider that it should be studied with the greatest care, especially since the ancient authors, while they have not altogether neglected it, have nevertheless discussed it with too little elaboration." He goes on (II, 14) to

lay down rules about the compost heap which should be written in letters of gold in every farm house.

"I appreciate that there are certain kinds of farms on which it is impossible to keep either live stock or birds, yet even in such places it is a lazy farmer who lacks manure: for he can collect leaves, rubbish from the hedge rows, and droppings from the high ways: without giving offence, and indeed earning gratitude, he can cut ferns from his neighbour's land: and all these things he can mingle with the sweepings of the courtyard: he can dig a pit, like that we have counselled for the protection of stable manure, and there mix together ashes, sewage, and straw, and indeed every waste thing which is swept up on the place. But it is wise to bury a piece of oak wood in the midst of this compost, for that will prevent venomous snakes from lurking in it. This will suffice for a farm without live stock."

One can see in Flanders today the happy land smiling its appreciation of farm management such as this, but what American farmer has yet learned this kind of conservation of his natural resources.]

[Footnote 32: The occupants of the motor cars which now roll so swiftly and so comfortably along the French national highway from Paris to Tours, through the pleasant *pays de Beauce*, can see this admirable and economical method of manuring still in practice. The sheep are folded and fed at night, under the watchful eye of the shepherd stretched at ease in his wheeled cabin, on the land which was ploughed the day before.]

[Footnote 33: These of course are all legumes. The intelligent farmer today sits under his shade tree and meditates comfortably upon the least expensive and most profitable labour on his farm, the countless millions of beneficent bacteria who, his willing slaves, are ceaselessly at work during hot weather forming root tubercles on his legumes, be it clover or cow peas, and so fixing for their lord the free atmospheric nitrogen contained in the

soil. As Macaulay would say, "every school boy knows" now that leguminous root nodules are endotrophic mycorrhiza,—but the Romans did not! Nevertheless their empirical practice of soil improvement with legumes was quite as good as ours. Varro (I, 23) explains the Roman method of green manuring more fully than Cato. Columella (II, 13) insists further that if the hay is saved the stubble of legumes should be promptly ploughed for he says the roots will evaporate their own moisture and continue to pump the land of its fertility unless they are at once turned over.

If the Romans followed this wise advice they were better farmers than most of us today, for we are usually content to let the stubble dry out before ploughing.]

[Footnote 34: Was this ensilage? The ancients had their silo pits, but they used them chiefly as granaries, and as such they are described, by Varro (I, 57, 63), by Columella (I, 6), and by Pliny (XVIII, 30, 73).]

[Footnote 35: The extravagant American farmer has not yet learned to feed the leaves of trees, but in older and more economical civilizations the practice is still observed.]

[Footnote 36: Amurca was the dregs of olive oil. Cato recommends its use for many purposes in the economy of the farm, for a moth proof (XCVIII), as a relish for cattle (CIII), as a fertilizer (CXXX), and as an anointment for the threshing floor to kill weevil (XCI).]

[Footnote 37: There is a similar remedy for scratches in horses, which is traditional in the cavalry service today, and is extraordinarily efficacious.]

[Footnote 38: Cf. Pliny *H.N.* XVII, 267 and Fraser, *The Golden Bough*, XI, 177. The principle is one of magical homeopathy: as the split reed,

when bound together, may cohere and heal by the medicine of the incantation, so may the broken bone.]

[Footnote 39: These examples will serve to illustrate how far Cato's veterinary science was behind his agriculture, and what a curious confusion of native good sense and traditional superstition there was in his method of caring for his live stock. On questions of preventing malady he had the wisdom of experience, but malady once arrived he was a simple pagan. There was a notable advance in the Roman knowledge of how to treat sick cattle in the century after Cato. Cf. Varro, II, 5.

The words of the incantations themselves are mere sound and fury signifying nothing, like the "counting out" rhythms used by children at their games.]

[Footnote 40: Cato gives many recipes of household as well as agricultural economy. Out of respect for the pure food law most of them have been here suppressed, but these samples are ventured because Varro mentions them and the editor is advised that some enterprising young ladies in Wisconsin have recently had the courage to put them to the test, and vow that they ate their handiwork! As they live to tell the tale, it is assumed that the recipes are harmless.]

[Footnote 41: Cf. the following traditional formula as practised in Virginia:

A VIRGINIA RECIPE FOR CURING HAMS

"Rub each ham separately with $\frac{1}{2}$ teaspoonful of saltpetre (use a small spoon); then rub each ham with a large tablespoonful of best black pepper; then rub each ham with a gill of molasses (black strap is best).

Then for 1,000 lbs. of ham take 3- $\frac{1}{4}$ pecks of coarse salt, 2- $\frac{1}{2}$ lbs. of saltpetre, 2 qts. hickory ashes, 2 qts. molasses, 2 teacupfuls of red pepper.

"Mix all together on the salting table. Then rub each ham with this mixture, and, in packing, spread some of it on each layer of ham. Use no more salt than has been mixed. Pack skin down and let stand for five weeks, then hang in the smoke house for five or six weeks, and smoke in damp weather, using hickory wood.

"As a ham, however well cured, is of no use to civilized man until it is cooked, and as this crowning mystery is seldom revealed out of Virginia, it may not be out of place to record here the process."

A VIRGINIA RECIPE FOR COOKING HAMS

Soak over night in cold water, having first scrubbed the ham with a small brush to remove all the pepper, saltpetre, etc., left from the curing process.

Put on to boil next morning in tepid water, skin downwards, letting it simmer on back of stove, never to boil hard. This takes about four hours (or until it is done, when the ham is supposed to turn over, skin upwards, of its

own accord, as it will if the boiler is large enough). Set aside over another night in the water it has boiled in.

The *following* day, skin and bake in the oven, having covered the ham well with brown sugar, basting at intervals with cider. When it is well baked, take it out of the oven and baste another ten to twenty minutes in the pan on top of the stove. The sugar crust should be quite brown and crisp when done.

To be thoroughly appreciated a ham should be carved on the table, by a pretty woman. A thick slice of ham is a crime against good breeding.]

[Footnote 42: It is interesting that Varro has realized the hope, here expressed, that his wisdom might survive for the benefit of the "uttermost generations of men" chiefly in the case of this treatise on Husbandry among the many monuments of his industry and learning. Petrarch in his *Epistle to Varro* in that first delightful book of Letters to Dead Authors (*de rebus familiaribus* XXIV, 6) rehearses the loss of Varro's books and, adapting the thought here expressed in the text, regrets for that reason that Varro cannot be included in that company of men "whom we love even after their death owing to the good and righteous deeds that live after them, men who mold our character by their teaching and comfort us by their example, when the rest of mankind offends both our eyes and our nostrils; men who, though they have gone hence to the common abode of all (as Plautus says in *Casina*), nevertheless continue to be of service to the living." If Petrarch had been a farmer he might have saved some of his regret, for Varro is surely, by virtue of the *Rerum Rusticarum*, a member of the fellowship Petrarch describes.]

[Footnote 43: Varro was essentially an antiquary and it is amusing to observe that he is unable to suppress his learning even in his prayers. One is reminded of the anecdote of the New England minister, who, in the course

of an unctuous prayer, proclaimed, with magisterial authority, "Paradoxical as it may appear, O Lord, it is nevertheless true, etc."]

[Footnote 44: Following Plato and Xenophon and Cicero, Varro cast his books into the form of dialogues to make them entertaining ("and what is the use of a book," thought Alice in Wonderland, "without pictures or conversations."): for the same reason he was careful about his local colour. Thus the scene of this first book, which relates to agriculture proper, is laid at Rome in the temple of Earth on the festival of the Seed Sowing, and the characters bear names of punning reference to the tilling of the soil. Varro was strong on puns, avowing (Cicero *Acad.* I, 2) that that form of humour made it easier for people of small intelligence to swallow his learning.]

[Footnote 45: The story is that when Scipio captured Carthage he distributed the Punic libraries among the native allies, reserving only the agricultural works of Mago, which the Roman Senate subsequently ordered to be translated into Latin, so highly were they esteemed. Probably more real wealth was brought to Rome in the pages of these precious volumes than was represented by all the other plunder of Carthage. "The improving a kingdom in matter of husbandry is better than conquering a new kingdom," says old Samuel Hartlib, Milton's friend, in his *Legacie*. It is a curious fact that as the Romans derived agricultural wisdom from their ancient enemies, so did the English. Cf. Thorold Rogers' *Six Centuries of Work and Wages*. "We owe the improvements in English agriculture to Holland. From this country we borrowed, at the beginning of the seventeenth century, the cultivation of winter roots, and, at that of the eighteenth, the artificial grasses. The Dutch had practised agriculture with the patient and minute industry of market gardeners. They had tried successfully to cultivate every thing to the uttermost, which could be used for human food, or could give innocent gratification to a refined taste. They taught agriculture and they taught gardening. They were the first people to surround their homesteads

with flower beds, with groves, with trim parterres, with the finest turf, to improve fruit trees, to seek out and perfect edible roots and herbs at once for man and cattle. We owe to the Dutch that scurvy and leprosy have been banished from England, that continuous crops have taken the place of barren fallows, that the true rotation of crops has been discovered and perfected, that the population of these islands has been increased and that the cattle and sheep in England are ten times what they were in numbers and three times what they were in size and quality."]

[Footnote 46: The Roman proverb which Agrius had in mind reminds one of the witty French woman's comment upon the achievement of St. Denis in walking several miles to Montmartre, after his head had been cut off, (as all the world can still see him doing in the verrières of Notre Dame de Chartres): "en pareil cas, ce n'est que le premier pas qui coûte."]

[Footnote 47: To this glowing description of agricultural Italy in the Augustan age may be annexed that of Machiavelli on the state of Tuscany in his youth: "Ridotta tutta in somma pace e tranquillità, coltivata non meno ne' luoghi più montuosi e più sterili che nelle pianure e regioni più fertili...." It is our privilege to see the image of this fruitful cultivation of the mountain tops not only in Machiavelli's prose, but on the walls of the Palazzo Riccardi in Gozzoli's *Journey of the Magi*, where, like King Robert of Sicily, the Magi crossed

"Into the lovely land of Italy
Whose loveliness was more resplendent made
By the mere passing of that cavalcade."

It seems almost a pity to contrast with these the comment of a careful and sympathetic student of the agricultural Italy of the age of King Umberto: "To return to the question of the natural richness of agricultural Italy," says Dr. W.N. Beauclerk in his *Rural Italy* (1888), "we may compare the words

of the German ballad: 'In Italy macaroni ready cooked rains from the sky, and the vines are festooned with sausages,' with the words today rife throughout the Kingdom, 'Rural Italy is poor and miserable, and has no future in store for her.' The fact is that Italy is rich in capabilities of production, but exhausted in spontaneous fertility. Her vast forests have been cut down, giving place to sterile and malarious ground: the plains and shores formerly covered with wealthy and populous cities are now deserted marshes: Sardinia and other ancient granaries of the Roman Empire are empty and unproductive: two-thirds of the Kingdom are occupied by mountains impossible of cultivation, and the remainder is to a large extent ill-farmed and unremunerative. To call Italy the 'Garden of Europe' under these circumstances seems cruel irony."]

[Footnote 48: As we may assume that the yields of wine of which Fundanius boasts were the largest of which Varro had information in the Italy of his time, it is interesting to compare them with the largest yields of the most productive wine country of France today. Fifteen cullei, or three hundred amphorae per jugerum, is the equivalent of 2700 gallons per acre: while according to P. Joigneaux, in the *Livre de la Ferme*, the largest yields in modern France are in the Midi (specifically Herault), where in exceptional cases they amount to as much as 250 hectolitres to the hectare, or say 2672 gallons per acre. It may be noted that the yields of the best modern wines, like Burgundy, are less than half of this, and it is probable that the same was true of the *vinum Setinum* of Augustus, if not of the Horatian Massic.]

[Footnote 49: The modern Italian opinion of farming in a fertile but unhealthy situation is expressed with a grim humour in the Tuscan proverb: "in Maremma s'arricchisce in un anno, si muore in sei mesi."]

[Footnote 50: This is Keil's ingenious interpretation of an obscure passage. We may compare the English designation of a church yard as "God's acre." What Licinius Crassus actually did was, while haranguing from the rostra, to turn his back upon the Comitium, where the Senators gathered, and address himself directly to the people assembled in the Forum. The act was significant as indicating that the sovereignty had changed place.]

[Footnote 51: Tremelius Scrofa was the author of a treatise on agriculture, which Columella cites, but which has not otherwise survived.]

[Footnote 52: "It was a received opinion amongst the antients that a large, busy, well peopled village, situated in a country thoroughly cultivated, was a more magnificent sight than the palaces of noblemen and princes in the midst of neglected lands." Harte's *Essays on Husbandry*, p. 11. This is a delightful book, the ripe product of a gentleman and a scholar. In the middle of the eighteenth century it advocated what we are still advocating—that agriculture, as the basis of national wealth, deserves the study and attention of the highest intelligence; specifically it proposed the introduction of new grasses and forage crops (alfalfa above all others) to enable the land to support more live stock. It was published in 1764, just after France had ceded to England by the Treaty of Paris all of her possessions in America east of the Mississippi River; and not the least interesting passages of Harte's book are those proposing an agricultural development of the newly acquired territory between Lake Illinois (Michigan) and the Mississippi, which he suggests may be readily brought under cultivation with the aid of the buffaloes of the country. He shrewdly says: "Maize may be raised in this part of Canada to what quantity we please, for it grows there naturally in great abundance." It happened, however, that a few years later, in 1778, Col. George Rogers Clark of Virginia made a certain expedition through the wilderness to the British outpost at Vincennes, which saved England the

trouble of taking Harte's advice, but that it has not been neglected may be evident from the fact that less than a century and a half later, or in 1910, the State of Illinois produced 415 million bushels of maize, besides twice as much oats and half as much wheat as did old England herself in the same year of grace.

Harte was the travelling governor of that young Mr. Stanhope, to whom my lord Chesterfield wrote his famous worldly wise letters. He was the author also of a *Life of Gustavus Adolphus*, which was a failure. Dr. Johnson, who liked Harte, said: "It was unlucky in coming out on the same day with Robertson's *History of Scotland*. His *Husbandry*, however, is good." (*Boswell*, IV, 91). With this judgment of Dr. Johnson there has been, and must be, general concurrence.]

[Footnote 53: Pliny records (H.N. XVIII, 7) that at Lucullus' farm there was less ground for ploughing than of floor for sweeping.]

[Footnote 54: Eggs were the first course, as apples were the last, at a Roman dinner, hence the saying "ab ovo usque ad mala."]

[Footnote 55: Cf. Gilbert Murray's version of Euripides' *Troades*, 799:

In Salamis, filled with the foaming
Of billows and murmur of bees,
Old Telamon stayed from his roaming,
Long ago, on a throne of the seas;
Looking out on the hills olive laden,
Enchanted, where first from the earth.
The gray-gleaming fruit of the Maiden
Athena had birth.

The physical reason why the olive flourished in Attica, as Theophrastus points out (C.P.V. II, 2), was because it craves a thin soil, and that of Attica, with its out-croppings of calcareous rock, suits the olive perfectly, while fit for little else agricultural.]

[Footnote 56: In the *Geoponica* (XIII, 15) there has been preserved a remedy for a similar evil, which, in all fairness, should be credited to Saserna. In any event, it is what the newspapers used to call "important, if true," viz: "If ever you come into a place where fleas abound, cry Och! Och! ([Greek: och, och]) and they will not touch you."]

[Footnote 57: The editor of an Iowa farm journal, who has been making a study of agricultural Europe, has recently reported an interesting comparison between the results of extensive farming as practised in Iowa and intensive farming as practised in Bavaria. He begins with the thesis that the object of agriculture is to put the energy of the sun's rays into forms which animals and human beings can use, and, reducing the crop production of each country to thermal units, he finds "that for every man, woman and child connected with farming in Iowa 14,200 therms of sun's energy were imprisoned, while for every man, woman and child connected with farming in Bavaria only 2,600 therms were stored up. In other words, the average Iowa farmer is six times as successful in his efforts to capture the power of the sun's rays as the average Bavarian farmer. On the other hand, the average acre of Iowa land is only about one-seventh as successful as the average acre of Bavarian land in supporting those who live on it. If we look on land as the unit, then the Bavarians get better results than we in Iowa, but if we look on human labor as the unit, then the Iowa farmers are far ahead of those of Bavaria."

It may be remarked that if the Iowa farmer, who gets his results by the use of machinery, was to adopt also the intensive practice of the Bavarian

farmer, he would secure at once the greatest efficiency per acre and per man, and that is the true purpose of agriculture.]

[Footnote 58: It is one of the charms of Varro's treatise that he always insists cheerfully on the pleasure to be derived from the land. It is the same spirit which Conington has remarked cropping out in many places in Virgil's *Georgics*—the joy of the husbandman in his work, as in the "iuvat" of

"iuvat Ismara Baccho Conserere,
atque olea magnum vestire Taburnum."

This is the blessed "surcease of sorrow" of which the crowded life of the modern city knows nothing: but, as the practical Roman indicates, it will not support life of its own mere motion. Cf. Dr. Johnson's picture of Shenstone: "He began from this time to entangle his walks and to wind his waters: which he did with such judgment and such fancy as made his little domain the envy of the great and the admiration of the skillful. His house was mean, and he did not improve it: his care was of his grounds.... In time his expences brought clamours about him, that overpowered the lambs' bleat and the linnets' song; and his groves were haunted by beings very different from fawns and fairies."]

[Footnote 59: Walter of Henley, in thirteenth century England, drove home a shrewd comment on the country gentleman who farms without keeping accounts and thinks he is engaged in a profitable industry. "You know surely," he says, "that an acre sown with wheat takes three ploughings, except lands which are sown yearly, and that one with another each ploughing is worth six pence, and harrowing a penny, and on the acre it is necessary to sow at least two bushels. Now two bushels at Michaelmas are worth at least twelve pence, and weeding a half penny and reaping five pence, and carrying in August a penny: the straw will pay for the threshing.

At three times your sowing you ought to have six bushels, worth three shillings; and the cost amounts to three shillings and three half pence, and the ground is yours and not reckoned."

Of Walter of Henley little is known, but it is conjectured that he was the bailiff of the manors near Henley which belonged to the Abbey of Canterbury. His curious and valuable *Dite de Hosebondrie*, which is as original in its way as Cato's treatise, being entirely free from mere literary tradition, is now available to the modern reader in a translation, from the original barbarous English law French, by Elizabeth Lamond, made for the Royal Historical Society in 1890.]

[Footnote 60: This was just before Pharsalia, and the army was that of Pompey which Varro had joined after surrendering to Caesar in Spain.]

[Footnote 61: In this enumeration of trees Varro does not include the chestnut which is now one of the features of the Italian mountain landscape and furnishes support for a considerable part of the Italian population, who subsist on *necci*, those indigestible chestnut flour cakes, just as the Irish peasants do on potatoes. The chestnut was late in getting a foothold in Italy but it was there in Varro's day. He mentions the nuts as part of the diet of dormice (III, 15).

By the thirteenth century chestnuts had become an established article of human food in Italy. Pietro Crescenzi (1230-1307) describes two varieties, the cultivated and the wild, and quotes the Arabian physician Avicenna to the effect that chestnuts are "di tarda digestionem ma di buono nuttimento." It is perhaps for this very reason that chestnut bread is acceptable to those engaged in heavy labor. Fynes Moryson says in his *Itinerary* (1617) that maslin bread made of a mixture of rye and wheat flour was used by labourers in England because it "abode longer in the stomach and was not so soon digested with their labour."

Crescenzi, who was a lawyer and a judge, says in his preface that he had left his native Bologna because of the civil strifes, had taken foreign service in several parts of Italy, and so had opportunity to see the world. He wrote his book on agriculture because, as he says, of all the things he learned on his travels there was nothing "piu a bondevole, niuna piu dolce, et niuna piu degna de l'huomo libero," a sentiment which Socrates had expressed sixteen hundred years earlier and which was echoed six hundred years later by another far-sighted Italian, the statesman Cavour.]

[Footnote 62: The white chalk which Scrofa saw used as manure in Transalpine Gaul, when he was serving in the army under Julius Caesar, was undoubtedly marl, the use of which in that region as in Britain was subsequently noted by Pliny (H.N. XVII, 4).

There were no deposits of marl in Italy, and so the Romans knew nothing of its use, from experience, but Pliny's treatment of the subject shows a sound source of information. In England, where several kinds of marl are found in quantities, its use was probably never discontinued after the Roman times. Walter of Henley discusses its use in the thirteenth century, and Sir Anthony Fitzherbert continues the discussion in the sixteenth century. In connection with the history of the use of marl in agriculture may be cited the tender tribute which Arthur Young recorded on the tombstone of his wife in Bradfield Church. The lady's chief virtue appears to have been, in the memory of her husband, that she was "the great-grand-daughter of John Allen, esq. of Lyng House in the County of Norfolk, the first person according to the Comte de Boulainvilliers, who there used marl."

The Romans did not have the fight against sour land which is the heritage of the modern farmer after years of continuous application to his land of phosphoric and sulphuric acid in the form of mineral fertilizers. What sour land the Romans had they corrected with humus making barnyard manure,

or the rich compost which Cato and Columella recommend. They had, however, a test for sourness of land which is still practised even where the convenient litmus paper is available. Virgil (*Georgic* II, 241) gives the formula: "Fill a basket with soil, and strain fresh water through it. The taste of water strained through sour soil will twist awry the taster's face."]

[Footnote 63: This sounds like the boast of the modern proprietor of an old blue grass sod in Northern Virginia or Kentucky. On the general question of pasture vs. arable land, cf. Hartlib's *Legacie*: "It is a misfortune that pasture lands are not more improved. England abounds in pasturage more than any other country, and is, therefore, richer. In France, acre for acre, the land is not comparable to ours: and, therefore, Fortescue, chancellor to Henry VI, observes that we get more in England by standing still (alluding to our meadows) than the French do by working (that is, cultivating their vineyards and corn lands)."

We may permit Montesquieu (*Esprit des Lois* II, 23, 14) to voice the French side of this question. "Les pais de pâturage sont peu peuplés. Les terres à bled occupent plus d'hommes et les vignobles infiniment d'avantage. En Angleterre on s'est souvent plaint que l'augmentation des pâturage diminueoit les habitans."

In the introduction to his Book Two (*post*, p. 179) Varro states the sound conclusion, that the two kinds of husbandry should be combined on the same land. Sir Anthony Fitzherbert knew this: "An housbande can not well thryue by his corne without he haue other cattell, nor by his cattell without corne. For els he shall be a byer, a borrower or a beggar."]

[Footnote 64: This is the explanation of why Aesop's fox found the grapes to be sour which grew on a trellis, for he had expected to find them of easy access on the ground. Aesop was a Phrygian, and, while Bentley has proved that Aesop never wrote the existing fables which go by that name,

yet it is recognized that they are of Oriental origin and it is evident that that of the Fox and the Grapes came out of Asia, where, as Varro says, the grapes were usually allowed to grow on the ground.]

[Footnote 65: One is tempted to include here Pliny's observations upon the tests of good soil if only for the sake of his description of one of the sweetest sensations of the farmer every where, the aroma of new ploughed fertile land:—

"Those unguents which have a taste of earth are better," says Cicero, "than those which smack of saffron," it seeming to him more to the purpose to express himself by the word taste than smell. And such is the fact no doubt, that soil is the best which has the savour of a perfume. If the question should be put to us, what is this odour of the earth that is held in such estimation; our answer is that it is the same that is often to be recognized at the moment of sunset without the necessity even of turning up the ground, at the spots where the extremities of the rainbow have been observed to meet the earth: as also, when after long continued drought, the rain has soaked the ground. Then it is that the earth exhales the divine odour that is so peculiarly its own, and to which, imparted to it by the sun, there is no perfume however sweet that can possibly be compared. It is this odour which the earth, when turned up, ought to emit, and which, when once found, can never deceive any person: and this will be found the best criterion for judging of the quality of the soil. Such, too, is the odour that is usually perceived in land newly cleared when an ancient forest has been just cut down; its excellence is a thing that is universally admitted.]

[Footnote 66: The *actus* was the head land or as much land as a yoke of oxen could plough at a single spell without stopping, and measured 120 feet in length and four feet in width. Cf. Pliny, H.N. XVIII, 3. Hence the square of the head land became the basis of the Roman land measure. With the

derivation of the *actus* may be compared that of the English furlong (furrow-long) and the French *arpent* (literally, head land).]

[Footnote 67: On the socialistic principle of Strepsiades in Aristophanes' *Clouds* that the use of geometry is to divide the land into *equal* parts.]

[Footnote 68: As it is difficult to appreciate that the Roman Campagna was formerly populous with villas, when one contemplates its green solitudes today, so when one faces the dread malaria which there breeds, one wonders how the Romans of the Republic maintained so long their hardy constitutions. It is now agreed that there was no malaria in the Land of Saturn so long as the volcanos in the Alban hills were active, because their gases purified the air and kept down the mosquitoes, and geology tells us that Monte Pila was in eruption for two or three centuries after the foundation of Rome. By the beginning of the second century B.C. the fever seems to have become endemic. Plautus and Terence both mention it and Cato (CLVII) describes its symptoms unmistakably. In his book on the effect of malaria in history, W.H. Jones expresses the opinion that the malady was brought into Italy from Africa by Hannibal's soldiers, but it is more probable that it was always there. See the discussion in Lanciani's *Wanderings in the Roman Campagna*. In Varro's time the Roman fever had begun to sap the vitality of the Roman people, and the "animalia minuta" in this passage suggests that Varro had a curious appreciation of what we call the modern science of the subject. Columella (I, 5, 6) indeed specifically mentions mosquitoes (infestis aculeis armata animalia) as one of the risks incident to living near a swamp.]

[Footnote 69: In the thirteenth century Ibn-al-Awam, a learned Moor, wrote at Seville his *Kitab al-felahah*, or Book of Agriculture, which has preserved for us not only the wisdom of the Moorish practice in agriculture and gardening which made Spain an enchanted paradise, but also the

tradition of the Arabs in such matters, purporting to go back, through the Nabataeans to the Chaldaean books, which recorded the agricultural methods that obtained "by the waters of Babylon." Ibn-al-Awam's book has, therefore, a double interest for us, and we are fortunate in having it available in an admirable French translation from the Arabic by J.J. Clement-Mullet (Paris, Librairie A. Franck, 1864). Not the least profitable chapters in this book are those devoted to the preparation of manure in composts, to be ripened in pits as Varro advises in the text. They show a thoroughness, a care and an art in the mixing of the various animal dungs, with straw, woodsearh and cinders, which few modern gardeners could equal. German scholarship has questioned the Chaldaean origin of the authorities quoted, but there is internal evidence which smacks of an oriental despotism that might well be Babylonian. In a recipe for a rich compost suitable for small garden plants, we are advised (I, 2, I, p. 95), without a quiver, to mix in blood—that of the camel or the sheep if necessary—but *human blood is to be preferred!*]

[Footnote 70: What Varro describes as the military fence of ditch and bank was doubtless the typical Herefordshire fence of modern England which Arthur Young, in *The Farmers' Letters*, recommends so highly as at once most effective and most economical. The bank is topped with a plashed hedge of white thorn in which sallow, ash, hazel and beech are planted for "firing." The fencing practice of the American farmer has followed the line of least resistance and is founded on the lowest first cost: the original "snake" fences of split rails, upon the making of which a former generation of pioneer American boys qualified themselves for Presidential campaigns, being followed by woven wire "made by a trust" and not the most enduring achievement of Big Business. The practical farmer, as well as the lover of rural scenery, has cause for regret that American agricultural practice has not yet had the patience to enclose the land within live hedges and ditches.]

[Footnote 71: The kind of fence which Varro here describes as "ex terra et lapillis compositis in formis" is also described by Pliny (H.N. XXXV, 169), as formaceos or moulded, and he adds, "aervis durant." It would thus clearly appear to have been of gravel concrete, the use of which the manufacturers of cement are now telling us, is the badge of the modern progressive farmer. Cato (XXXVIII) told how to burn lime on the farm, and these concrete fences were, of course, formed with lime as the matrix. When only a few years ago, Portland cement was first produced in America at a cost and in a quantity to stimulate the development of concrete construction, engineers began with rough broken stone and sand as the constituents of what they call the aggregate, but some one soon "discovered" that the use of smooth natural gravel made more compact concrete and "gravel concrete" became the last word in engineering practice. But it was older even than Varro. A Chicago business man visiting Mycenae picked up and brought home a bit of rubbish from Schliemann's excavations of the ancient masonry: lying on his office desk it attracted the attention of an engineering friend who exclaimed, "That is one of the best samples of the new gravel concrete I have seen. Did it come out of the Illinois tunnel?" "No," replied the returned traveller, "it came out of the tomb of Agamemnon!"]

[Footnote 72: Varro here seems to forget the unities. He speaks in his own person, when Scrofa has the floor.]

[Footnote 73: It will be recalled that Aristotle described slaves as living tools. In Roman law a slave was not a *persona* but a *res*. Cf. Gaius II, 15.]

[Footnote 74: One of the most interesting of these freemen labourers of whom we know is that Ofellus whom Horace (Satire II, 2) tells us was working with cheerful philosophy as a hired hand upon his own ancestral property from which he had been turned out in the confiscations following

the battle of Philippi. This might have been the fate of Virgil also had he not chanced to have powerful friends.]

[Footnote 75: "Mais lorsque, malgré le dégoût de la chaîne domestique, nous voyons naître entre les males et les femelles ces sentiments que la nature a partout fondés sur un libre choix: lorsque l'amour a commencé à unir ces couples captifs, alors leur esclavage, devenu pour eux aussi doux que la douce liberté, leur fait oublier peu à peu leur droits de franchise naturelle et les prérogatives de leur état sauvage; et ces lieux des premiers plaisirs, des premières amours, ces lieux si chers à tout être sensible, deviennent leur demeure de prédilection et leur habitation de choix: l'éducation de la famille rend encore cette affection plus profonde et la communique en même temps aux petits, qui s'étant trouvés citoyens par naissance d'un séjour adopté par leur parents, ne cherchent point à en changer: car ne pouvant avoir que pen ou point d'idée d'un état différent ni d'un autre séjour ils s'attachent au lieu ou ils sont nés comme à leur patrie; et l'on sait que la terre natale est chère a ceux même qui l'habitent en esclaves."

One might assume that this eloquent and comfortable essay on contentment in slavery had been written to illustrate Varro's text at this point, but, as a matter of fact, it is Buffon's observation (VIII, 460) on the domestication of wild ducks!]

[Footnote 76: Saserna's rule would be the equivalent of one hand to every five acres cultivated. With slave labour, certainly with negro slave labour, the experience of American cotton planters in the nineteenth century very nearly confirmed this requirement, but one of the economic advantages of the abolition of slavery is illustrated by this very point. In Latimer's *First Sermon before King Edward VI*, animadverting on the advance in farm rents in his day, he says that his father, a typical substantial English yeoman of

the time of the discovery of America, was able to employ profitably six labourers in cultivating 120 acres, or, say, one hand for each twenty acres, which was precisely what Arthur Young recommended as necessary for high farming at the end of the eighteenth century. At the beginning of the twentieth century the American farmer seldom employs more than one hand for every eighty acres cultivated, but this is partly due to the use of improved machinery and partly to the fact that his land is not thoroughly cultivated.]

[Footnote 77: This example of Roman cost accounting is matched by Walter of Henley in thirteenth century England.

"Some men will tell you that a plough cannot work eight score or nine score acres yearly, but I will show you that it can. You know well that a furlong ought to be forty perches long and four wide, and the King's perch is sixteen feet and a half: then an acre is sixty-six feet in width. Now in ploughing go thirty-six times round to make the ridge narrower, and when the acre is ploughed then you have made seventy-two furlongs, which are six leagues, for be it known that twelve furlongs are a league. And the horse or ox must be very poor that cannot from the morning go easily in pace three leagues in length from his starting place and return by three o'clock. And I will show you by another reason that it can do as much. You know that there are in the year fifty-two weeks. Now take away eight weeks for holy days and other hindrances, then are there forty-four working weeks left. And in all that time the plough shall only have to plough for fallow or for spring or winter sowing three roods and a half daily, and for second fallowing an acre. Now see if a plough were properly kept and followed, if it could not do as much daily."]

[Footnote 78: Stolo is quibbling. Cato's unit of 240 jugera was based on the duodecimal system of weights and measures which the Romans had

originally derived from Babylon but afterwards modified by the use of a decimal system. The enlightened and progressive nations of the modern world who have followed the Romans in adopting a decimal system may perhaps approve Stolo's remarks, but it behooves those of us who still cling to the duodecimal system to defend Cato, if only to keep up our own courage.]

[Footnote 79: Here, in a few words, is the whole doctrine of intelligent agriculture. Cf. Donaldson's *Agricultural Biography*, tit. Jethro Tull. "The name of Tull will ever descend to posterity as one of the greatest luminaries, if not the very greatest benefactor, that British agriculture has the pride to acknowledge. His example furnishes the vast advantages of educated men directing their attention to the cultivation of the soil, as they bring enlightened minds to bear upon its practice and look at the object in a naked point of view, being divested of the dogmas and trammels of the craft with which the practitioners of routine are inexpugnably provided and entrenched."]

[Footnote 80: Pliny quotes Cato: "What ever can be done by the help of the ass costs the least money," which is the philosophy of modern power machinery on the farm, as elsewhere. It is largely a question of the cost of fuel, as Varro says.]

[Footnote 81: Green manuring is one of the oldest, as it is one of the best, of agricultural practices. Long before Varro, Theophrastus (II.P. 9, I) had recorded what the agricultural colleges teach today—that beans are valuable for this purpose because they rot readily, and, he adds, in Macedonia and Thessaly it has always been the custom to turn them under when they bloom.]

[Footnote 82: Although Varro advises the first ploughing in the spring, the ancients were not unmindful of the advantages of winter ploughing of

stiff and heavy clay. Theophrastus, who died in B.C. 287, advises it "that the earth may feel the cold." Indeed, he was fully alive to the reasons urged by the modern professors of agronomy for intensive cultivation. "For the soil," he says (C.P. III, 25), "often inverted becomes free, light and clear of weeds, so that it can most easily afford nourishment."

King Solomon gives the same advice, "The sluggard will not plough by reason of the winter, therefore shall he begin harvest and have nothing." *Proverbs*, XX, 4.]

[Footnote 83: The Romans understood the advantages of thorough cultivation of the soil. As appears from the text, they habitually broke up a sod in the spring, ploughed it again at midsummer, and once more in September before seeding. Pliny prescribes that the first ploughing should be nine inches deep, and says that the Etruscans some times ploughed their stiff clay as many as nine times. The accepted Roman reason for this was the eradication of weeds, but it also accomplished in some measure the purpose of "dry farming"—the conservation of the moisture content of the soil, as that had been practised for countless generations in the sandy Valley of Mesopotamia. Varro makes no exception to this rule, but Virgil was here, as in other instances, induced to depart from Varro's wisdom, with the result that he imposed upon Roman agriculture several thoroughly bad practices. Thus, while he applies Varro ploughing rules to rich land and bids the farmer "exercetque frequens tellurem atque imperat arvis," he says (Geo. I, 62) that it will suffice to give sandy land a single shallow ploughing in September immediately before seeding, for fear, forsooth, that the summer suns will evaporate whatever moisture there is in it! Again, Virgil recommends, what Varro does not, cross-ploughing and burning the stubble and Virgil's advice was generally followed.

In William Benson's edition (1725) of the *Georgics* "with notes critical and rustick," it is stated that "the husbandry of England in general is Virgilian, which is shown by paring and burning the surface: by raftering and cross-ploughing, and that in those parts of England where the Romans principally inhabited all along the Southern coast Latin words remain to this hour among shepherds and ploughmen in their rustick affairs: and what will seem more strange at first sight to affirm though in fact really true, there is more of Virgil's husbandry put in practice in England at this instant than in Italy itself." That this was the fact in the thirteenth century is clear from the quotations we have made from Walter of Henley's *Dite de Hosebondrie*. Cf. also Sir Anthony Fitzherbert and the account of the manorial system of farming in England in Prothero's *English Farming Past and Present*.

It remained for Jethro Tull of the *Horseshoeing Husbandry* to unloose in England the long spell of the magic of Virgil's poetry upon practical agriculture.]

[Footnote 84: The Julian calendar, which took effect on January 1, B.C. 45, had been in use only eight years when Varro was writing.]

[Footnote 85: Schneider and others have attempted to emend the enumeration of the days in this succession of seasons, but Keil justly observes: "As we do not know what principle Varro followed in establishing these divisions of the year, it is safer to set them down as they are written in the codex than to be tempted by uncertain emendation." I have accordingly followed Keil here.]

[Footnote 86: The practice of ridging land seeded to grain was necessary before the invention of the modern drill. Dickson, in his *Husbandry of the Ancients*, XXIV, argues that, while wasteful of land, it had the advantage of preventing the grain from lodging. Walter of Henley, who followed the Roman methods by tradition without knowing it, advises with them that to

be successful in this kind of seeding the furrow at the last ploughing of the fallow should be so narrow as to be indistinguishable. "At sowing do not plough large furrows," he says, "but little and well laid together that the seed may fall evenly: if you plough a large furrow to be quick you will do harm. How? I will tell you. When, the ground is sown then the harrow will come and pull the corn into the hollow which is between the two ridges and the large ridge shall be uncovered, then no corn shall grow there. And will you see this? When the corn is above ground go to the end of the ridge and you will see that I tell you truly. And if the land must be sown below the ridge see that it is ploughed with small furrows and the earth raised as much as you are able. And see that the ridge which is between the two furrows is narrow. And let the earth, which lies like a crest in the furrow under the left foot after the plough, be over-turned, and then shall the furrow be narrow enough."]

[Footnote 87: Farrago was a mixture of refuse *far*, or spelt, with vetch, sown thick and cut green to be fed to cattle in the process now called soiling. The English word "forage" comes from this Latin original.]

[Footnote 88: Spanish American engineers today insert in their specifications for lumber the stipulation that it be cut on the wane of the moon. The rural confidence in the influence of the moon upon the life of a farm still persists vigorously: thus as Pliny (H.N. XVIII, 75) counselled that one wean a colt only when the moon is on the wane, so it will be found that the moon is consulted before a colt is weaned on most American farms today: for that may be safely done, says the rural oracle, only when the moon's sign, as given in the almanack, corresponds with a part of the almanack's "moon's man" or "anatomic" at or below the knees, i.e., when the moon is in one or the other of the signs Pisces, Capricornus or Aquarius: but never at a time of day when the moon is in its "Southing."]

[Footnote 89: Modern agricultural chemistry has contradicted this judgment of Cassius, for the manure of sea birds, especially that brought from the South American islands in the Pacific, known commercially as Peruvian guano, is found on analysis to be high in the elements which are most beneficial to plant life.]

[Footnote 90: Seed selection, which is now preached so earnestly by the Agricultural Department of the United States as one of the things necessary to increase the yield of wheat and corn, has ever been good practice. Following Varro Virgil (*Georgic* I, 197) insists upon it: "I have seen those seeds on whose selection much time and labour had been spent, nevertheless degenerate if men did not every year rigorously separate by hand all the largest specimens."]

[Footnote 91: Cicero (de Div. II, 24) records a *mot* of Cato's that he wondered that an haruspex did not laugh when he saw another—"qui mirari se aiebat, quod non rideret aruspex, aruspicem quum vidisset."]

[Footnote 92: This process of propagation which Varro describes as "new" is still practised by curious orchardists under the name "inarching." The free end of a growing twig is introduced into a limb of its own tree, back of a specimen fruit, thus pushing its development by means of the supplemental feeding so provided. Cf. *Cyc. Am. Hort.* II, 664.]

[Footnote 93: *Alfalfa* is the Moorish name which the Spaniards brought to America with the forage plant *Medicago Sativa*, Linn., which all over Southern Europe is known by the French name *lucerne*. It is proper to honour the Moors by continuing in use their name for this interesting plant, because undoubtedly they preserved it for the use of the modern world, just as undoubtedly they bequeathed to us that fine sentiment known as personal honour.

Alfalfa was one of the standbys of ancient agriculture. According to Pliny, it was introduced into Italy from Greece, whence it had been brought from Asia during the Persian wars, and so derived its Greek and Roman name *Medica*. As Cato does not mention it with the other legumes he used, it is probable that the Romans had not yet adopted it in Cato's day, but by the time of Varro and Virgil it was well established in Italy. In Columella's day it was already a feature of the agriculture of Andalusia, and there the Moors, who loved plants, kept it alive, as it were a Vestal fire, while it died out of Italy during the Dark Ages: from Spain it spread again all over Southern Europe, and with America it was a fair exchange for tobacco. Alfalfa has always been the subject of high praise wherever it has been known. The Greek Amphilochus devoted a whole book to it, as have the English Walter Harte in the middle of the eighteenth century and the American Coburn at the beginning of the twentieth century, but none of them is more instructive on the subject of its culture than is Columella in a few paragraphs. Because of the difficulty of getting a stand of it in many soils, it is important to realize the pains which the Romans took with the seed bed, for it is on this point that most American farmers fail. Says Columella (II, 10):

"But of all the legumes, alfalfa is the best, because, when once it is sown, it lasts ten years: because it can be mowed four times, and even six times, a year: because it improves the soil: because all lean cattle grow fat by feeding upon it: because it is a remedy for sick beasts: because a jugerum (two-thirds of an acre) of it will feed three horses plentifully for a year. We will teach you the manner of cultivating it, as follows: The land which you wish to set in alfalfa the following spring should be broken up about the Kalends of October, so that it may mellow through the entire winter. About the Kalends of February harrow it thoroughly, remove all the stones and break up the clods. Later, about the month of March, harrow it for the third time. When you have so got the land in good order, lay it off after the

manner of a garden, in beds ten feet wide and fifty feet long, so that it may be possible to let in water by the paths, and access on every side may be had by the weeders. Then cover the beds with well rotted manure. At last, about the end of April, sow plentifully so that a single measure (cyanthus) of seed will cover a space ten feet long and five wide. When you have done this brush in the seed with wooden rakes: this is most important for otherwise the sprouts will be withered by the sun. After the sowing no iron tool should touch the beds; but, as I have said, they should be cultivated with wooden rakes, and in the same manner they should be weeded so that no foreign grass can choke out the young alfalfa. The first cutting should be late, when the seed begins to fall: afterwards, when it is well rooted, you can cut it as young as you wish to feed to the stock. Feed it at first sparingly, until the stock becomes accustomed to it, for it causes bloat and excess of blood. After cutting, irrigate the beds frequently, and after a few days, when the roots begin to sprout, weed out all other kinds of grass. Cultivated in this way alfalfa can be mowed six times a year, and it will last for ten years."]

[Footnote 94: See the explanation of what the Romans meant by *terra varia* in the note on Cato V. *ante*, p. 40.]

[Footnote 95: It is interesting to note from the statements in the text that in Varro's time the Roman farmer in Italy both sowed and reaped substantially the same amount of wheat as does the American farmer today. Varro says that the Romans sowed five modii of wheat to the jugerum and reaped on the maximum fifteen for one. As the modius was nearly the equivalent of our peck, the Roman allowance for sowing corresponds to the present American practice of sowing seven pecks of wheat to the acre: and on this basis a yield of 26 bushels to the acre, which is not uncommon in the United States, is the equivalent of the Roman harvest of fifteen for one.

It is fair to the average Italian farmer of the present day who is held up by the economists to scorn because he does not produce more than eleven bushels of wheat to the acre, to record that in Columella's time, when agriculture had declined as compared with Varro's experience, the average yield of grain in many parts of Italy did not exceed four for one (*Columella*, III, 3), or say seven and a half bushels to the acre.

Varro's statement that at Byzacium in Africa wheat yielded 100 for one, which Pliny (*II.N.* XVIII, 23) increases to 150 for one, means from 175 to 260 bushels per acre, seems incredible to us, but is confirmed by the testimony of agricultural practice in Palestine. Isaac claimed to reap an hundred fold, and the parable of the Sower alludes to yields of 30, 60 and 100 fold.

Harte *Essays on Husbandry*, 91, says that the average yield in England in the middle of the eighteenth century was seven for one, though he records the case of an award by the Dublin Society in 1763 to an Irish gentleman who raised 50 bushels of wheat from a single peck of seed! Harte was a parson, but apparently he did not bring the same unction into his agriculture as did the Rev. Robert Herrick to the husbandry of his Devonshire glebe, a century earlier. In Herrick's *Thanksgiving to God for his House* he sings:

"Lord, 'tis thy plenty dropping hand
That soils my land
And giv'st me for my bushel sown
Twice ten for one.
Thou makst my teeming hen to lay
Her egg each day:
Besides my healthful ewes to bear
Me twins each year."]

[Footnote 96: As the Gallic header here described by Varro is the direct ancestor of our modern marvellous self-binding harvester, it is of interest to rehearse the other ancient references to it.

Pliny (*H. N.* XVIII, 72) says:

"In the vast domains of the provinces of Gaul a large hollow frame armed with teeth and supported on two wheels is driven through the standing corn, the beasts being yoked behind it, the result being that the ears are torn off and fall within the frame." Palladius (VII, 2) goes more into detail:

"The people of the more level regions of Gaul have devised a method of harvesting quickly and with a minimum of human labour, for thereby a single ox is made to bear the burden of the entire harvest. A cart is constructed on two low wheels and is furnished with a square body, of which the side boards are adjusted to slope upward and outward to make greater capacity. The front of the body is left open and there across the width of the cart are set a series of lance shaped teeth spaced to the distance between the grain stalks and curved upward. Behind the cart two short shafts are fashioned, like those of a litter, where the ox is yoked and harnessed with his head towards the cart: for this purpose it is well to use a well broken and sensible ox, which will not push ahead of his driver. When this machine is driven through the standing grain all the heads are stripped by the teeth and are thrown back and collected in the body of the cart, the straw being left standing. The machine is so contrived that the driver can adjust its height to that of the grain. Thus with little going and coming and in a few short hours the entire harvest is made. This method is available in level or prairie countries and to those who do not need to save the straw."

That ingenious Dutchman Conrad Heresbach refers, in his *Husbandry*, to Palladius' description of the Gallic header with small respect, which indicates that in the sixteenth century it was no longer in use. I quote from

Barnaby Googe's translation of Heresbach (the book which served Izaak Walton as the model for his *Compleat Angler*): "This tricke might be used in levell and champion countries, but with us it would make but ill-favoured worke."

Dondlinger, in his excellent *Book of Wheat* (1908), which should be in the hands of every grain farmer, gives a picture reproducing the Gallic header and says:

"After being used during hundreds of years the Gallic header disappeared, and it seems to have been completely forgotten for several centuries. Only through literature did it escape the fate of permanent oblivion and become a heritage for the modern world. The published description of the machine by Pliny and Palladius furnished the impulse in which modern harvesting inventions originated. Its distinctive features are retained in several modern inventions of this class, machines which have a practical use and value under conditions similar to those which existed on the plains of Gaul. Toward the close of the eighteenth century, the social, economic and agricultural conditions in England, on account of increasing competition and the higher value of labour, were ripe for the movement of invention that was heralded by the printed account of the Gallic header. The first header was constructed by William Pitt in 1786. It was an attempted improvement on the ancient machine in that the stripping teeth were placed in a cylinder which was revolved by power transmitted from the wheels. This 'rippling cylinder' carried the heads of the wheat into the box of the machine, and gradually evolved into the present day reel."

It may be added that the William Pitt mentioned was not the statesman, but a contemporary agricultural writer of the same name.]

[Footnote 97: According to Sir Anthony Fitzherbert it was the custom in England to shear wheat and rye and to leave the straw standing after the

third method described by Varro, the purpose being to preserve the straw to be cut later for thatching, as threshing it would necessarily destroy its value for thatching. It was the custom in England, however, to mow barley and oats.]

[Footnote 98: Pliny advises that the grain which collects on the circumference of a threshing floor of this description be saved for seed because it is evidently the heaviest.]

[Footnote 99: In the Apennines today the threshing floor, or *aja*, is anointed with cow dung smeared smooth with water, doubtless for the same reason that the Romans so used *amurca*.]

[Footnote 100: Between harvests the winnowing basket is quite generally used in Italy today for a cradle, as it was from the beginning of time, for there is an ancient gem representing the infant Bacchus asleep in a winnowing basket.]

[Footnote 101: What the French call, from the same practice, *vin de rognure*.]

[Footnote 102: Varro does not mention the season of the olive harvest, but Virgil tells us (G. II, 519) that in their day as now it was winter. Cato (XX-XXII) described the construction and operation of the *trapetus* in detail. 'It can still be seen in operation in Italy, turned by a patient donkey and flowing with the new oil of an intense blue-green colour. It is always flanked by an array of vast storage jars (Cato's *dolii* now called *orci*), which make one realize the story of *Ali Baba and the Forty Thieves*.]

[Footnote 103: The Roman waste of *amurca*, through ignorance of its value, was like the American waste of the cotton seed, which for many years was thrown out from the gin to rot upon the ground, even its

fertilizing use being neglected. Now cotton seed has a market value equivalent to nearly 20 per cent of that of the staple. It is used for cattle feed and also is made into lard and "pure olive oil," being exported in bulk and imported again in bottles with Italian labels.]

[Footnote 104: Cf. Fowler, *Social Life at Rome in the Age of Cicero*. "Let us consider that in a large city today the person and property of all, rich or poor, are adequately protected by a sound system of police and by courts of first instance which are sitting every day. Assault and murder, theft and burglary are exceptional. It might be going too far to say that at Rome they were the rule: but it is the fact that in what we may call the slums of Rome there was no machinery for checking them.... It is the great merit of Augustus that he made Rome not only a city of marble but one in which the persons and property of all citizens were fairly secure."

There are several contemporary references to the crowded and dangerous condition of the streets of Rome at the end of the Republic. Cicero (*Plancius*, 7) tells how he was pushed against the arch of Fabius while struggling through the press of the Via Sacra, and exonerates from blame the man who was the immediate cause of his inconvenience, holding that the one next beyond was more responsible: in which judgment Cicero was of the opinion of Mr. Justice Blackstone in the famous leading case of *Scott v. Shepherd* (1 *Smith's L.C.*, 480), where the question was who was liable for the damage eventually done by the burning squib which was passed about the market house by successive hands. The majority of the court held, however, against Blackstone and Cicero, and established the doctrine of proximate cause.]

[Footnote 105: The Roman week (*nundinum*, or more properly *internundinum*) was of eight days, the last being the market day on which the citizens rested from agricultural labour and came into town to sell and buy

and talk politics. Cf. Pliny, XVIII, 3. This custom which Varro regrets had fallen into desuetude so far as Rome was concerned was in his day still practised in the provinces. Thus the five tenants on Horace's Sabine farm were wont to go every *nundinum* to the market town of Varia (the modern Vicovaro) to transact public business (*Epist.* I, 14, 2).]

[Footnote 106: Varro here refers to the great economic change which was coming over Italian husbandry in the last days of the Republic, the disappearance of the small farms, the "septem jugera" which nurtured the early Roman heroes like Cincinnatus and Dentatus, and even the larger, but still comparatively small, farms which Cato describes, and the development of the *latifundia* given over to grazing.]

[Footnote 107: The tradition is, says Pliny, that King Augeas was the first in Greece to use manure, and that Hercules introduced the practice into Italy. To the wise farmer the myth of the Augean stables is the genesis of good agriculture.]

[Footnote 108: This was the "crowded hour" in Varro's life, and, as M. Boissier has pointed out, he loved to dwell upon its episodes. It will be recalled that Pompey divided the Mediterranean into thirteen districts for the war with the Pirates and put a responsible lieutenant in command of each, thus enabling him by concurrent action in all the districts to clear the seas in three months. Appian gives the list of officers and the limits of their commands, saying: "The coasts of Sicily and the Ionian sea as far as Acarnania were entrusted to Plotius and Varro." It is difficult to understand Varro's own reference to Delos, but Appian makes clear how it happened that Varro was stationed on the coast of Epirus and so fell in with the company of "half Greek shepherds" who are the *dramatis personae* of the second book. As the scene of the first book was laid in a temple of Tellus, so this relating to live stock is cast in a temple of Pales, the goddess of

shepherds, on the occasion of the festival of the Parilia, and the names of the characters have a punning reference to live stock.]

[Footnote 109: The codices here contain an interpolation of the words "HIC INTERMISIMUS," to indicate that a part of the text is missing, with which judgment of some early student of the archetype Victoriuss, Scaliger and Ursinus, as well as their successors among the commentators on Varro, have all agreed. It is a pleasure to record the agreement on this point, because it is believed to be unique: but many precedents for plunging the reader *in medias res*, as does the surviving text, might be found in the modern short story of the artist in style. As M. Boissier points out Varro might have cited the beginning of the Odyssey as a precedent for this.]

[Footnote 110: This is a paraphrase of a favorite locution of Homer's heroes, whose characteristic modesty does not, however, permit them to apply it to themselves, as Varro does. Thus in *Iliad*, VII, 114, Agamemnon advises Menelaos not to venture against Hector, whom "even Achilles dreadeth to meet in battle, wherein is the warrior's glory, and Achilles is better far than thou."]

[Footnote 111: Virgil (*Aen.* VII, 314) made a fine line out of this tradition, endowing the sturdy race of Fauns and Nymphs who inhabited the land of Saturn before the Golden Age, with the qualities of the trees on whose fruit they subsisted, "gensque virum truncis et duro robore nata."]

[Footnote 112: In the registers of the censors every thing from which the public revenues were derived was set down under the head of *pascua*, or "pasture lands," because for a long time the pasture lands were the only source of such revenue. Cf. Pliny, *H.N.* XVIII, 3.]

[Footnote 113: Olisippo is the modern Lisbon. This tradition about the mares of the region is repeated by Virgil (*Geo.* III, 272) by Columella (VI,

27) and by Pliny (VIII, 67). Professor Ridgeway in *The Origin and Influence of the Thoroughbred Horse* describes it as "an aetiological myth to explain the swiftness of horses" for the fleetest horses came out of the West; thus Pegasus was born at the springs of the ocean, and there is the passage in Homer (*Iliad*, XVI, 149) about the horses "that flew as swift as the winds, the horses that the harpy Podarge (Swift Foot) bare to the West Wind as she grazed on the meadows by the stream of the Ocean." Hence we may conclude that there was a race of swift horses in Portugal in the earliest times, which Professor Ridgeway would doubtless like very much to prove, in support of his interesting thesis, were derived from Libya.]

[Footnote 114: *Hypenemia*, or barren eggs, are described intelligently by Aristotle (H.A.V. 1, 4, VI. 2, 5), and, with Varro's confidence in the country traditions, by Pliny, H.N. X, 80.

If he had known it, Varro might have here cited the fact that the unfertilized queen bee is parthenogenetic, though producing only male bees; i.e., drones: but it remained for a German clergyman, Dzierzon, to discover this in the eighteenth century.]

[Footnote 115: Cf. Plautus *Menaechmi*, II, 2, 279. One of the two *Menaechmi* is, on his arrival at Epidamnus, mistaken for his brother, of whose existence he does not know, and much to his amazement is introduced into the brother's life and possessions. At first he expostulates, accusing the slave of the brother, who has mistaken his identity, of being crazy and offers to exorcise him by a sacrifice of weanling pigs, wherefore he asks the question quoted in the text. Varro was evidently fond of this passage, as he quotes it again, *post*, p. 221. The *Menaechmi* is one of the immortal comedies and has survived in many forms on the modern stage all over Europe. From it Shakespeare derived the plot of the *Comedy of Errors*.]

[Footnote 116: It is interesting to compare these sane therapeutics with Cato's practice less than two hundred years previous (*ante*, p. 47), which was characteristic of the superstitious peasant who in Italy still seeks the priest to bless his ailing live stock.]

[Footnote 117: This Atticus was Cicero's intimate friend to whom he addressed so many of his charming letters. He changed his name as stated in the text, the new name being that of an uncle who adopted him, as we learn from his life by Nepos. As is well known to all students of Cicero, Atticus had dwelt in Athens many years and derived his income from estates in Epirus, which is the point of Scrofa's jest.]

[Footnote 118: This requirement of short legs is the more remarkable because of the long journeys which Varro says the Roman sheep were required to make between their summer and winter pastures. A similar necessity and bad roads created in England, before the eighteenth century, a demand for long legged sheep. Prothero (*English Farming Past and Present*) quotes a description of the "true old Warwickshire ram" in 1789: "His frame large and remarkably loose. His bone throughout heavy. His legs long and thick, terminating in large splaw feet."

One of the things which Bakewell accomplished was to shorten the legs as well as to increase the mutton on his New Leicesters. Of Bakewell, Mr. Prothero justly says, "By providing meat for the million he contributed as much to the wealth of the country as Arkwright or Watt."]

[Footnote 119: Shepherds still look for the black or spotted tongue in the mouth of the ram, for the reason given by Varro, but the warning is no longer put in the shepherds' manual.]

[Footnote 120: Varro would still feel at home in Apulia, for there the sheep industry is carried on much as it was in his time, and thence the *calles*

publicae, to which he refers, still lead to the summer pastures in the Apennines. Cf. Beauclerk *Rural Italy*, chap. V. "The extensive pasturages of the 'Tavoliere di Puglia' (Apulia) are of great importance and have a history of their own. This vast domain covers 750,000 acres: its origin belongs to the time of the Roman Conquests and the protracted wars of the Republic, which were fought out in the plains, whence they became deserted and uncultivated, fit only for public pastures in winter time ... the periodical emigrations of the flocks continue as in the past times: they descend from the mountains into the plains by a network of wide grassy roads which traverse the region in every direction and are called *tratturi*. These lanes are over 100 yards in width and cover a total length of 940 miles.... Not less than 50,000 animals are pastured on the Tavoliere, requiring over 1,500 square miles of land for their subsistence.... Five thousand persons are employed as shepherds."]

[Footnote 121: Varro quite uniformly uses words which indicate that he was accustomed to see sheep driven (*abigere, propellere, adpellere*) but we can see the flocks *led* in Italy today, as they were in Palestine soon after Varro's death, according to the testimony of that beautiful figure of the Good Shepherd (*St. John*, X, 4): "And when he putteth forth his own sheep he goeth before them, and the sheep follow him, for they know his voice." R. Child, in his "Large Letter" in Hartlib's *Legacie*, gives the explanation of the difference in the custom:

"Our sheep do not follow their shepherds as they do in all other countries: for the shepherd goeth before and the sheep follow like a pack of dogs. This disobedience of our sheep doth not happen to us, as the Papist Priests tell their simple flocks, because we have left their great shepherd the Pope; but because we let our sheep range night and day in our fields without a shepherd: which other countries dare not for fear of wolves and

other ravenous beasts, but are compelled to guard them all day with great dogs and to bring them home at night, or to watch them in their folds."]

[Footnote 122: Cf. Dante, *Purg.* XXVII, 79.

"Le capre

Tacite all' ombra mentre che'l sol ferve

Guardate dal pastor che'n su la verga

Poggiato s'e, e lor poggiato serve."]

[Footnote 123: It will be recalled that when Odysseus, disguised as a beggar, was making his way to his house in company with the faithful swineherd Eumaeus, they met the goatherd Melanthius "leading his goats to feast the wooers, the best goats that were in all the herds." (*Odyssey*, XVII, 216), and that subsequently he suffered a terrible punishment for this unfaithfulness to his master's interests.]

[Footnote 124: Pliny (VIII, 76) calls these excrescences *lancinae*, or folds, and attributes them exclusively to the she goat, as Varro seems to do also, but Columella (VII, 6) attributes them to the buck.]

[Footnote 125: Aristotle (H.A. I, 9.1) refers to this opinion and denounces it as erroneous.]

[Footnote 126: The Roman *denarius*, which has been here and later translated *denier*, may be considered for the purpose of comparing values as, roughly, the equivalent of the modern franc, or lira, say 20 cents United States money.]

[Footnote 127: Macrobius (*Saturn.* I, 6) tells another story of the origin of this cognomen, which, if not so heroic as that in the text, is entertaining. It is related that a neighbour's sow strayed on Tremelius' land and was

caught and killed as a vagrant. When the owner came to claim it and asserted the right to search the premises Tremelius hid the carcass in the bed in which his wife was lying and then took a solemn oath that there was no sow in his house except that in the bed.]

[Footnote 128: It would seem, as Gibbon says of the Empress Theodora, that this passage could be left "veiled in the obscurity of a learned language"; but it may be noted that the *locus classicus* for the play on the word is the incident of the Megarian "mystery pigs" in Aristophanes' *Acharnians*, 728 ff. Cf. also Athenaeus, IX, 17, 18.]

[Footnote 129: Cf. Pliny (*H.N.* VIII, 77): "There is no animal that affords a greater variety to the palate of the epicure: all the others have their own peculiar flavour, but the flesh of the hog has nearly fifty different flavours."]

[Footnote 130: In his stimulating book, *Comment la route crée le type Social*, Edmond Desmolins submits an ingenious hypothesis to explain the pre-eminence of the Gauls in the growing and making of pork, and how that pre-eminence was itself the explanation of their early success in cultivating the cereals. He describes their migrating ancestors, the Celts, pushing their way up the Danube as hordes of nomad shepherds with their vast flocks and herds of horses and cattle, on the milk of which they had hitherto subsisted. So long as they journeyed through prairie steppes, the last of which was Hungary, they maintained their shepherd character, but when they once passed the site of the present city of Vienna and entered the plateau of Bavaria, they found new physical conditions which caused them to reduce and to separate their herds of large cattle—an unbroken forest affording little pasture of grass. Here they found the wild boar subsisting upon the mast of the forest, and him they domesticated out of an economic necessity, to take the place of their larger cattle as a basis of food supply. Until then

they had not been meat eaters, and so had known no necessity for cereals, for milk is a balanced ration in itself. But this change of diet required them also to take to agriculture and so to abandon their nomad life.

'By reason of the habits of the animal, swine husbandry has a tendency in itself to confine those engaged in it to a more or less sedentary life, but we are about to see how the Celts were compelled to accomplish this important evolution by an even more powerful force. Meat cannot be eaten habitually except in conjunction with a cereal ... and of all the meats pork is the one which demands this association most insistently, because it is the least easily digested and the most heating of all the meats.... So that is how the adoption of swine husbandry and a diet of pork compelled our nomad Celts to take the next step and settle down to agriculture.']

[Footnote 131: This Gallic *tomacina* was doubtless the ancestor of the *mortadella* now produced in the Emilia and known to English speaking consumers as "Bologna" sausage.]

[Footnote 132: The Gaul of which Cato was here writing is the modern Lombardy, one of the most densely populated and richest agricultural districts in the world. Here are found today those truly marvellous "marchite" or irrigated meadows which owe the initiative for their existence to the Cistercian monks of the Chiaravalle Abbey, who began their fruitful agricultural labours in the country near Milan in the twelfth century. There is a recorded instance of one of these meadows which yielded in a single season 140 tons of grass per hectare, equal to 75 tons of hay, or 30 tons per acre! The meadows are mowed six times a year, and the grass is fed green to Swiss cows, which are kept in great numbers for the manufacture of "frommaggio di grana," or Parmesan cheese. This system of green soiling maintains the fertility of the meadows, while the by-product of the dairies is the feeding of hogs, which are kept in such quantity that they are today

exported as they were in the times of Cato and Varro. There is no region of the earth, unless it be Flanders, of which the aspect so rejoices the heart of a farmer as the Milanese. Well may the Lombard proverb say, "Chi ha prato, ha tutto."]

[Footnote 133: Virgil (*Aen.* VII, 26) subsequently made good use of this tradition of the founding of Lavinium, the sacred city of the Romans where the Penates dwelt and whither solemn processions were wont to proceed from Rome until Christianity became the State religion. The site has been identified as that of the modern village of Practica, where a few miserable shepherds collect during the winter months, fleeing to the hills at the approach of summer and the dread *malaria*.]

[Footnote 134: Cf. Polybius, XII, 4: 'For in Italy the swineherds manage the feeding of their pigs in the same way. They do not follow close behind the beasts, as in Greece, but keep some distance in front of them, sounding their horn every now and then: and the animals follow behind and run together at the sound. Indeed, the complete familiarity which the animals show with the particular horn to which they belong seems at first astonishing and almost incredible. For, owing to the populousness and wealth of the country, the droves of swine in Italy are exceedingly large, especially along the sea coast of the Tuscans and Gauls: for one sow will bring up a thousand pigs, or some times even more. They, therefore, drive them out from their night styes to feed according to their litters and ages. When if several droves are taken to the same place they cannot preserve these distinctions of litters: but they, of course, get mixed up with each other both as they are being driven out and as they feed, and as they are being brought home. Accordingly, the device of the horn blowing has been invented to separate them when they have got mixed up together, without labour or trouble. For as they feed one swineherd goes in one direction sounding his horn, and another in another and thus the animals sort

themselves of their own accord and follow their own horn with such eagerness that it is impossible by any means to stop or hinder them. But in Greece when the swine get mixed up in the oak forests in their search for the mast, the swineherd who has most assistants and the best help at his disposal, when collecting his own animals drives off his neighbours' also. Some times, too, a thief lies in wait and drives them off without the swineherd knowing how he has lost them, because the beasts straggle a long way from their drivers in their eagerness to find acorns, when they are just beginning to fall.'

Bishop Latimer in one of his sermons quotes the phrase used in his youth, at the time of the discovery of America, in calling hogs: 'Come to thy mingle-mangle, come pur, come pur.' It would be impossible to transcribe the traditional call used in Virginia. One some times thinks that it was the original of the celebrated 'rebel yell' of General Lee's army.]

[Footnote 135: The use of the Greek salutation was esteemed by the more austere Romans of the age of Scipio an evidence of preciousness, to be laughed at: and so Lucienus' jesting apology for the use of it here doubtless was in reference to Lucilius' epigram which Cicero has preserved, *de Finibus*, I, 3.

"Graece ergo praetor Athenis

Id quod maluisti te, quum ad me accedi, saluto

[Greek: Chaire] inquam, Tite: lictores turma omni cohorsque

[Greek: Chaire] Tite! Hinc hostis mi Albucius, hinc inimicus."

It was the word which the Romans taught their parrots. Cf. Persius, *Prolog.* 8.]

[Footnote 136: The working ox was respected by the ancient Romans as a fellow labourer. Valerius Maximus (VIII, 8 *ad fin.*) cites a case of a Roman

citizen who was put to death, because, to satisfy the craving of one of his children for beef to eat, he slew an ox from the plough. Ovid puts this sentiment in the mouth of Pythagoras, when he agrees that pigs and goats are fit subjects for sacrifice, but protests against such use of sheep and oxen. (*Metamor.* XV, 139.)

"Quid meruere boves, animal sine fraude dolisque
Innocuum, simplex, natum tolerare labores?
Immemor est demum, nee frugum manere dignus
Qui potuit curvi demto modo pondere arati
Ruricolam mactare suum: qui trita labore
Ilia quibus toties durum renovaverat arvom
Tot dederse messes, percussit colla securi."

[Footnote 137: The learned commentators have been able to discover nothing about either this Plautius or this Hirrius, but it appears that Archelaus wrote a book under the title *Bugonia*, of which nothing survives. It may be conjectured, however, on the analogy of Samson's riddle to the Philistines, "Out of the eater came forth meat, and out of the strong came forth sweetness," (*Judges*, XIV, 14), that Plautius meant to imply that some good might be the consequence of the evil Hirrius had done: and that Vaccius cited the allusion to suggest to Varro that, while he might know nothing much about cattle, his attempt to deal with the subject might provoke some useful discussion.]

[Footnote 138: Darwin, *Animals and Plants*, II, 20, cites this passage and says that "at the present day the natives of Java some times drive their cattle into the forests to cross with the wild Banteng." The crossing of wild blood on domestic animals is not, however, always successful. A recent visitor to the German agricultural experiment station at Halle describes "a curious hairy beast with great horns, a wild look in his eye, a white streak down his

back and a bumpy forehead, which had in it blood from cattle which had lived on the plains of Thibet, which had grazed on the lowland pastures of Holland, which had roamed the forests of northeast India and of the Malay Peninsular, and had wandered through the forests of Germany. We Americans had sympathy for this beast. He was some thing like ourselves, with the blood of many different races flowing through his veins."]

[Footnote 139: Pliny (VIII, 66) cites the fact that the Scythians always preferred mares to stallions for war, and gives an ingenious reason for the preference. Aristotle (*H.A.* VI, 22) says that the Scythians rode their pregnant mares until the very last, saying that the exercise rendered parturition more easy. Every breeder of heavy draft horses has seen a mare taken from the plough and have her foal in the field, with no detriment to either: and the story of the mare Keheilet Ajuz, who founded the best of the Arab families, is well known, but bears repetition. I quote from Spencer Borden, *The Arab Horse*, p. 44: "It is related that a certain Sheik was flying from an enemy, mounted on his favourite mare. Arab warriors trust themselves only to mares, they will not ride a stallion in war. The said mare was at the time far along toward parturition: indeed she became a mother when the flying horseman stopped for rest at noonday, the new comer being a filly. Being hard pressed the Sheik was compelled to remount his mare and again seek safety in flight, abandoning the newborn filly to her fate. Finally reaching safety among his own people, great was the surprise of all when, shortly after the arrival of the Sheik on his faithful mare, the little filly less than a day old came into camp also, having followed her mother across miles of desert. She was immediately given into the care of an old woman of the tribe (Ajuz = an old woman), hence her name Keheilet Ajuz, 'the mare of the old woman,' and grew to be the most famous of all the animals in the history of the breed."]

[Footnote 140: Varro does not describe the livery of the horses of his day, as he does of cattle, but Virgil (*Georg.* III, 81) supplies the deficiency, asserting that the best horses were bay (*spadices*) and roan (*glauci*) while the least esteemed were white (*albi*) and dun (*gilvi*), which is very interesting testimony in support of the most recent theory of the origin of the thoroughbred horse. Professor Ridgeway who, opposing Darwin's conclusion, contends for a multiple origin of the historic and recent races of horses, has collected a mass of information about the marking of famous horses of all ages in his *Origin and Influence of the Thoroughbred Horse*. He maintains that a bay livery, with a white star and stockings, the development of protective coloration from an originally striped coat, such as has gone on more recently in the case of the quaggas, is absolute evidence of the North African origin of a horse, and he shows that all the swiftest horses mentioned in history are of that race, while the heavier and less mettlesome horses of Northern origin have been, when pure bred, dun coloured or white.

Of the Italian breeds mentioned by Varro, Professor Ridgeway conjectures that the Etruscan (or Rosean) was probably an improved Northern horse, while the Apulian, from the South of Italy, represented an admixture of Libyan blood.]

[Footnote 141: Aristotle (*H.A.* VI, 22) preceded Varro with this good advice, saying that a mare "produces better foals at the end of four or five years. It is quite necessary that she should wait one year and should pass through a fallow, as it were—[Greek: poiein osper neion]."]

[Footnote 142: Mules were employed in antiquity from the earliest times. In Homer they were used for drawing wagons: thus Nausicaa drove a mule team to haul out the family wash, and Priam made his visit to Achilles in a mule litter. Homer professes to prefer mules to oxen for ploughing. There

were mule races at the Greek games. Aristotle (*Rhetoric*, III, 2) tells an amusing story of Simonides, who, when the victor in the mule race offered him only a poor fee, refused to compose an ode, pretending to be shocked at the idea of writing about "semi-asses," but, on receipt of a proper fee, he wrote the ode beginning: "Hail, daughters of storm-footed mares," although they were equally daughters of the asses.]

[Footnote 143: The breed of Maremma sheep dogs, still preferred in Italy, is white. He is doubtless the descendant of the large woolly "Spitz" or Pomeranian wolf dog which is figured on Etruscan coins.]

[Footnote 144: In his essay, *Notre ami le chien*, Maeterlinck maintains eloquently that the dog alone among the domestic animals has given his confidence and friendship to man. "We are alone, absolutely alone, on this chance planet: and amid all the forms of life that surround us not one excepting the dog has made alliance with us. A few creatures fear us, most are unaware of us, and not one loves us. In the world of plants, we have dumb and motionless slaves: but they serve us in spite of themselves.... The rose and the corn, had they wings, would fly at our approach, like birds. Among the animals, we number a few servants who have submitted only through indifference, cowardice or stupidity: the uncertain and craven horse, who responds only to pain and is attached to nothing ... the cow and the ox happy so long as they are eating and docile because for centuries they have not had a thought of their own.... I do not speak of the cat, to whom we are nothing more than a too large and uneatable prey: the ferocious cat whose side long contempt tolerates us only as encumbering parasites in our own homes. She at least curses us in her mysterious heart: but all the others live beside us as they might live beside a rock or a tree."

The effective use of this thesis in the scene of the revolt of the domestic animals in the *Blue Bird* will be remembered.]

[Footnote 145: This method of securing the faithful affection of a dog is solemnly recommended, without acknowledgment to Saserna, in the seventeenth century editions of the *Maison Rustique* (I, 27).]

[Footnote 146: Keil happily points out that in his book on the Latin language (VII, 31), Varro quotes the "ancient proverb" to which he here refers, viz.: "canis caninam non est" dog doesn't eat dog.]

[Footnote 147: Aristotle (*H.A.* VI, 20) says that puppies are blind from twelve to seventeen days, depending upon the season of the year at which they are born. Pliny (*H N.* VIII, 62) says from seven to twenty days, depending upon the supply of the mother's milk.]

[Footnote 148: It was among these hardy shepherd slaves that Spartacus recruited his army in 72-71 B.C., as did Caelius and Milo in 48 B.C., while their descendants were the brigands who infested Southern Italy even in the nineteenth century.]

[Footnote 149: Gaius, I, 119, II, 24, 41, describes in detail the processes here referred to by which a slave was acquired under the Roman law.]

[Footnote 150: Dennis, in his *Cities and Cemeteries of Etruria*, draws a picture of modern Italy which may serve to illustrate Varro's sketch of the mountain life of the shepherds of his day:

"Occasionally in my wanderings on this site (Veii) I have entered, either from curiosity or for shelter, one of the *capanne* scattered over the downs. These are tall conical thatched huts which the shepherds make their winter abode. For in Italy, the lowlands being generally unhealthy in summer, the flocks are driven to the mountains about May, and as soon as the great heats are past are brought back to the rich pastures of the plains. It is a curious sight, the interior of a *capanna*, and affords an agreeable diversity to the

antiquity hunter. A little boldness is requisite to pass through the pack of dogs, white as new dropt lambs, but large and fierce as wolves, which, were the shepherd not at hand, would tear in pieces whoever might venture to approach the hut: but with one of the *pecoraj* for a Teucer, nothing is to be feared. The *capanne* are of various sizes. One I entered not far from Veii was thirty or forty feet in diameter and fully as high, propped in the centre by two rough masts, between which a hole was left in the roof for the escape of smoke. Within the door lay a large pile of lambs, there might be a hundred, killed that morning and already flayed, and a number of shepherds were busied in operating on the carcasses of others: all of which were to be dispatched forthwith to the Roman market. Though a fierce May sun blazed without, a huge fire roared in the middle of the hut: but this was for the sake of the *ricotta*, which was being made in another part of the *capanna*. Here stood a huge cauldron, full of boiling ewes' milk. In a warm state this curd is a delicious jelly and has often tempted me to enter a *capanna* in quest of it, to the amazement of the *pecoraj*, to whom it is *vilior alga*. Lord of the cauldron, stood a man dispensing ladlefuls of the rich simmering mess to his fellows, as they brought their bowls for their morning allowance: and he varied his occupation by pouring the same into certain small baskets, the serous part running off through the wicker and the residue caking as it cooled. On the same board stood the cheeses, previously made from the cream. In this hut lived twenty-five men, their nether limbs clad in goat skins, with the hair outwards, realizing the satyrs of ancient fable: but they had no nymphs to tease, nor shepherdesses to woo, and never

'sat all day Playing on pipes of corn, and versing love
To amorous Phillida.'

They were a band of celibates without the vows. In such huts they dwell all the year round, flaying lambs or shearing sheep, living on bread, *ricotta* and water, very rarely tasting meat or wine and sleeping on shelves ranged

round the hut, like berths in a ship's cabin. Thus are the dreams of Arcadia dispelled by realities."]

[Footnote 151: In modern Italy the shepherds do not take their women with them to the *saltus*, but, as Dennis says, lead there the life of "celibates, without the vows."]

[Footnote 152: In the Venitian provinces of Italy today the women are still seen at work in the harvest and rice fields with their babes in their bosoms: but the most amazing modern spectacle of this kind is that of women coaling ships in the East, carrying their unhappy youngsters up and down the coal ladders throughout the work.]

[Footnote 153: The author of *Maison Rustique* did not agree with Varro in this opinion. I quote from Surflet's translation of 1606 (I, 7):

"And for writing and reading it skilleth not whether he be able to doe it or no, or that he should have any other charge to looke unto besides that of yours, or else that he should use another to set downe in writing such expences as he hath laid out: for paper will admit any thing."]

[Footnote 154: This temple and fig tree stood in Rome at the foot of the Palatine hill, in the neighbourhood of the Lupercal. It was under this fig tree that Romulus and Remus were supposed to have been suckled by the wolf.]

[Footnote 155: 'That is the beste grease that is to a shepe, to grease hym in the mouthe with good meate,' says Sir Anthony Fitzherbert.]

[Footnote 156: Pliny (VII, 59) says that most nations learn the use of barbers next after that of letters, but that the Romans were late in this respect. Varro himself wore a beard, as appears on the coin he struck during

the war with the Pirates. It is reproduced in Smiths *Dict. Gr. and Rom. Biog.*, III, p. 1227.]

[Footnote 157: Cowper's verse in *The Task* seems to be all that is happy in the way of translation of Varro's text, "divina natura dedit agros, ars humana aedificavit urbes": but Cowley's "God the first garden made, and the first city Cain" was probably Cowper's source. Cowley was a reader of Varro, as his pleasant and sane essay *Of Agriculture* shows.]

[Footnote 158: Following the precedent of the first and second books in the matter of local colour, the scene of this third book, relating to villas and the "small deer," which were there reared, is laid in the *villa publica* at Rome, and the characters of the dialogue are selected for the suggestion which their names may make of the denizens of the aviary, the barn yard and the bee-stand.]

[Footnote 159: This Appius Claudius Pulcher served in Asia under his brother-in-law Lucullus, was Augur in B.C. 59, Consul in 54 and Censor in 50. He wrote a book on augural law and the habits of birds at which Cicero poked some rather mean fun. He fixes the date of the dialogue.]

[Footnote 160: In Varro's time, as today, the river Velinus drained the fresh pastures of the Umbrian prairie of Rosea, "the nurse of Italy," which lay below the town of Reate (the modern Rieti), and was originally the bed of a lake. Its waters are so strongly impregnated with carbonate of lime that by their deposit of travertine they tend to block their own channel. The drainage of Rosea has, therefore, always been a matter of concern to the live stock industry of Reate, and in B.C. 272 M. Curius Dentatus opened the first of several successful artificial canals (the last dating from the sixteenth century, A.D.), which still serve to lead the Velinus into the Nar at the renowned Cascade delle Marmore. For two hundred years the people of Interamna (the modern Terni) had complained that their situation below the

falls was endangered by Curius' canal, and finally in B.C. 54 the Roman Senate appointed the commission to which Appius Claudius refers in the text, to hear the controversy. Cicero was retained as counsel for the people of Reate, and during the hearing stopped, as Appius Claudius did, with our friend Axius at his Reatine villa, and wrote about the visit to the same Atticus whom we met in Varro's second book, as follows (*ad Atticum*, IV, 15): "After this was over the people of Reate summoned me to their Tempe to plead their cause against the people of Interamna, before the Consul and ten commissioners, the question being concerning the Veline lake, which, drained by M. Curius by means of a channel cut through the mountain, now flows into the Nar: by this means the famous Rosea has been reclaimed from the swamp, though still fairly moist. I stopped with Axius, who took me also to visit the Seven Waters." What was once deemed a danger is a double source of profit to the modern folk of Interamna. Tourists today crowd to see the same waterfall which Cicero visited, taking a tram from the busy little industrial town of Terni: and the waters which flow from Velinus now serve to generate power with which armour plates are manufactured for the Italian navy on the site of the ancient Interamna.]

[Footnote 161: Sicilian honey was famous for its flavour because of the bee pasture of thyme which there abounded, especially at Hybla. Theophrastus (H.P. III, 15, 5) explains that the honey of Corsica had an acrid taste, because the bees pastured there largely on box trees.]

[Footnote 162: These denizens of the Roman villa are all enumerated by Martial in his delightful verses (III, 38) upon Faustinus' villa at Baiae. The picture of the barn yard is very true to life in all ages, especially the touch of the hungry pigs sniffing after the pail of the farmer's wife:

"Vagatur omnis turba sordidae cortis

Argutus anser, gemmeique pavones

Nomenque debet quae rubentibus pennis,
Et picta perdix, Numidicaeque guttatae
Et impiorum phasiana Colchorum.
Rhodias superbi feminas prement galli
Sonantque turres plausibus columbarum,
Gemit hinc palumbus, inde cereus turtur
Avidi sequuntur villicae sinum porci:
Matremque plenam mollis agnus exspectat."]

[Footnote 163: The *sestertius* was one quarter of a *denarius*, or, say, the equivalent of five cents. It was also called *nummus*, as we say "nickel." The ordinary unit used by the Romans in reckoning considerable sums of money was 1,000 sesterces, which may accordingly be translated as the equivalent of (say) \$50. Axius' jackass thus cost \$2,000, while Seius' income from his villa was \$2,500 per annum, that of Varro's aunt from her aviary was \$3,000, and that of Axius from his farm \$1,500. Cicero records that Axius was a money lender, which explains the fun here made of his avarice.]

[Footnote 164: Columella, writing about one hundred years after Varro, refers to this passage and says that luxury had so developed since Varro's time that it no longer required an extraordinary occasion, like a triumph, to bring the price of thrushes to three *denarii* a piece, but that that had become a current quotation.]

[Footnote 165: A *minerval* was the fee (of Minerva) paid to a school teacher.]

[Footnote 166: The inventor of the auspices *ex tripudiis* or the feeding of chickens was evidently an ingenious poultry fancier who succeeded in securing the care of his favourites at the public charge.]

[Footnote 167: This was L. Marcius Philippus, the orator mentioned by Horace (*Epist.* I, 7, 46), who was Consul in B.C. 91, and was celebrated for his luxurious habits, which his wealth enabled him to gratify. His son married the widow of C. Octavius and so became the step-father of the Emperor Augustus.]

[Footnote 168: This was *turdus pilaris*, the variety of thrush which is called field fare.]

[Footnote 169: The traveller by railway from Rome to Naples passes near Varro's estate of Casinum, and if he stops at the mediaeval town of San Germano to visit the neighbouring Badia di Monte Cassino, where the "angelic doctor" Thomas Aquinas was educated, he will find Varro's memory kept green: for he will be entertained at the *Albergo Varrone* ("very fair but bargaining advisable," sagely counsels Mr. Baedeker) and on his way up the long winding road to the Abbey there will be pointed out to him the river Rapido, on the banks of which Varro's aviary stood, and nearby what is reputed to be the site of the old polymath's villa which Antony polluted with the orgies Cicero described in the second Philippic. Antony's destruction of his library was a great blow to Varro, but one likes to think that his ghost can take satisfaction in the maintenance, so near the haunts of his flesh, of such a noble collection of books as is the continuing pride of the Abbey on the mountain above.]

[Footnote 170: Varro's Museum, or study where he wooed the Muses, on his estate at Casinum was not unlike that of Cicero at his native Arpinum, which he described (*de Leg.* II, 3) agreeably as on an island in the cold and clear Fibrenus just above its confluence with the more important river Liris, where, like a plebeian marrying into a patrician family, it lost its name but contributed its freshness. The younger Pliny built a study in the garden of his Laurentine villa near Ostia, which he describes (II, 17) with enthusiasm:

"horti diaeta est, amores mei, re vera amores": and here he found refuge from the tumult of his household during the festivities of the Saturnalia, which corresponded with our Christmas. In the ante bellum days every Virginia gentleman had such an "office" in his house yard where he pretended to transact his farm business, but where actually he was wont to escape from the obligations of family and continuous hospitality.]

[Footnote 171: The commentators on this interesting but obscure description of Varro's aviary have at this point usually endeavoured to explain the arrangements of the chamber under the lantern of the *tholus* with respect to its use as a dining room which Varro frequented himself, and hence have been amused into all kinds of difficulties of interpretation. The references to the *convivae* are what lead them astray, and it remained for Keil to suggest that this was a playful allusion to the birds themselves, a conclusion which is strengthened by Varro's previous statement of the failure of Lucullus' attempt to maintain a dining room in his aviary.]

[Footnote 172: Cf. Vitruvius, I, 6: "Andronicus Cyrrhestes built at Athens an octagonal marble tower, on the sides of which were carved images of the eight winds, each on the side opposite that from which it blew. On the pyramidal roof of this tower he placed a bronze Triton holding a rod in his right hand, and so contrived that the Triton, revolving with the wind, always stood opposed to that which prevailed, and thus pointed with his rod to the image on the tower of the wind that was blowing at the moment." The ruins of this Tower of the Winds may still be seen in Athens. There is a picture of it in Harper's Dictionary of Classical Antiquities in the article *Andronicus*.]

[Footnote 173: One ventures to translate *athletoe comitorum* by Mr. Gladstone's famous phrase.]

[Footnote 174: Reading "tesserulas coicientem in loculum."]

[Footnote 175: A French translator might better convey the intention of the pun, contained in the *ducere serram* of the text, by the locution, *une prise de bec*.]

[Footnote 176: It probably will not comfort the ultimate consumer who holds in such odium the celebrated "Schedule K" of the Payne-Aldrich tariff, to realize that the American wool grower puts no higher value on his sheep than did his Roman ancestor, as revealed by this quotation from the stock yards of Varro's time. It is interesting, however, to the breeder to know that a good price for wool has always stimulated the production of the best stock. Strabo says that the wool of Turdetania in Spain was so celebrated in the generation after Varro that a ram of the breed (the ancestors of the modern Merino) fetched a talent, say \$1,200; a price which may be compared with that of the prize ram recently sold in England for export to the Argentine for as much as a thousand pounds sterling, and considered a good commercial investment at that. Doubtless the market for Rosean mules comforted Axius in his investment of the equivalent of £400 in a breeding jack.]

[Footnote 177: In feudal times the right to maintain a dove cote was the exclusive privilege of the lord of the manor. According to their immemorial custom, which Varro notices, the pigeons preyed on the neighbourhood crops and were detested by the community in consequence. During the French revolution they were one of the counts in the indictment of the land-owning aristocracy, and in the event the pigeons as well as their owners had the sins of their forefathers justly visited upon them. The American farmer who has a pigeon-keeping neighbour and is restrained by the pettiness of the annoyance from making a point on their trespasses, feels something of the blind and impotent wrath of the French peasant against the whole pigeon family.]

[Footnote 178: It appears that the Romans actually hired men to chew the food intended for cramming birds, so as to relieve the unhappy victims even of such exercise as they might get from assimilating their diet. Columella (VII, 10) in discussing the diet of thrushes deprecates this practice, sagely saying that the wages of the chewers are out of proportion to the benefit obtained, and that any way the chewers swallow a good part of what they are given to macerate.

The typical tramp of the comic papers who is forever looking for occupation without work might well envy these Roman professional chewers. Not even Dr. Wiley's "poison squad" employed to test food products could compare with them.]

[Footnote 179: These prices of \$10 and \$50 and even \$80 a pair for pigeons, large as they seem, were surpassed under the Empire. Columella says (VIII, 8): "That excellent author, M. Varro, tells us that in his more austere time it was not unusual for a pair of pigeons to sell for a thousand sesterces, a price at which the present day should blush, if we may believe the report that men have been found to pay for a pair as much as four thousand *nummi*." (\$200.)]

[Footnote 180: The market for chickens and eggs in the United States would doubtless astonish the people of Delos as much as the statistics do us (*ipsa suas mirantur Gargara messes!*). It is solemnly recorded that the American hen produces a billion and a quarter dozen eggs per annum, of a value greater than that of either the wheat or cotton crops, and yet there are many of us who cannot get our hens to lay more than a hundred eggs a year!]

[Footnote 181: Reading *ad infirma crura*. This practice is explained more at length by Columella (VIII, 2, 3) who specifies the spurs, *calcaribus inustis*.

Buffon, who describes a 'practice of trimming the combs of capons, adds (V, 302) an interesting account of an experiment which he says he had made "une espece de greffe animale": after trimming the comb of a growing cockerel his budding spurs were cut out and grafted on the roots of the comb, where they took root and flourished, growing to a length of two and a half inches, in some cases curving forward like the horns of a ram, and in others turning back like those of a goat.]

[Footnote 182: The dusting yard which Varro here describes was in the open, but Columella (VIII, 3) advises what modern poultry farmers pride themselves upon having recently discovered,—a covered scratching pen strewn with litter to afford exercise for the hens in rough weather. It will be observed that, so far as ventilation is concerned, Varro recommends a hen house open to the weather: this is another standard of modern practice which has had a hard struggle against prejudice. Columella adds two more interesting bits of advice, that for the comfort of the hens the roosts should be cut square, and for cleanliness their water trough should be enclosed leaving only openings large enough to receive a hen's head. With so much enlightenment and sanitation one would expect one or the other of these Romans to tell us of some "teeming hen" like Herrick's who laid "her egg each day."

We are proud to be able to cite the eminent Roseburg Industrious Bidy who, in the year of grace 1912, achieved the championship of America with a record of 266 eggs in ten months and nineteen days, and was sold for \$800: but Varro is content to suggest that a hen will lay more eggs in a season than she can hatch, and the conservative Columella (VIII, 5) that the number of eggs depends upon diet.]

[Footnote 183: The guinea fowl got their Greek name, *meleagrides*, because the story was that the sisters of Meleager were turned into guinea

hens. Pliny (*H.N.* X, 38) says that they fight every year on Meleager's tomb. It is a fact that they are a pugnacious fowl. Buffon says that guinea fowl disappeared from Europe in the Dark Ages and were not known again until the route to the Indies via the Cape of Good Hope was opened when they were imported anew from the west coast of Africa.]

[Footnote 184: Reading, "propter fastidium hominum." Cf. Pliny (X, 38), whose explanation is "propter ingratum virus."]

[Footnote 185: There is a Virginia practice of feeding a fat turkey heavily on bread soaked in wine or liquor just before he is killed, the result being that as the turkey gets into that condition which used to put our ancestors under the table, he relaxes all his tendons and so is sweeter and more tender when he comes above the table. There is a humanitarian side to the practice which should recommend it even to the W.C.T.U. as well as to the epicure.]

[Footnote 186: Many thousands of geese used to be driven every year to Rome from the land of the Morini in Northern Gaul, but the Germans are the modern consumers. A British consular report says that in addition to the domestic supply a special "goose train" of from fifteen to forty cars is received daily in Berlin from Russia. It would seem that the goose that lays the golden egg has emigrated to Muscovy. Buffon says that the introduction of the Virginia turkey into Europe drove the goose off the tables of all civilized peoples.]

[Footnote 187: Columella (VIII, 14) repeats this myth, but Aristotle (*H.A.* V, 2, 9) says that geese bathe *after* breeding. Buffon gives a Gallic touch, "ces oiseaux preludent aux actes de l'amour en allant d'abord s'egayer dans l'eau."]

[Footnote 188: Reading *seris*. It is the *Cichorium endivia* of Linnaeus. Cf. Pliny (*H.N.* XX, 32.)]

[Footnote 189: Varro does not mention it, but the Romans knew and prized *pâté de foie gras* under the name *ficatum*, which indicates that they produced it by cramming their geese with a diet of figs. Cf. Horace's verse "pinguibus et ficis pastum iecur anseris albi."

In Toulouse, whence now comes the best of this dainty of the epicure, the geese are crammed daily with a dough of corn meal mixed with the oil of poppies, fed through a tin funnel, which is introduced into the esophagus of the unhappy bird. At the end of a month the stertorous breathing of the victim proclaims the time of sacrifice to Apicius. The liver is expected to weigh a kilogram, (say two pounds), while at least two kilograms of fat are saved in addition, to garnish the family *plat* of vegetables during the remainder of the year.]

[Footnote 190: Reading *foeles*, which Keller, in his account of the fauna of ancient Italy in the Cambridge *Companion to Latin Studies*, identifies with *Martes vulgaris*. Sir Anthony Fitzherbert calls them fullymartes. It does not appear that the Romans had in Varro's time brought from Egypt our household cat, *F. maniculata*. They used weasels and tame snakes for catching mice.]

[Footnote 191: Darwin (*Animals and Plants*, I, 8) cites this passage and argues that Varro's advice to cover the duck yard with netting to keep the ducks from flying out is evidence that in Varro's time ducks were not entirely domesticated, and hence that the modern domestic duck is the same species as the wild duck. It may be noted, however, that Varro gives the same advice about netting the chicken yard, having said that chickens had been domesticated from the beginning of time.]

[Footnote 192: The ancient Etruscan city of Tarquinii is now known as Corneto. The wild sheep which Lippinus there kept in his game preserves were probably the *mouflon* which are still hunted in Sardinia and Corsica,

though they may have been the Phrygian wild sheep (*Aegoceros argali*) which Varro mentions in Book II. Pliny (*H.N.* VIII, 211) says that this Lippinus was the first of the Romans to keep wild animals enclosed; that he established his preserves shortly before the Civil Wars, and that he soon had imitators.]

[Footnote 193: Reading * * * * [Transcriber's note: the preceding four *s are actually four instances of the "infinity" symbol (like a digit 8 rotated horizontally)]*passum*. The Roman mile, *mille passuum*, was 142 yards less than the English mile.]

[Footnote 194: Of the three kinds of hares mentioned by Varro the "common Italian kind" was *L. timidus*, a roast shoulder of which Horace vaunts as a delicacy: the Alpine hare was *L. variabilis*, which grows white on the approach of winter: and the *cuniculus* was the common rabbit known to our English ancestors as the coney. Strabo records (Casaub, 144) that the inhabitants of the Gymnesian (Balearic) Islands in Spain sent a deputation to Augustus to request a military force to exterminate the pest of rabbits, for such was their multitude that the people were being crowded out of their homes by them, in which their plight was that of modern Australia. They were usually hunted in Spain with muzzled ferrets imported from Africa.]

[Footnote 195: The edible snail, *helix pomatia*, L., is still an article of commerce in France and Italy. They prey upon vines and give evidence of their appreciation of the best by abounding in the vineyards of the *Cote d'or*, the ancient Burgundy. There at the end of summer they are gathered for the double purpose of protecting the vines and delighting the epicure: are then stored in a safe place until cold weather, when they considerably seal up their own shells with a calcareous secretion and so are shipped to market.

Here is the recipe for 'escargots à la bourguignonne,' which despite the prejudice engendered by *Leviticus* (XI, 30.) may be recommended to the American palate jaded by beefsteak and potatoes and the high cost of living: "Mettre les escargots a bouillir pendant 5 a 10 minutes dans de l'eau salée, les retirer de leur coquille, les laver a l'eau froide pour les debarrasser du limon, les cuire dans un court-bouillon fortement assaisonné. Apres cuisson les replacer dans le coquille bien nettooyee, en les garnissant au fond et par dessus d'une farce de beurre frais manipule avec un fin hachis de persil, cerfeuil, ail, echalote, sel et poivre. Avant de servir, faire chauffer au four."]

[Footnote 196: Reading LXXX *quadrantes*. A comparison may be made of this capacity with that of the ordinary snail known to the Romans, for their smallest unit of liquid measure was called a *cochlear*, or snail shell, and contained.02 of a modern pint, or, as we may say, a spoonful: indeed the French word *cuiller* is derived from *cochlear*.]

[Footnote 197: It is perhaps well to remind the American reader that the European dormouse (*Myoxus glis*. Fr. *loir*. Ger. *siebenschlafer*) is rather a squirrel than a mouse, and that he is still esteemed a dainty edible, as he was by the Romans: indeed when fat, just before he retires to hibernate, he might be preferred to 'possum and other strange dishes on which some hospitable Americans regale themselves and the patient palates of touring Presidents. In his treatise *De re culinaria* Apicius gives a recipe for a ragout of dormice which sounds appetizing.]

[Footnote 198: Darwin (*Animals and Plants*, XVIII) says: "I have never heard of the dormouse breeding in captivity."]

[Footnote 199: Varro makes no mention of tea and bread and butter as part of the diet of a dormouse; so we are better able to understand his abstinence at the mad tea party in *Alice in Wonderland*. As Martial (III, 58)

calls him *somniculosus*, it is probable that his table manners on that occasion were nothing new and that his English and German names were always justified.]

[Footnote 200: This is one of Varro's puns which requires a surgical operation to get it into one's head. Appius is selected to talk about bees because his name has some echo of the sound of *apis*, the word for bee.]

[Footnote 201: The study of bees was as interesting to the ancients as it is to us. There have survived from among many others the treatises of Aristotle, Varro, Virgil, Columella and Pliny, but they are all made up, as Maeterlinck has remarked, of "erreurs charmantes," and for that reason the antique lore of bees is read perhaps to best advantage in the mellifluous verses of the fourth *Georgic*, which follow Varro closely.]

[Footnote 202: He might have said also that the hexagonal form of construction employed by bees produces the largest possible result with the least labour and material. Maeterlinck rehearses (*La Vie des Abeilles*, 138) the result of the study of this problem in the highest mathematics:

"Réaumur avait proposé au célèbre mathématicien Koenig le problème suivant: 'Entre toutes les cellules hexagonales à fond pyramidal composées de trois rhombes semblables et égaux, déterminer celle qui peut être construite avec le moins de matière?' Koenig trouva qu'une telle cellule avait son fond fait de trois rhombes dont chaque grand angle était de 109 degrés, 26 minutes et chaque petit de 70 degrés, 34 minutes. Or, un autre savant, Maraldi, ayant mesuré aussi exactement que possible les angles des rhombes construits par les abeilles fixa les grands à 109 degrés, 28 minutes, et les petits à 70 degrés, 32 minutes. Il n'y avait donc, entre les deux solutions qu'une différence de 2 minutes. Il est probable que l'erreur, s'il y en a une, doit être imputée à Maraldi plutôt qu'aux abeilles, car aucun

instrument ne permet de mesurer avec une precision infaillible les angles des cellules qui ne sont pas assez nettement definis."

Maclaurin, a Scotch physicist, checked Koenig's computations and reported to the Royal Society in London in 1743 that he found a solution in exact accord with Maraldi's measurements, thereby completely justifying the mathematics of the bee architect.]

[Footnote 203: The Romans were as curious and as constant in the use of perfumes as we are of tobacco. It is perhaps well to remember that they might find our smoke as offensive as we would their unguents.]

[Footnote 204: Indeed one of the marvels of nature is the service which certain bees perform for certain plants in transferring their fertilizing pollen which has no other means of transportation. Darwin is most interesting on this subject.]

[Footnote 205: The ancients, even Aristotle, did not know that the queen bee is the common mother of the hive. They called her the king, and it remained for Swammerdam in the seventeenth century to determine with the microscope this important fact. From that discovery has developed our modern knowledge of the bee; that the drones are the males and are suffered by the (normally) sterile workers to live only until one of them has performed his office of fertilizing once for all the new queen in that nuptial flight, so dramatically fatal to the successful swain, which Maeterlinck has described with wonderful rhetoric, whereupon the workers massacre the surviving males without mercy. This is the "driving out" which Varro mentions.]

[Footnote 206: This picture of the queen bee is hardly in accord with modern observations. It seems that while the queen is treated with the utmost respect, she is rather a royal prisoner than a ruler, and, after her

nuptial flight, is confined to her function of laying eggs incessantly unless she may be unwillingly dragged forth to lead a swarm. Maeterlinck thus pictures (*La Vie des Abeilles*, 174) her existence with a Gallic pencil:

"Elle n'aura aucune des habitudes, aucunes des passions que nous croyons inherentes à l'abeille. Elle n'éprouvera ni le desir du soleil, ni le besoin de l'espace et mourra sans avoir visite une fleur. Elle passera son existence dans l'ombre et l'agitation de la foule à la recherche infatigable de berceaux à peupler. En revanche, elle connaîtra seule l'inquietude de l'amour."]

[Footnote 207: It would have interested Axius to know that the annual consumption of honey in the United States today is from 100 to 125 million pounds and that the crop has a money value of at least ten million dollars. To match Seius, we might put forward a bee farmer in California who produces annually 150,000 pounds of honey from 2,000 hives.]

[Footnote 208: Maeterlinck has made a charming picture of this habit of propinquity of the bee-stand to the human habitation. He describes (*La Vie des Abeilles*, 14) the old man who taught him to love bees when he was a boy in Flanders, an old man whose entire happiness "consistait aux beautés d'un jardin et parmi ces beautés la mieux aimée et la plus visitée était un rucher, composé de douze cloches de paille qu'il avait peint, les unes de rose vif, les autres de jaune clair, la plupart d'un bleu tendre, car il avait observé, bien avant les expériences de Sir John Lubbock, que le bleu est la couleur préférée des abeilles. Il avait installé ce rucher contre le mur blanchi de la maison, dans l'angle que formait une des ces savoureuses et fraîches cuisines hollandaises aux dressoirs de faïence où étincelaient les étains et les cuivres qui, par la porte ouverte, se reflétaient dans un canal paisible. Et l'eau chargée d'images familières, sous un rideau de peupliers, guidait les regards jusqu'au repos d'un horizon de moulins et de prés."]

[Footnote 209: Reading *Apiastro*. This is the *Melissa officinalis* of Linnaeus. Cf. Pliny, XX, 45 and XXI, 86.]

[Footnote 210: Bee keepers attribute to Reaumur the invention of the modern glass observation hive, which has made possible so much of our knowledge of the bee, but it may be noted that Pliny (*H.N.* XXI, 47) mentions hives of "lapis specularis," some sort of talc, contrived for the purpose of observing bees at work. The great advance in bee hives is, however, the sectional construction attributed to Langstroth and developed in America by Root.]

[Footnote 211: Columella, (IX, 14) referring to the myth of the generation of bees in the carcase of an ox (out of which Virgil made the fable of the pastor Aristaeus in the Fourth Georgic), explains the practice mentioned in the text with the statement "hic enim quasi quadam cognatione generis maxime est apibus aptus." The plastering of wicker hives with ox dung persisted and is recommended in the seventeenth century editions of the *Maison Rustique*.]

[Footnote 212: Reading *seditiosum*.]

[Footnote 213: This is a mistake upon which Aristotle could have corrected Varro.]

[Footnote 214: After studying the commentators on this obscure passage, I have elected to follow the emendation of Ursinus, which, although Keil sneers at its license, has the advantage of making sense.]

[Footnote 215: *Sinapis arvensis*, Linn.]

[Footnote 216: *Sium sisarum*, Linn.]

[Footnote 217: The philosophy of the bee is not as selfish as that human principle which Varro attributes to them. The hive does not send forth its "youth" to found a colony, but, on the contrary, abandons its home and its accumulated store of wealth to its youth and itself ventures forth under the leadership of the old queen to face the uncertainties of the future, leaving only a small band of old bees to guard the hive and rear the young until the new queen shall have supplied a new population.]

[Footnote 218: Reading *imbecilliores*.]

[Footnote 219: Pliny (*H.N.* IX, 81) relates that this loan was made to supply the banquet on the occasion of one of the triumphs of Caesar the dictator, but Pliny puts the loan at six thousand fishes.]

[Footnote 220: It is impossible to translate this pun into English, *dulcis* being the equivalent of both "fresh" and "agreeable," and *amara* of "salt" and "disagreeable." A French translator would have at his command *doux* and *amer*.]

[Footnote 221: Cf. Pliny (*H.N.* II, 96): "In Lydia the islands called Calaminae are not only driven about by the wind, but may even be pushed at pleasure from place to place, by which means many people saved themselves in the Mithridatic war. There are some small islands in the Nymphaeus called the Dancers, because, when choruses are sung, they move in tune with the measure of the music."]

[Footnote 222: Reading *in ius vocare*, with the *double entendre* of service in a sauce and bringing to justice.]

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