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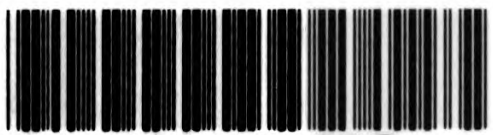


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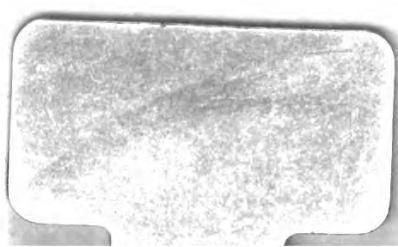
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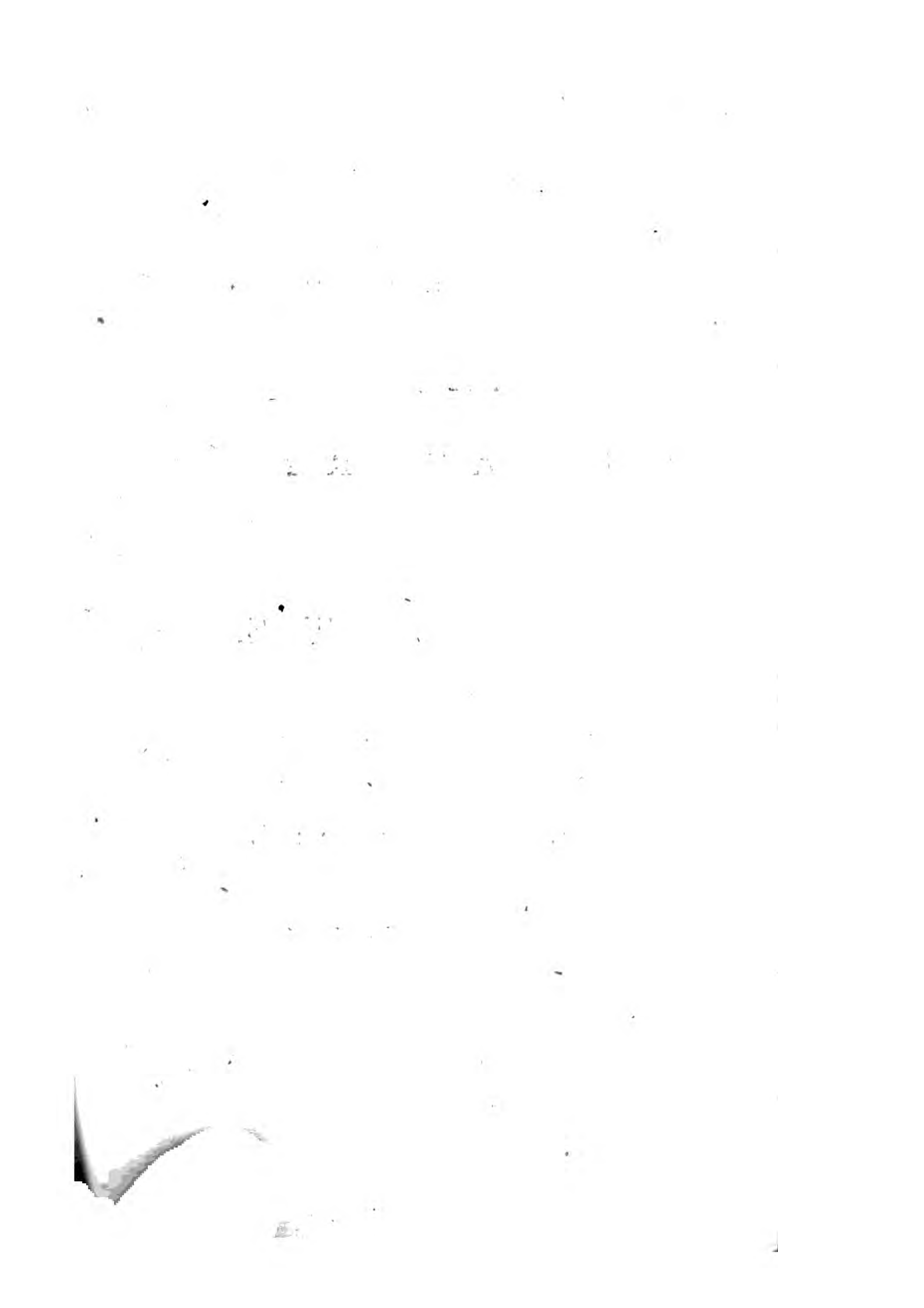






THE  
H U S B A N D R Y  
OF THE  
A N C I E N T S,  
V O L U M E I.





THE  
H U S B A N D R Y  
OF THE  
A N C I E N T S.

IN TWO VOLUMES.

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By ADAM DICKSON, A.M.  
LATE MINISTER OF WHITTINGHAM.

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V O L U M E I.

EDINBURGH:

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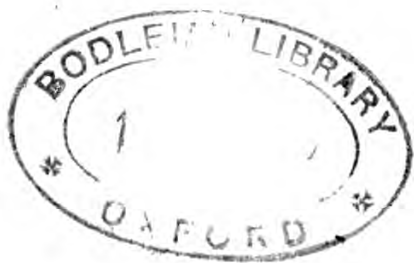
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TO HIS GRACE, THE  
DUKE OF BUCCLEUGH,  
EARL OF DALKEITH AND DONCASTER, &c.  
KNIGHT AND COMPANION  
OF THE MOST NOBLE ORDER  
OF THE THISTLE, &c.  
PRESIDENT OF THE ROYAL SOCIETY  
OF EDINBURGH, &c.

MY LORD DUKE,

THE following posthumous work is  
of right inscribed to your Grace, as it is  
intirely owing to your decided approbation,  
and liberal patronage, that it is offered to  
the

the public, so long after the death of the author.

BUT, independent of that circumstance, your Grace's constant attention to the interest of your Country, and your judicious and successful encouragement of Husbandry, in all its branches, entitle your Grace to every mark of respect which the lovers of that art can bestow.

IT would not become me here, to enumerate your Grace's qualities of a more public nature; but I may be permitted to say, that the esteem and affection of your countrymen, of all ranks, which your Grace has so long possessed, demonstrate, that the steady exercise of the virtues of justice and humanity can alone, with certainty,

DEDICATION. vii

tainty, give to rank and fortune, or to eminent talents, a lasting ascendant in the minds of men.

I am, with profound respect,

MY LORD DUKE,

Your Grace's

Much obliged,

And most obedient

Humble servant,

THE EDITOR.



1870

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# SOME ACCOUNT

OF THE

AUTHOR.

**T**HE author of the following work, was a son of the late Reverend Mr Andrew Dickson, Minister of Aberlady, in the county of East Lothian: He had a liberal education at the University of Edinburgh; and, having a very promising genius for learning, was always designed for the church. His father, however, having a large farm, he early turned his thoughts to agriculture; and, in his youth, passing some part of his time with the farmers of that opulent county, who are many of them not unfit to converse with men of letters, he, from them, as well as from his own observation, acquired the exact knowledge of facts, and of the practice of husbandry. Being a man of a very lively apprehension, of an ardent mind, and of a clear

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and

and sound judgment, he soon became an adept in any branch of science to which he applied.

Mr Dickson was ordained minister of Dunse, in the shire of Berwick, in the year 1750. As his settlement had been delayed for a considerable time, on account of a law-suit about the legality of the presentation, an opposition to him was stirred up in the parish; but such was the ability, good sense, and engaging temper of Mr Dickson, and such the candor and generosity of his conduct, that his most sanguine opponents very soon became his greatest friends.

Our author resided for twenty years in Berwickshire, where improvements in agriculture having been much more recent, and the difficulties to be surmounted much greater than in East Lothian, he had occasion there to observe the most spirited exertions, by the cultivators of land. This change of situation enlarged his views, and extended his knowledge, on the subject of his favourite pursuit.

In the year 1770, Mr Dickson returned to his native county, having been translated from Dunse to Whittingham, in East Lothian, where he lived but a few years; he was killed by a fall from his horse, on the 25th of March 1776.

No man could be more universally regretted among the circle of his acquaintance, than he was; not merely on account of his respectable abilities as a clergyman and a scholar, but still more on account of the unbounded benevolence of his heart, and the peculiar frankness and promptitude with which he gave his assistance in advice, or in credit and support, to every person who had the smallest title to ask him.

It was with no small degree of judgment, that Mr Dickson had early selected to himself a corner of literature, for which the habits of his life had peculiarly qualified him, and in which he was not likely to interfere with any of his companions, who started at the same time, for the same derived from writing well. He had observed with regret, that the books of husbandry, that had been published in England, were ill calculated for the soil and climate of Scotland; and likewise, that many of them consisted chiefly of uncertain speculations on theories, not well supported by the history of facts: He was therefore determined to compose a treatise of agriculture, on a plan that should obviate these objections. The first volume of this treatise was published in the year 1764; and the  
second

second some years afterwards; and has ever since been held, not only to be the book best adapted to the practice of the Scottish farmer, but, upon the whole, one of the most judicious and practical treatises on the subject, that has ever been published in Britain.

The following work is the produce of Mr Dickson's maturest years, and, as he confesses himself in the preface, cost him a very great degree of application and labour. The public will judge of the execution. To the editor, it appears to do much honour to the author, and to be a very valuable present to all who are conversant in the first and most useful of all the necessary arts. Farmers, in general, are intirely ignorant of the language in which the books of ancient husbandry are written; and there are but few of those lovers of the art, who are masters of the language, that will take the trouble to select out of the ancient authors, in some of which there is no small degree of obscurity, all the experiments and rules that suit the modern practice.

This they will find done to their hands by the author, who has collected under proper heads, from the ancient writers, whatever is material  
to

to the moderns; has compared the facts and rules together, and has set them in one view before his readers, both in a Translation, and in the original Latin. His perfect knowledge of the subject has enabled him to clear up many difficulties, which the learned commentators on the *Rei Rusticae Scriptores*, being intirely ignorant of husbandry, had rendered them more obscure; while his skill in modern agriculture enabled him to make a judicious comparifon between that and the practice of the ancients.

It appears, from the author's preface, which follows, that his work was ready for the prefs before his death; though, by the copy of a letter in the editor's hands, he had not then determined whether he would treat with a book-feller, or publish it by subscription. But, although the work was compleated for the prefs, the candid reader may probably find defects and inaccuracies in it, that would have been supplied or corrected, had the author lived to superintend the prefs. He will also reflect, that the book was written fully twelve years ago, and therefore will make an allowance for there being no notice taken in it of improvements or discoveries

coveries in husbandry, that may have been made since that time.

The manuscript was given to the editor a few years ago, by a daughter of the author's, who survived him, with a recommendation to do with it what he thought best for the memory of her deceased father, and his own friend. After revising it with care, the editor put it into the hands of the noble Lord to whom it is inscribed; with whose approbation, and under whose patronage, he ventured to offer it to the public, in the shape in which it now appears, with little doubt of its meeting with a favourable reception.

THE EDITOR.

EDINBURGH, }  
Jan. 1. 1788. }

T H E

A U T H O R ' s P R E F A C E .

**I**N the preface to a treatise of agriculture, published some years ago by the author, he took occasion to observe, that he had looked into some of the ancient rustic writers, and was agreeably surpris'd to find, that, notwithstanding the great difference of climate, the maxims of the ancient Roman farmers are the same with those of the best modern farmers in Britain. In consequence of this, he propos'd, as a thing which he imagin'd would not be unacceptable, to give as full an account of their husbandry, so far as the British farmer is concern'd, as can be obtained from those writings on the subject that are still extant. This he now gives to the public, and begs that the critics will be merciful ; he expects at least, from their candour, that, unless well acquainted with the subject, they will not condemn in a few minutes what has been produced by years of anxious study.



study. It is needless, however, to mention how much labour and time it has actually taken, the more, no doubt, as he does not pretend to be an adept in philology, nor a profound critic in classical learning: But he does not regret his pains and labour, as he flatters himself that he has, from his knowledge of the subject, thrown some light on many passages of the rustic authors, which the commentators have left involved in darkness; and, particularly, has in some measure rescued the husbandry of Virgil, that immortal husbandman, as well as poet, from the misrepresentations of those, who, from their ignorance of agriculture, have made him approve principles, and recommend practices, which he never thought of.

The original of all the passages cited is placed in the notes, by which the book has swelled to a larger size than was expected; but this the author thought necessary, not only because copies of the rustic writers are but rare, but likewise, because, in his translation of many passages, he differs widely from the generality of the commentators; by placing the original, therefore, in the reader's view, he puts it in his power,  
without

without any trouble, to judge of the propriety or impropriety of the translation.

This account of the husbandry of the ancients, may probably be considered rather as a matter of curiosity, than of utility; But, if communicating to all the knowledge in the practices in the different counties of a kingdom, is reckoned important, as no doubt it is, it cannot surely be reckoned altogether useless, to communicate to the modern farmer, a knowledge of the practices of an ancient nation, famous for wisdom, and whose greatest men applied themselves to the study and practice of agriculture. In the course of the work, a variety of reflections were suggested to the author, which he flatters himself are important, and have an immediate tendency to improve this useful art: He was naturally led to compare the ancient husbandry with the modern, and although, in the comparison, he has only hinted at the practices of the moderns, yet, from what he has mentioned, it is in the reader's power to judge to which of them the preference ought to be given.

The author acknowledges that, in his inquiry into some parts of the subject, he has not received all the satisfaction he desired: He has not, how-

ever, omitted the articles, but has endeavoured to explain the passages that have any relation to them, and thereby to throw all the light upon them in his power. If the passages cited should not appear in themselves to contain any thing of sufficient importance to justify the inserting them, let it be considered, that they may at least be of some use to any person that shall attempt to penetrate further into the subject.

The subject is certainly worthy of the consideration of the learned; and the author will think himself fortunate, if, by the pains which he has taken, he shall pave the way to a more perfect account of the husbandry of the ancients, by a person of more extensive knowledge.

If it is considered, that husbandry, like other branches of natural knowledge, is intirely founded on the history of facts, that the rules of it must be drawn from the experience of ages, conveyed down in authentic accounts; and that such a series of observations and experiments, has not occupied the attention of modern Europe for much more than an hundred years; whereas, this science was an object of careful inquiry among the ancients, and the subject of innumerable books, from the days of Hesiod,  
the

the first writer on husbandry, who lived above 900 years before Christ, down to the end of the fifth century of our aera, when the Roman empire was over-run by the Barbarians, we must confess, that the remains of their writings on the subject, must be highly interesting and instructive.

But the author not only expects attention to his work from the ingenious cultivators of land, and from the many societies now established through Britain for the improvement of agriculture, but he likewise hopes for the approbation of all the antiquarians of the kingdom, to whom he has opened up a mine of genuine Roman antiquities, that has hitherto been shut, except only to a few.

C O N.



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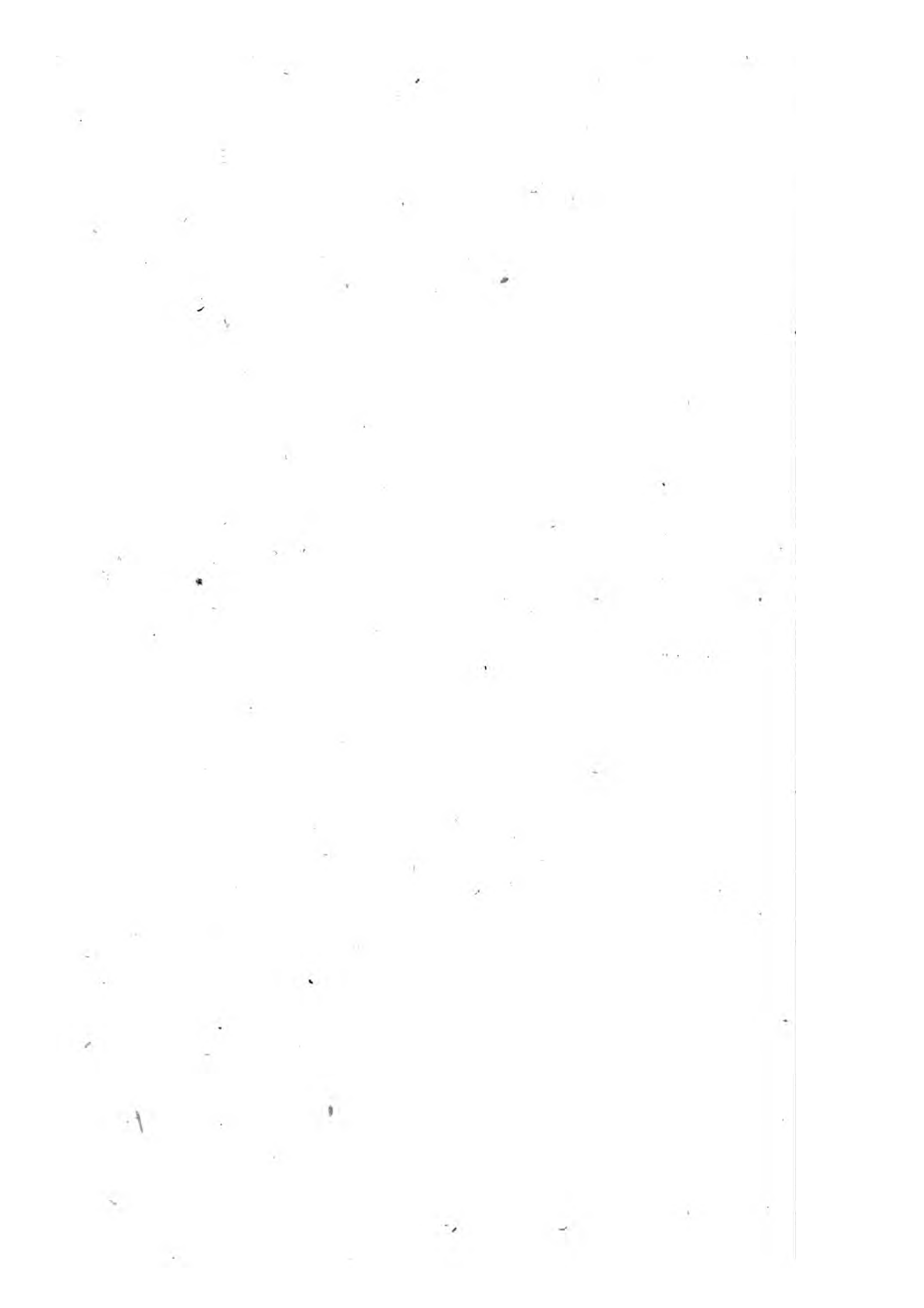
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# INTRODUCTION.

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**T**HE wisdom of the Romans, and their attention to Agriculture, are well known. The greatest men amongst them applied themselves to the study and practice of it, not only in the first ages of the state, but also after they had carried their arms beyond the confines of Italy. Among others, particular mention is made of Quinctius Cincinnatus, who delivered the Roman army when besieged by the Æqui; Caius Fabricius, who conquered the Sabines; Curius Dentatus, who drove Pyrrhus out of Italy; Attilius Seranus, and Attilius Regulus, who commanded against the Carthaginians; Cato the Censor, and Scipio Africanus the conqueror

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## 2 INTRODUCTION.

queror of Hannibal. Agriculture, in the hands of such persons, was certainly brought to great perfection, and all its operations performed with the greatest exactness and oeconomy. This Pliny asserts, and assigns it as the reason that, in ancient times, there was such plenty of corn in Rome. ‘What,’ says he, ‘was the cause of this fruitfulness? Was it, because in those times the lands were cultivated by the hands even of generals, the earth, as it is natural to suppose, delighting to be ploughed with a share adorned with laurels, and by a ploughman who had been honoured with a triumph? or, because these men ploughed their fields with the same diligence that they pitched their camps, and sowed their corn with the same care that they formed their armies for battle \*?’

Exactness

\* *Quaenam ergo tantae ubertatis causa erat? Ipsorum tunc manibus Imperatorum colebantur agri; (ut fas est credere) gaudente terra vomere laureato et triumphali aratore: sive illi eadem cura semina tractabant, qua bella; eademque diligentia arva disponebant, qua castra; Plin. Nat. Hist. lib. xviii. cap. iii.*

The knowledge of the Romans in agriculture is called in question by some modern authors. The forests and lakes in Italy, and the testimony of authors in the most flourishing

## INTRODUCTION. 3

Exactness and oeconomy in performing the several operations of agriculture are the natural consequences

flourishing aera of the state, and particularly of Cato the Censor, are mentioned as evidences of this. The extent of the forests and lakes is no doubt an evidence that Italy, as a country, was not improved in such a manner as might have been done; but it is no evidence that agriculture was not brought by the Romans to all the perfection of which it is capable. The draining of extensive lakes, and clearing of extensive forests, are works that cannot be executed without great labour and expence; and nothing will engage men to encounter these but a great demand for the produce of improved lands. In Italy there was no such demand. The cultivated lands were so fruitful as to supply the whole inhabitants at a very cheap rate. The proportion between the expence of labour and the price of corn is perhaps the most proper thing to determine, not only whether the lands of Italy were very fruitful, but also whether there was any encouragement for expensive improvements. In the time of Cato, a labouring slave cost L. 50; a few years before the birth of Cato, wheat was sold at the rate of 3 s. 6 d. per quarter; and, for more than 150 years after, did not exceed 10 s. Was the proportion between these at present in Britain the same, there would be no encouragement for expensive improvements, and indeed very little for the culture of corn.

It may likewise be observed, that many of the forests of Italy were commonities belonging to villages, called

*communia*

## 4 INTRODUCTION.

consequences of an Agrarian law. When a person has only a small portion of land assigned to

*communia* or *compascua*. As it is expensive to improve these, so it is difficult to divide them : Neither is this ever attempted, except when men are encouraged by the high price given for the produce of improved lands.

If Cato the Censor has indeed declared, that agriculture in Italy was in a low state, the question is determined ; for this art in his time was perhaps in as great perfection as at any period afterwards : But Cato has not said so. What he said implies not that agriculture in his time was not carried on with great success, but that grazing cattle was more profitable. The story, as told by Columella, is as follows : Treating of pasturage, he says, ‘ Et nunc apud nostros quidem colonos, alia res uberior  
‘ nulla est. Ut etiam M. Cato credidit, qui, consulenti,  
‘ quam partem rei rusticae exercendo celeriter locuple-  
‘ tari posset ? respondet, si bene pasceret : rursusque in-  
‘ terroganti, quid deinde faciendo satis uberes fructus per-  
‘ cepturus esset ? Affirmavit, si mediocriter pasceret.  
‘ Caeterum de tam sapiente viro piget dicere, quod eum  
‘ quidam auctores memorant, eidem quaerenti, quod-  
‘ nam tertium in agricolatione quaestuosum esset ? asser-  
‘ vasse, si quis vel male pasceret : cum praesertim majus  
‘ dispendium sequatur inertem et inscium pastorem, quam  
‘ prudentem diligentemque compendium ;’ Col. lib. vi.  
Praef. This cannot be supposed to imply any thing more than that the profits of pasturage were in his time  
much

to him, and the maintenance of his family depends entirely upon its productions, it is natural to suppose that the culture of it employs his whole attention\*.

By

much higher than the profits of tillage, occasioned not by any defect in the culture of the lands, but by the high price of labour and the low price of corn. Had it been Cato's opinion, that, in every case, the profits of pasturage exceed the profits of every kind of culture, he would have given meadows the first place in his list of fields ranked by him in order, according to their value to a purchaser; and yet, in this list, he assigns them only the fifth place; a certain evidence that he considered the other crops, when properly cultivated, as more valuable. See chap. xxxvi.

\* Those who are of opinion, that the moderns have brought agriculture to greater perfection than the ancients, sensible of the great influence of an Agrarian law, alledge, that equality of fortunes never was legally established at Rome; and, as an evidence of this, mention the *census* in the reign of Servius Tullius. It is acknowledged, that, although an equal division of the lands was made by Romulus, yet matters could not continue long in this situation. The Roman state at first subsisted chiefly by plunder: As the nobles possessed the chief offices of the state, they had also the chief offices in the army; and, in consequence of this, obtained the largest share of the plunder. Some persons, therefore, soon became rich-

By the first Agrarian law among the Romans, which was made by Romulus, the quantity of land allotted to every citizen amounted to no more than 2 *jugera*, equal to 1.236 acres English,

er than others, and could afford to advance money to those who needed it. This frequently happened: For, till the siege of Veii by Camillus, the soldiers were not paid out of the treasury, but were obliged to provide for their own maintenance. Hence, in every expedition, many of the people were obliged to borrow money, for which they paid at the rate of 12 *per cent. per annum*. By this high rate of interest, the monied men further enriched themselves. It appears likewise, that, after the division of the lands, some of the citizens soon disposed of their shares, and resided within the walls of the city. Hence the early distinction between the country tribes and those of the town; the latter of which, being idle and slothful, were not reckoned so honourable as those of the country. ‘*Rusticae tribus laudatissimae eorum, qui rura habent. Urbanae vero, in quas transferri ignominia effert, desidiaie probro;*’ Plin. Nat. Hist. lib. xviii. cap. iii. But, though persons were not confined to the quantity allotted to each citizen, yet there was such a number of great men that possessed no more than this small portion, for the course of near 500 years from the building of the city, that the same effect must have been produced in the improvement of agriculture, as if the Agrarian law had been enforced in the strictest sense.

## INTRODUCTION. 7

lish, or 982 parts of an acre Scotch\*. Pliny expressly declares, that no person was allowed a larger share †. Agreeable to this, we find, that, when the Romans divided the conquered lands, they gave to every hundred men 200 *jugera*, which 200 *jugera* were, from the hundred men, called *centuria* ‡.

After

\* *Bina jugera quod a Romulo primum divisa veritim, &c.* Var. de R. R. lib. i. cap. x. A *jugerum*, according to Columella, contains 28800 square feet. ‘Actus quadratus undique finitur pedibus cxx. Hoc duplicatum facit *jugerum*.—Ergo, ut dixi, duo actus *jugerum* efficiunt longitudine pedum cxx. latitudine pedum cxx; quae utraeque summae inter se multiplicatae quadratorum faciunt pedum viginti octo millia et octingentos;’ Col. lib. v. cap. 1. The Roman foot, according to Doctor Arbuthnot, contains 11.604 English inches; the Roman square foot is therefore to the English square foot as 134.65 is to 144; so that 28800, the number of square feet Roman in a *jugerum*, is equal to 26930.56 square feet English. The English acre contains 43560 square feet; the *jugerum*, therefore, is only .618 parts of an English acre. The Scots acre contains 54760 square feet; the *jugerum*, therefore, is only .491 parts of a Scotch acre.

† *Bina tunc jugera pop. Rom. satis erant, nullique majorem modum attribuit;* Plin. Nat. Hist. lib. xviii. cap. 11.

‡ *Centuriis, quarum mentionem nunc facimus, vocabulum*



## INTRODUCTION.

After the expulsion of the kings, there was a second Agrarian law, by which 7 jugera, equal to 4.326 acres English, and to 3.437 acres Scotch, were allotted to each citizen \*.

The

bulum datum est ex eo ; cum antiqui Romanorum agrum ex hoste captum victori populo per bina jugera partiti sunt, centenis hominibus ducentena jugera dederunt, et ex hoc facto centuria juste appellata est ; Siculus Flaccus de cond. agr.

\* Ejusdem gentis C. Licinius tribunus pleb. cum esset post reges exactos annis cccxv primus populum, ad leges accipiundas in septem jugera forensia, e comitio e-duxit ; Var. de R. R. lib. 1. cap. 11.

Ideoque post reges exactos Liciniana illa septena jugera, quae plebis tribunus viritim diviserat, majores quaestus antiquis retulere, quam nunc nobis praebent amplissima vervacta ; Col. lib. 1. cap. 111.

Cui septem jugera non essent satis. Haec autem mensura plebei post exactos reges assignata est ; Plin. Nat. Hist. lib. xviii. cap. 111.

I have cited all the passages in which this law is mentioned ; because commentators are not agreed at what time it was enacted, whether soon after the expulsion of the kings in the time of Caius Licinius, one of the first tribunes, or under the tribuneship of Licinius Stolo, who procured for the people another law, by which no person was allowed to possess more than 500 *jugera*. The generality of the commentators seem to be of opinion, that it

was

## INTRODUCTION. 9

The 2 *jugera* at first allotted to each citizen were certainly cultivated with the spade; and hence

was a law of Licinius Stolo, and some of them, that there was only one law relating to this matter, consisting of two parts, by the one fixing the *minimum*, and by the other the *maximum*. There are, however, several facts mentioned, that seem to fix the date of this law before the time of Licinius Stolo. Immediately after the taking of Veii, 20 years before he was tribune, the conquered lands were divided, and 7 *jugera*, by a decree of the senate, were assigned to each of the citizens, not only to the heads of families, but also to every freeman come to age. ‘A-  
‘ deoque ea victoria laeta patribus fuit, ut postero die re-  
‘ ferentibus consulibus, senatusconsultum fieret, ut agri  
‘ Veientani septena jugera plebi dividerentur; nec patri-  
‘ bus familiae tantum, sed ut omnium in domo liberorum  
‘ capitum ratio haberetur;’ Tit. Liv. lib. v. cap. 30. This seems to supersede the necessity of insisting upon a distribution of this kind under the tribuneship of Stolo.

The manner in which Columella mentions the 7 *jugera* assigned to each citizen by the Licinian law, supposes that none at that time were possessed of 500 *jugera*. He makes a comparison between the crops in his own time raised upon their extensive fallows, and those raised upon the small fields of 7 *jugera*, assigned to each citizen by the Licinian law. Now, this comparison is absurd, upon the supposition that 7 *jugera* were only the *minimum*, and that any person by law might possess no less than 500.

hence it is, that we find the spade often mentioned as an instrument of husbandry used by the

The expulsion of the kings is mentioned in all the passages cited; and a good reason cannot be given for this, but upon the supposition that the law alluded to was enacted soon after that event. It is certain that, soon after, there was a violent contest between the nobles and people about an Agrarian law, in which the people prevailed; it is natural, therefore, to suppose that this is the law, and that it received its name from C. Licinius, one of the first tribunes, by whom it is probable the law was first proposed.

The story told of Quint. Cincinnatus is a further evidence of this. He was chosen Dictator in the 296th year of the city, more than 40 years before the tribuneship of Stolo. At that time, it is said, that he possessed only 4 *jugera*; and the reason given for his possessing only 4 is, that he had mortgaged the other 3 for a friend. Both Columella and Pliny mention only 4 *jugera*; and Val. Maximus says, ‘Æque magna latifundia L. Quinctii Cincinnati fuerunt: septem enim jugera agri possedit; ex hisque tria, quae pro amico ad aerarium obsignaverat, mulctae nomine amisit;’ Lib. iv. cap. iv. This supposes, that, in his time, the quantity of land assigned by law was 7 *jugera*.

The only difficulty is, that Varro mentions the 365th year of the city, more than an hundred years after the expulsion of the kings: But it is very probable, that the

number

the ancient farmers. Even the 7 *jugera* afterwards allotted could not be cultivated with the plough, supposing matters to have been in the same situation as in later times; for the whole quantity is scarcely sufficient for the maintenance of one yoke of oxen. Attilius Regulus, in his letter from Africa to the senate, mentions two labourers on his 7 *jugera* farm, a *villicus* and hired servant. If the land had been ploughed, one certainly would have been sufficient. He mentions his labouring utensils, but no oxen\*. It is probable, therefore, that these small farms

number in this passage has been altered in transcribing. To make it answer to the law of Stolo, instead of *ccclxv* it ought to be *ccclxxxix*; and, indeed, about the 365th year of the city, nothing of this kind seems to have been done, except the dividing of the lands of Veii, which was done by a voluntary decree of the senate. As there seems, therefore, to be an error in the number, it is probable that, in place of *ccclxv*, it was originally *ccxxv*, which answers to the time when the people prevailed in the Agrarian law, being 5 years after the first tribunes were chosen, and 16 after the expulsion of the kings.

\* Attilius Regulus, &c. *consulibus scripsit: Villicum in agello, quem septem jugerum in Pupinia habebat, mortuum esse, occasionemque nactum mercenarium, amoto inde rustico instrumento discessisse; Val. Max. lib. iv. cap. iv.*

farms were cultivated with the spade; or, if with the plough, large pastures must have belonged to each, or oxen must have been let out for hire.

The custom of distributing the conquered lands, by giving 7 *jugera* to each citizen, continued to be observed in later times. This method was observed after the taking of Tarentum\*. Notwithstanding the great services that Curius Dentatus had done in this war, the senate offered him no more than 50 *jugera*, which he rejected, contenting himself with 7, the quantity assigned to every citizen †.

Although, in the division of the lands, an equal quantity was allotted to each of the citizens without distinction, yet nothing was done to prevent any of them from acquiring more. When each of the soldiers had received his share

\* 207 years after the expulsion of the kings, and 105 after the law of Stolo.

† Idem (Curius) cum Italia Pyrrhum regem exegisset, nihil omnino ex praeda regia, quae exercitum urbemque ditaverat, attigit. Decretis etiam a senatu septem jugeribus agri populo, sibi autem quinquaginta, popularis assignationis modum non excessit: parum idoneum rei publicae civem existimans, qui eo, quod reliquis tribueretur, contentus non esset; Val. Max. lib. iv. cap. iiii.

share of the conquered lands, the remainder was sold by the quaestors. The Sabine lands were divided into lots of 50 *jugera* \*. So it is probable were the lands of Tarentum, and that it was one of those lots that was offered to Cur. Dentatus. No person was prohibited from acquiring as large a landed estate as he could, till the law of Stolo, by which no person was allowed to possess more than 500 *jugera* †.

This

\* Ut vero Romani omnium gentium potiti sunt, agros alios ex hoste captos in victorem populum partiti sunt, alios vero agros vendiderunt, ut Sabinorum ager qui dicitur quaestorius. Eum limitibus actis diviserunt, et denis quibusque actibus laterculi quinquagena jugera incluserunt, atque ita per quaestores populo Romano vendiderunt; Sic. Flaccus, de cond. Agrorum.

† Varro de R. R. lib. 1. cap. 11. Plin. Nat. Hist. lib. xviii. cap. 111. Val. Maximus, lib. viii. cap. vi. Tit. Liv. lib. vi. When this law was enacted, it is very probable that there were many of the Romans that had estates of this extent: It is not a little surprising, then, that the senate, 105 years after, when there was a very great acquisition of territory, should offer no more than 50 *jugera* to the consul and commander by whose bravery and conduct this additional territory was acquired. It is still more surprising that, 300 years after, the Gracchi should attempt a law to prevent persons from possessing  
any

This law was at first executed with rigour. Stolo himself was condemned for having more, though the overplus was in his son's name. It seems also to have been observed many years after. Pliny, when mentioning the prices of corn in ancient times, informs us, that, when Metellus led elephants in triumph, a *modius* of *far* was sold for an *as*, and that this low price was not owing to large estates; for that, by the law of Stolo, no person could possess more than 500 *jugera*\*. According to Pliny, therefore, the

any more than 200 *jugera* in Italy: Gracchus, &c.—  
Praeterea legem tulit, ne quis in Italia amplius quam duocenta jugera possideret. Intelligebat enim contra jus esse, majorum modum possidere, quam qui ab ipso possidente coli possit; Sic. Flaccus de conditione agrorum. Were it not, therefore, that all the above mentioned authors agree in representing 500 as the number of *jugera* to which the estates in Italy were confined, and that Livy and Val. Maximus expressly declare that Stolo was condemned for having 1000 *jugera*, I should conclude that the *maximum* established by law was only 50 *jugera*, as is mentioned by Columella, lib. 1. cap. 111.

\* Metellus in triumpho plurimos duxit elephantos, affibus singulis farris modios fuisse.—Nec e latifundiis singulorum contingebat arcentium vicinos. Quippe etiam lege Stolonis Licinii incluso modo a jugerum; Plin. Nat. Hist. lib. xviii. cap. 111.

the law of Stolo was in force at that time, which was in the 502d year of the city \*. It is natural to suppose, that it was likewise in force in the time of the Gracchi, otherwise they would not have attempted to reduce estates to 200 *jugera*. Had the estates in Italy exceeded 500, they would naturally have attempted only to renew and enforce the old law.

But, though the Roman citizens were allowed by law to possess 500 *jugera*, yet it appears, from the passages cited, that Cincinnatus had only 4; and that, as late as the first Punic war, there were some of the greatest men that had no more than 7. That there were a great many in this situation cannot be doubted: For the reason of mentioning some of them is not because they were singular in possessing only 7 *jugera*, but because they happened to be called to the most important services, which they executed with courage, conduct, and success.

As agriculture, in the hands of men of such wisdom and attention, was certainly brought to great

\* Elefantos—plurimos anno quingentesimo quarto, victoria L. Metelli, pontificis in Sicilia de poenis captos. Centum quadraginta duo fuere transesti ratibus, quas doliorum confertis ordinibus imposuerat. Verrius eos pugnasse in circo tradit; Plin. Nat. Hist. lib. viii. cap. vi.



great perfection, so the Roman rustic writers deserve the greatest confidence. For, instead of schemes produced by a lively imagination, which we receive but too frequently from authors of genius unacquainted with the practice of agriculture, we have good reason to believe that they deliver in their writings a genuine account of the most approved practices; practices, too, the goodness of which they themselves had experienced. The writings of six of these authors are transmitted down to us, viz. Cato, Varro, Virgil, Columella, Pliny, and Palladius. There were many more whose writings are lost, and of whom, therefore, we know little more than their names. There were also many Greek writers on this subject. Columella makes mention of forty\*, and Varro of fifty†. Of these there are a few whose writings have been preserved. Among these few are Hesiod, Xenophon, and Theophrastus. Besides the Greek writers, Columella mentions ten Roman authors on this subject; among them Cato, Varro, and Virgil‡. Not only Varro and Columella, but  
 Pliny

\* Col. lib. 1. cap. 1.

† Var. de R. R. lib. 1. cap. 1.

‡ Col. lib. 1. cap. 1.

Pliny likewise, take particular notice of Mago the Carthaginian, whose twenty-eight books of husbandry, after the destruction of Carthage, were, by order of the senate, translated into the Latin language \*. After Columella, wrote Pliny and Palladius, whose writings upon agriculture are amongst the number of those extant. In the number of the writings on this subject that are lost, are those of Tremellius Scrofa, which all lovers of agriculture must regret, not because Columella says that he had rendered agriculture eloquent †, but on account of what Varro says of his farms. ‘ I see,’ says he, ‘ Cn. Tremellius Scrofa coming hither, who is reckoned the most skilful of the Romans in agriculture, and most justly; for his farms are to  
C many,

\* Et duces Xenophon et Poenus etiam Mago; cui quidem tantum honorem senatus noster habuit, Carthagine capta, ut cum regulis Africae bibliothecas donaret, unius ejus xxix volumina censeret in Latinam linguam transferenda, cum jam M. Cato praecepta condidisset; Plin. Nat. Hist. lib. xviii. cap. iiii. Col. lib. i. cap. i. Var. lib. i. cap. i.

† Ac deinde Scrofam Tremellium, qui eam eloquentem reddidit; Col. lib. i. cap. i.

‘ many, on account of their culture, a more agreeable spectacle than the royally ornamented edifices of others \*.’

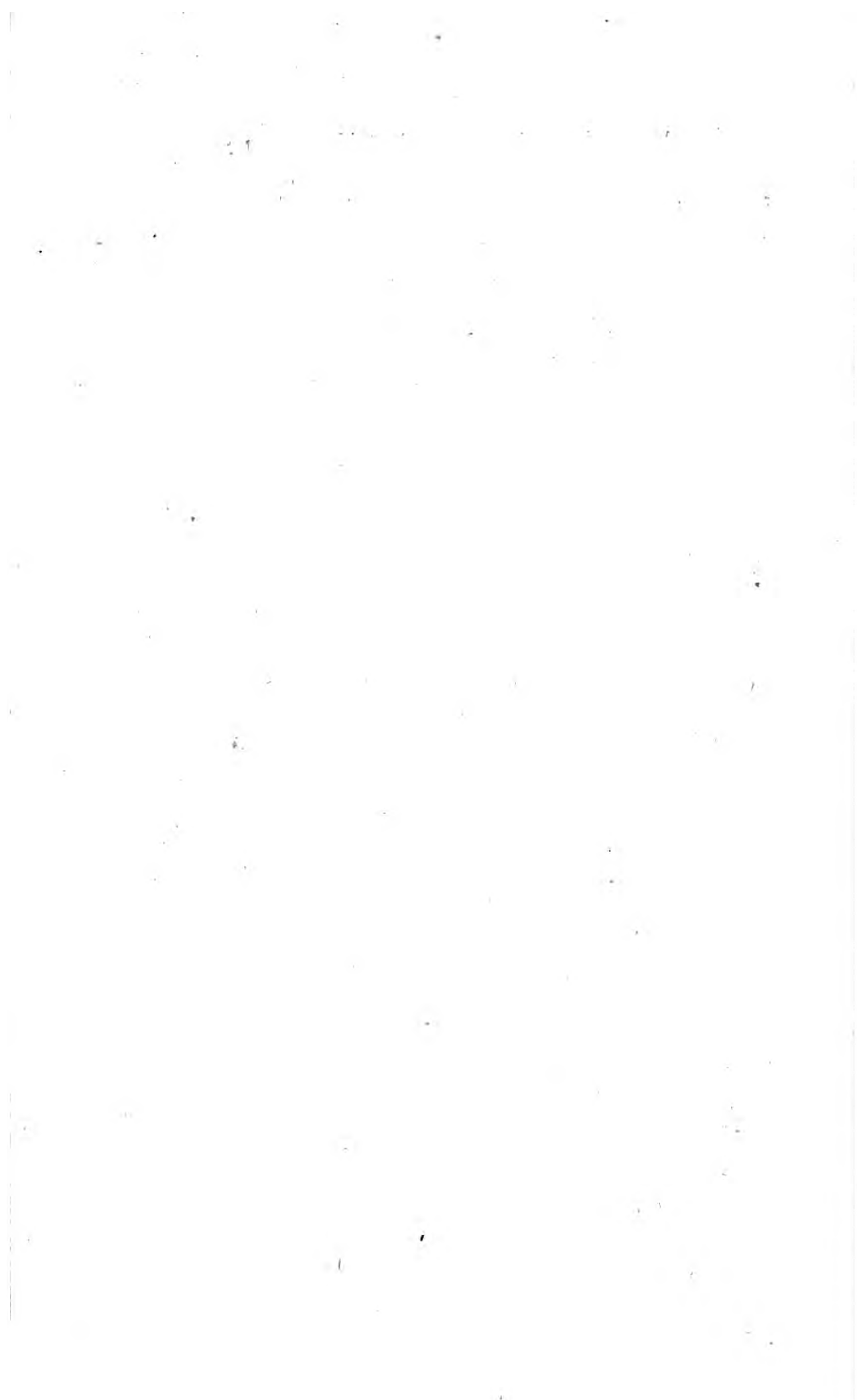
Although it is supposed that agriculture and all other arts are brought to great perfection in the present age, yet I am persuaded, that all who consider the attention, genius, and knowledge of the ancients, and particularly of the Romans, will be convinced that something useful and important may be learned from a knowledge of their practices in husbandry. The design of this treatise is to give as full an account of these as can be obtained from their authors on the subject, and to apply them for the improvement of modern agriculture. I propose likewise to compare the practices of the ancients with the most approved practices of the moderns. From this comparison, it will probably appear evident

to

\* Video huc venire Cn. Tremellium Scrofam, virum omnibus virtutibus politum, qui de agricultura Romanus peritissimus existimatur. Annon jure inquam? Fundi enim ejus propter culturam jucundiore spectaculo sunt multis, quam regie polita aedificia aliorum; Var. de R. R. lib. 1, cap. 11.

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to all, that if, in the knowledge of the theory of agriculture, the ancient farmers are inferior to our modern improvers, yet, in attention to circumstances and exactness of execution, they are greatly superior.



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C H A P. I.

*Of the Villa.*

**I**N the first ages of the commonwealth, the *villas* of the Romans were very plain and small, fuitable to the plain manners of the people, and adapted to the small size of their farms: But, when they had extended their empire, when they had become rich and luxurious, and particular

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particular persons were possessed of large landed estates, then the *villas* became large and magnificent. In the time of Valerius Maximus, there were *villas* that covered more ground than was in the estates of some of the ancient nobles. 'Now,' says he, 'those think themselves very much confined whose houses are not more extensive than the fields of Cincinnatus\*.' In the days of Cato, it is probable that they had begun to extend their *villas* considerably, which makes him give a caution to the proprietors of land not to be rash in building. He recommends to them to sow and plant in their youth, but not to build till somewhat advanced in years. His words are remarkable; 'A landholder,' says he, 'should apply himself to the planting of his fields early in his youth; but he ought to think long before he builds. He ought not to think about planting; but he ought to do it. When he is about thirty-six years of age, he may build, provided his fields are planted †.'

Pliny

\* Anguste se habitare nunc putat, cujus domus tantum patet, quanquam Cincinnati rura patuerunt; Val. Max. lib. iv. cap. iv. f. 7.

† Prima adolescentia patrem familiae agrum conferere studere

Pliny likewise mentions this maxim : ‘ Men,’ says he, ‘ should plant in their youth, and not build till their fields are planted ; and even then ought not to be in a hurry, but take time to consider. It is best, according to the proverb, to profit by the folly of others \*.’

The labouring oxen in Italy in the time of the Romans were fed, for several months in the year, with leaves and mast : The fruit of the vine, the fig, the olive, and other trees, was very useful in the family. This is the reason that these authors recommend greater attention to planting than building.

Cato gives a very short, but very proper direction with respect to the size of the buildings of the *villa*. ‘ Build,’ says he, ‘ in such a manner, that your villa may not need a farm, nor  
‘ your

*studere oportet, aedificare diu cogitare oportet ; conferere cogitare non oportet. Ubi aetas accessit ad annos xxxvi, tum aedificare oportet, si agrum confitum habeas ; Cat. cap. III.*

\* *Fundum in adolescentia conferendum sine cunctatione, aedificandum non nisi confito agro ; tunc quoque cunctanter ; optimumque est (ut vulgo dixeret) aliena infania frui ; Plin. Nat. Hist. lib. xviii. cap. v.*



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‘ your farm need a *villa* \*.’—Varro assigns proper reasons for this. ‘ In not attending,’ says he, ‘ to the measure of the farm, many have gone wrong. Some have made the *villa* much smaller, and others much larger than the farm required. One of these is contrary to a man’s interest, and the other hurtful to the produce of his lands: For we both build and repair the larger buildings at a greater expence than is necessary; and, when the buildings are less than what the farm requires, the fruits are in danger of being destroyed †.’ Columella expresses himself to the same purpose, and mentions two persons in particular who had fallen into each of the extremes. ‘ I remember,’ says he, ‘ that many have erred in this point, as these most excellent men did, L. Lucullus

\* Ita aedifices, ne villa fundum quaerat, neve fundus villam; Cat. cap. 111.

† In modo fundi non animadverso lapsi sunt multi, quod alii villam minus magnam fecerunt quam modus postulavit, alii majorem, cum utrumque sit contra rem familiarem ac fructum; majora enim tecta et aedificamus pluris, et tuemur, sumptu majore; minora cum sunt quam postulat fundus, fructus solent desperire; Var. de R. R. lib. 1. cap. 21.

‘cullus and Q. Scaevola, one of whom built a  
 ‘*villa* much larger, and the other much less,  
 ‘than the farm required\*.’ A little after, he  
 cites the passage from Cato already mentioned,  
 and approves of the maxim which it contains.  
 Pliny likewise mentions this maxim of Cato’s,  
 and says that it was approved of; at the same  
 time, he takes notice of the errors of L. Lucullus  
 and Q. Scaevola in the same manner as Columella  
 does; adding, what it is natural to suppose,  
 from the characters of the men, that it was  
 the farm of Scaevola that needed the *villa*,  
 and the *villa* of Lucullus that needed the farm.  
 Upon this he makes an observation not a little  
 curious, that Lucullus had thereby rendered  
 himself liable to the chastisement of the Censors,  
 having less occasion to plough his lands than to  
 clean his house. ‘In this case,’ says he, ‘to  
 ‘plough less than to sweep was a foundation for  
 ‘the chastisement of the Censors †.’ In another

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passage,

\* Multos enim deerrasse memoria prodidit, sicut praestantissimos viros L. Lucillum et Q. Scaevolam, quorum alter majores, alter minus amplas, quam postulavit modus agri, villas extruxit, cum utrumque sit contra rem familiarem; Col. lib. 1. cap. 14.

† Modus hic probatur, ut neque fundus villam quaeratur,

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passage, after mentioning the proverb, 'It is best to profit by the folly of others,' he adds, 'It should be built in such a manner, that the keeping it in repair may not be too heavy an expence \*.'

Palladius is more particular in this than any of the other authors; and he proportions the expence of the building to the rent, or the profits arising from the farm. 'An edifice,' says he, 'should be built according to the value of the farm and fortune of the master, which, *immoderately* undertaken, it is commonly more difficult to support than to build. The largeness of it should be so estimated, that, if any thing shall happen to destroy it, it may be rebuilt by one, or at most by two year's rent or profits of the farm in which it is placed †.'

Some

rat, neque villa fundum; non ut fecerunt juxta diversis eadem aetate exemplis L. Lucullus et Q. Scaevola, cum villa Scaevolae fundus careret, villa Luculli agro. Quo in genere censoria castigatio erat minus arare quam verere; Plin. Nat. Hist. lib. xviii. cap. vii.

\* Sed ita, ut villarum tutela non sit oneri; Plin. Nat. Hist. lib. xviii. cap. vi.

† Ædificium pro agri merito, et pro fortuna domini oportet institui; quod plerumque *immodice* sumptum, difficilius

Some of these authors give particular directions about the position of the villa, and the situation of its different parts. ‘Some art,’ says Pliny, ‘is required in this. C. Marius, of a very mean family, seven times consul, placed a villa in the lands of Misenum, with such skill in the contrivance, that Sylla Felix said, that all others in this respect were blind, when compared to him\*.’ All of them advise, that it shall not be placed near a marsh, nor fronting a river. Pliny cites the authority of Homer for this †. Varro says, that such a situation is cold in winter and unhealthful in summer; that, in such a place, there are many small insects that,

though

cilius est sustinere quam condere. Ita igitur aestimanda est ejus magnitudo, ut si aliquis casus incurrerit, ex agro, in quo est, unius anni, aut multum, biennii pensione reparetur; Pal. lib. I. tit. VIII.

\* Nec hoc sine arte quadam est. Novissimus villam in Misenenfi posuit C. Marius septies Consul, sed peritia castrametandi, sic ut comparatos ei caeteros etiam Sylla Felix caecos fuisse diceret; Plin. Nat. Hist. lib. XVIII. cap. VII.

† Convenit nec juxta paludes ponendam esse, neque adverso amne. Quanquam Homerus omnino e flumine semper antelucanas auras insalubres verissime tradidit; Ibid.

though invisible, enter the body at the mouth and nostrils, and occasion diseases \*. Palladius gives reasons of the same kind †. Besides this, Varro directs, that, if possible, it shall be placed at the foot of a mountain covered with woods, in such a manner as to be exposed to the most healthful winds, and to enjoy the sun in winter and the shade in summer. An east exposure, he thinks, is the best for this purpose ‡. Palladius proposes,

\* *Sin cogare secundum flumen aedificare, curandum ne adversum eum ponas: Hieme enim fiet vehementer frigida, et aestate non salubris. Advertendum etiam si qua erunt loca palustria, et propter easdem causas, et quod arescunt, crescunt animalia quaedam minuta, quae non possunt oculi consequi, et per aëra intus in corpus per os ac nares perveniunt, atque efficiunt difficiles morbos; Var. de R. R. lib. 1. cap. xii.*

† *Si vicinus est fluvius, ubi statuimus fabricae sedem parare, ejus debemus explorare naturam, quia plerumque quod exhalat, inimicum est; a quo (si talis sit) conveniet refugere conditorem. Palus tamen omni modo vitanda est; praecipue quae ab austro est, vel occidente; et sicari consuevit aestate, propter pestilentiam, vel animalia inimica, quae generat; Pal. lib. 1. tit. vii.*

‡ *Dandum operam, ut potissimum sub radicibus montis silvestris villam ponas, ubi passiones sint laxae, ita ut contra ventos, qui saluberrimi in agro flabunt. Quae, posita*

proposes, that, for the same purpose, the *villa* shall front the south-east; that the *praetorium*, or master's house, shall be a little higher than the rest of the *villa*, both to secure the foundations, and to have a more agreeable prospect \*. It is probable that both these authors have Italy particularly in view: But Pliny extends his views further; for he says, that the *villa* in warm climates ought to front the north, in cold climates the south, and in temperate climates the east †.

Columella is more particular than any of the other authors, both in giving directions as to the situation of the *villa*, and giving reasons for the

*posita est ad exortus aequinoctiales, aptissima, quod aestate habet umbram, hieme solem; Var. de R. R. lib. 1. cap. xii.*

\* Sed totus fabricae tractus unius lateris longitudine, in quo frons erit, meridianam partem respiciat, in primo angulo excipiens ortum solis hiberni; et paululum ab occidente avertatur hiemali. Ita proveniet, ut per hiemem sole illustretur, et calores ejus aestate non sentiat.—Ipsius autem praetorii situs sit loco aliquatenus erectiore et sicciore quam caetera; et propter injuriam fundamentorum, et ut coelo fruatur aspectu; Pal. lib. 1. tit. viii.

† Spectare in aestuosis locis septentriones debet, meridiem in frigidis; in temperatis exortum aequinoctialem; Plin. Nat. Hist. lib. xviii cap. vii.

the situation he recommends. To give, therefore, a proper idea of the attention of the Romans in this article, it may not be amiss to translate the whole passage. After mentioning the conveniency of water, and giving a description of the different kinds, he proceeds thus: ‘ Running brooks have great influence in moderating the heats of summer, and in rendering situations more agreeable. If they are of sweet water, and the position of the place allows, they ought, in my opinion, to be conducted to the *villa*: But, if there is a river far removed from the hills, and if the healthfulness of the country and the height of the banks allow the *villa* to be placed by its stream, it is better to have the river behind than before. Care should be taken, likewise, to have the front of the edifice turned away from the winds, which in that country are hurtful, and to have it exposed to such as are salutary; for there are many rivers covered with exhaled mists in summer, and cold clouds in winter, which, if they are not dispersed by the force of blowing winds, are fatal to men and cattle. In healthful places, as I have said, the *villa* should front the east or south; and in thick cloudy climates it should

' should front the north. A *villa* is always pro-  
 ' perly placed upon the sea, when so near as to  
 ' be beat and dashed with the waves. It should  
 ' never be removed from the bank to a little di-  
 ' stance from the shore; for it is better to retire  
 ' to a considerable distance, than only a short  
 ' way; because the air is grosser at a little di-  
 ' stance than at a greater, or immediately on  
 ' the shore\*. Neither indeed should a *villa* be  
 ' situated near a marsh, or by a military road;  
 ' for the heats exhale from the marsh a noxious  
 ' vapour, and bring to life insects armed with  
 ' stings, which fly against us in the thickest  
 ' swarms; from it likewise come forth the plagues  
 ' of water snakes and serpents, being destitute  
 ' of the winter pools; these, envenomed with  
 ' mud and putrified filth, often occasion hidden  
 ' diseases,

\* This passage is translated by Mr Castell, in his illus-  
 tration of the *villas* of the ancients, in a sense very diffe-  
 rent from what it is here translated; he makes Columella  
 forbid the *villa* to be placed near the sea; if this is the  
 meaning of the passage, very little regard was paid to the  
 direction; for we find, from the younger Pliny, that not  
 only his own *villa* of Laurentinum, but many other *villas*  
 in the neighbourhood, were situated immediately on the  
 shore.



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‘ diseases, the causes of which physicians cannot  
‘ find out. Besides these, there is, through the  
‘ whole year, a kind of scurf and moisture,  
‘ which consumes the rustic instruments, rots  
‘ the household furniture, and spoils the fruits  
‘ of the earth, both before and after they are  
‘ laid up. A highway is likewise pernicious,  
‘ both by reason of the ravages of the travellers  
‘ that pass along, and the continual visits of those  
‘ who are on jaunts of pleasure. To shun all in-  
‘ conveniences of this kind, a *villa*, in my opi-  
‘ nion, ought to be placed neither on a highway,  
‘ nor in a pestilential country, but in a retired  
‘ and open situation fronting the east; for this  
‘ position equally exposes the villa to the sum-  
‘ mer, and defends it from the winter winds.  
‘ In proportion as the ground where the villa  
‘ stands declines to the east, the more freely it  
‘ receives the winds of summer, is the less in-  
‘ fested with the storms of winter, and better  
‘ warmed by the morning sun, to liquify the  
‘ frozen dews. These things are of great im-  
‘ portance, as that place is reckoned unhealth-  
‘ ful, which is not exposed to the sun and dry  
‘ winds; for there is nothing but these that can  
‘ dry up or wipe off the nocturnal hoar frost,  
‘ and

‘ and that rust and filth which fall upon and  
 ‘ adhere to every thing ; and which, as they are  
 ‘ hurtful to men, so likewise to cattle, to plants,  
 ‘ and to fruits \*.’

## The

\* *Caeterum ad aestuum temperandos calores, et amoenitatem locorum, plurimum conferunt salientes rivi, quos, si conditio loci patietur, qualescunque, dummodo dulces, utique perducendos in villam censeo. Sin summotus longius a collibus erit amnis, et loci salubritas, editiorque situs ripae permittet superponere villam profluenti; cavendum tamen erit, ut a tergo potius quam prae se flumen habeat, et ut aedificii frons averfa sit ab intellis ejus regionis ventis, et amicissimis adverfa; cum plerique amnes aestate vaporatis, hieme frigidis nebulis caligent; quae, nisi vi majore inspirantium ventorum submoventur, pecudibus hominibusque conferunt pestem. Optime autem salubribus, ut dixi, locis ad orientem, vel ad meridiem, gravibus ad septentrionem villa convertitur. Eademque semper mare recte conspicit, cum pulsatur, ac fluctu respargitur; nunquam ex ripa, sed paullum submota a litore; nam praestat a mari longo potius intervallo, quam brevi refugisse, quia media sunt spatia gravioris halitus. Nec paludem quidem vicinam esse oportet aedificiis; nec junctam militarem viam, quod illa caloribus noxium virus eructat, et infestis aculeis armata gignit animalia, quae in nos densissimis examinibus involant; tum etiam naticum serpentiumque pestes, hiberna destituta uligine, coe-*

The villa is by the same author divided into three parts, the *urbana*, the *rustica*, and the *fructuaria*; all the particulars of these, he says, ought to be properly placed with respect to each other. The *urbana* contained the apartments of the landlord; the *rustica* contained the kitchen, the houses of the labouring servants, the stables,

no et fermentata colluvie venenatas, emittit; ex quibus saepe contrahuntur caeci morbi, quorum causas ne medici quidem perspicere queunt: Sed et anni toto tempore situs atque humor instrumentum rusticum, supellectilemque, et inconditos conditosque fructus corrumpit. Haec autem praetereuntium viatorum populationibus, et assiduis divertentium hospitibus infestat rem familiarem. Propter quae censeo ejusmodi vitare incommoda, villamque nec in via, nec pestilenti loco, sed procul et editiore situ condere, ut frons ejus ad orientem aequinoctialem directa sit. Nam ejusmodi positio medium temperatumque libramentum ventorum hiemalium et aestivorum tenet; quantoque fuerit aedificii solum pronius orienti, tanto et aestate liberius capere perflatus, et hiemis procellis minus infestari, et matutino regelari ortu poterit, ut concreti rores liquecant; quoniam fere pestilens habetur, quod est remotum ac sinistrum soli, et apricis flatibus; quibus si caret, nulla alia vis potest nocturnas pruinas, et quodcunque rubiginis aut spurcitiae recedit, ficcare atque detergere. Haec autem cum hominibus afferant perniciem, tum et armentis, et virentibus, eorumque fructibus; Col. lib. 1. cap. 7.

stables, &c.; and the *fructuaria* contained the oil cellar, the place for the oil presses, the wine cellar, the hay loft, granaries, &c. He gives some directions how these should be situated and constructed; but not so particular as to enable one to form a just opinion concerning them. He directs that the *urbana* be divided into summer and winter apartments; but his directions are such as seem to make it not an easy matter to observe them. He says, that the winter bed-chambers should front the winter sun-rising, that is, south-east; and the dining-rooms, the equinoctial sun-setting, which is due west; that the summer bed-chambers front due south, and the summer dining-rooms the winter sun-rising, which is south-east; that the bathing-rooms be exposed to the summer sun-setting, which is north-west\*; and that the walks be placed under the equinoctial meridian †. One can scarcely

\* It appears from Pliny, Nat. Hist. lib. xviii. that the winter sun-rising and south-east were reckoned the same; and so of the others here mentioned.

† Modus autem, membrorumque numerus aptetur universo conspecto, et dividatur in tres partes, urbanam, rusticam, et fructuariam. Urbana rursus in hiberna et aestiva sic digeratur, ut spectent hiemalis temporis cubicula  
brumalem.

ly form any idea of the construction of a building that has apartments fronting so many different ways. There are several passages in Palladius relating to this matter; but they are far from rendering it distinct. He says, the form of the building ought to be such as to afford both summer and winter rooms, conveniently and contiguously situated for lodging; that those intended for winter should be so placed as to be cheered by the sun in the whole of his course \*. And afterwards, ‘ But, if they are summer mansions, they ought to front the north-east †.’ In  
 another

*brumalem orientem; coenationes aequinoctialem occidentem. Rursus aestiva cubacula spectent meridiem aequinoctialem; sed coenationes ejusdem temporis prospectent hibernum orientem. Balnearia occidenti aestivo advertantur, ut sint post meridiem, et usque in vesperum illustra. Ambulationes meridiano aequinoctiali subjectae sint, ut hieme plurimum solis, et aestate minimum recipiant; Col. lib. 1. cap. vi.*

\* Forma tamen esse debet ejusmodi, ut ad habitationem breviter collectas et aestati et hiemi praebeat mansiones. Quae hiemi parantur ita sunt constitutae, ut possit eas hiberni solis totus propemodum cursus hilarare; Pal. lib. 1. tit. ix.

† Sed si aestive mansiones sunt, orientem solstitialem et partem septentrionis aspiciant; Ibid.

another place, ‘ In planning a country house,  
 ‘ the first thing to be studied is to have it well  
 ‘ lighted. The next thing is to make the apart-  
 ‘ ments intended for the different seasons, as I  
 ‘ have already said, front the suitable parts of  
 ‘ the heavens; that is, that the summer apart-  
 ‘ ments front the north, the winter ones the  
 ‘ south, and the spring and autumnal ones the  
 ‘ east \*.’

It was already observed, that this author proposes that the *villa* shall front the south-east. There is an expression in the passage, in which he mentions this, worthy of attention. He says, that, in this situation, it receives in the first angle the winter rising sun. Now, from this it may be observed, that the front of the house was not plain, but had projections in it, one of which was joined to it in such a manner as to make an angle that received the rays of the sun rising in the south-east. From this, too, it appears probable that this projection was not perpendicular  
 to

\* In primis studendum est in agræsti fabrica, ut multa luce clarescat: deinde ut partes temporibus divisas, sicut supra dixi, congruis partibus offeramus, id est, æstivas septentrioni, hibernas meridiano, vernas et autumnales orienti; tit. XII.

to the front, but that it stretched out from the corner, like a bastion in a regular fortification, so as to answer equally to the front and side. A projection of this kind, at the south corner of a south-east front, makes an angle that may be said to receive the rays of the winter rising sun; but this cannot so properly be said when the projection is perpendicular. If the projections, then, in the Roman *villa* were of the kind mentioned; if the building was in the form of a square with an open space in the middle, and if there was a projection at each corner, then apartments might be placed with all the different exposures mentioned by Columella. This author directs, that the *villa* front due east; when this was done, the windows of the four sides fronted the four cardinal points, east, south, west, and north; and the windows of the projections or wings fronted the middle points betwixt these, the south-east, the south-west, the north-west, and the north-east.

It was observed, that Columella directs the walks to be placed under the equinoctial meridian. He gives this reason, that they may enjoy much of the sun in winter, and have little of it in summer\*. It seems probable, from this, that

\* Col. lib. 1. cap. vi.

that the walk was placed along the south front of the building, extending also along the fronts of both the wings; and that the cover of this walk extended so far outward from the roof of the building, as to prevent the meridian sun at the time of the equinoxes from shining upon the walk. The building, according to the form of it above described, allowed the sun to shine upon the walk only from the south-east to the south-west. In the cold of winter, when the sun was in this quarter of the heavens, being low, the walk enjoyed all the benefit of its rays; on the other hand, in the heat of summer, the sun being high, its rays were intercepted by the cover, and the walk thereby kept cool\*.

The younger Pliny, in his letters, has given a description of two of his *villas*. The modern authors, who have given us plans of these *villas* from his description of them, make all the projections perpendicular to the sides, as agreeable probably to the rules of architecture. However, when we consider the situation and exposure

\* Whether projections of this kind from the corners of a square are agreeable to the rules of architecture, the author does not know; but they seem necessary to answer the description of the *villa urbana* given by Columella.



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ture of some of the apartments, as described by Pliny himself, it appears, that these do not agree so well with projections of this kind as with those of the kind above mentioned, which seemed necessary to account for the exposure of some of the apartments in Columella's *villa*.

CHAP.

## C H A P. II.

*Of the Persons employed in Agriculture.*

IT has already been observed, that in the first ages of the Roman Commonwealth, when the greatest men possessed only a few acres, the lands were cultivated by the proprietors themselves, except when immediately employed in the service of their country. But, when Rome extended her conquests, and acquired large territories, when rich men, in consequence of this, were allowed to possess large estates, agriculture fell into different hands, and was carried on by farmers or servants, as in modern times. Columella informs us, that it was so in his time. After giving landlords directions about the construction of the *villa*, and several other important things, he adds, ‘ All these things being in this order, either acquired or executed; as the landlord ought to be very careful about every  
 VOL. I. F ‘ thing,

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‘ thing, so he ought to be particularly careful  
‘ about the men employed in agriculture; and  
‘ these are either farmers or servants; the last  
‘ are divided into the free servants and slaves \*.’

In the time of the elder Pliny, it seems to have been but too common a practice to cultivate the lands with slaves, and that kind too that had been stigmatized with marks of infamy for their crimes †. There were some however, that had no slaves; but let their estates to farmers, among whom was the younger Pliny ‡.

In the time of Cato the censor, though the several operations of agriculture were generally performed by servants or farmers, yet the great men among the Romans continued to give a  
par-

\* His omnibus ita vel acceptis vel compositis, praecipua cura domini requiritur, cum in caeteris rebus, tum maxime in hominibus. Atque hi vel coloni, vel servi sunt, soluti, aut vincti; Col. lib. i. cap. vii.

† At nunc eadem illa vincti pedes, damnatae manus, inscriptique vultus exercent; Plin. Nat. Hist. lib. xviii. cap. iv.

‡ Sunt ergo instruendi eo plures, quod frugi mancipiis; nam nec ipse usquam vinctos habeo, nec ibi quisquam superest; Plin. Ep. lib. iii. ep. xix. Calvisio Rufo.

particular attention to it, studied its improvement, and were very careful and exact in the management of all their country affairs. This appears from the directions given them by this most attentive farmer. Those great men had both houses in town, and *villas* in the country; and, as they resided frequently in town, the management of their country affairs was committed to a bailiff or overseer. Now, their attention to the culture of their lands, and to every other branch of husbandry, appears from the directions given them how to behave upon their arrival from the city at their *villas*. As Cato is very particular, and his directions important, I shall translate the whole passage. ‘After the ‘landlord,’ says he, ‘has come to the *villa* and ‘performed his devotions \*, he ought that very ‘day,

\* It may not be amiss to observe, that while Cato here recommends to the master of the family, to be regular in performing his devotions, he expressly forbids the rest of the family to perform any, either by themselves or others, telling them that they were to consider that the master performed devotions for the whole family. In his directions to the *villicus*, regarding the method of managing the *villica* his wife, he says, *Rem divinam*

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‘ day, if possible, to go through his farm; if  
‘ not that day, at least the next. ‘ When he  
‘ has considered in what manner his fields should  
‘ be cultivated, what work should be done, and  
‘ what not; next day he ought to call the bailiff,  
‘ and inquire what of the work is done, and  
‘ what remains; whether the labouring is far e-  
‘ nough advanced for the season, and whether  
‘ the things that remain might have been finish-  
‘ ed; and what is done about the wine, corn,  
‘ and all other things. When he has made him-  
‘ self acquainted with all these, he ought to take  
‘ an account of the workmen and working days.  
‘ If a sufficiency of work does not appear, the  
‘ bailiff will say that he was very diligent, but  
‘ that the servants were not well; that there were  
‘ violent storms; that the slaves had run away;  
‘ and that they were employed in some public  
‘ work.

*vinam ni faciat, neve mandet, qui pro ea faciat, injussu do-  
mini, aut dominae. Scito dominum pro tota familia rem di-  
vinam facere; Cat. cap. CXLIII.* These things, no doubt,  
were intended to preserve a decency in worship, and re-  
gard for things sacred, and at the same time to guard a-  
gainst superstition and enthusiasm, into which the lower  
class of people are but too apt to fall.

' work. When he has given these and many  
 ' other excuses, call him again to the account  
 ' of the work and the workmen. When there  
 ' have been storms, inquire for how many days,  
 ' and consider what work might be done in rain:  
 ' Casks ought to have been washed and mended,  
 ' the *villa* cleaned, corn carried away, dung  
 ' carried out, a dunghill made, feed cleaned,  
 ' old ropes mended, new ones made, and the  
 ' servants cloaths mended. On holy days, old  
 ' ditches may have been scoured, a high-way re-  
 ' paired, briars cut, the garden digged, mea-  
 ' dows cleared from weeds, twigs bound up,  
 ' thorns pulled, *far* pounded, all things made  
 ' clean: When the servants have been sick, the  
 ' ordinary quantity of meat ought not to have  
 ' been given them. When he is fully satisfied  
 ' in all these things, and has given orders that  
 ' the work that remains be finished, he should  
 ' inspect the bailiff's accompts, his accompt of  
 ' money, of corn, fodder, wine, oil, what has  
 ' been sold, what exacted, what remains, what  
 ' of this may be sold, whether there is good se-  
 ' curity for what is owing. He should inspect  
 ' the things that remain, buy what is wanting  
 ' for the year, and let out what is necessary to  
 ' be

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‘ be employed in this manner. He should give  
‘ orders concerning the works he would have  
‘ executed, and the things he is inclined to let,  
‘ and leave his orders in writing. He should  
‘ inspect his flocks, make a sale, sell the super-  
‘ fluous oil, wine, and corn, if they are giving a  
‘ proper price, sell the old oxen, the refuse of  
‘ the cattle and sheep, wool, hides, the old carts,  
‘ old iron tools, and old and diseased slaves.  
‘ Whatever is superfluous he ought to sell; a  
‘ farmer should be a feller, not a buyer \*.’ Now,  
it

\* *Paterfamilias ubi ad villam venit, ubi larem famili-  
arem salutavit, fundum eodem die, si potest, circumeat;  
si non eo die, at postridie. Ubi cognovit quomodo fun-  
dus cultus fiet, operaque quae facta infectaque sient, pos-  
tridie ejus diei villicum vocet, roget quid operis fiet factum,  
quid restet, satisne tempore opera sient confecta, possitne  
quae reliqua sient conficere: Et quid factum vini, frumen-  
ti, aliarumque rerum omnium. Ubi ea cognovit, ratio-  
nem inire oportet operarum dierum. Si ei opus non ap-  
paret, dicit villicus sedulo se fecisse, servos non valuisse,  
tempestates malas fuisse, servos aufugisse, opus publicum  
effecisse. Ubi eas aliasque causas multas dixerit, ad ra-  
tionem operum operarumque villicum revoca. Cum tem-  
pestates pluviae fuerint, videto quot dies, quaeve opera  
per imbrem fieri potuerint, dolia lavari, picari, villam  
purgari,*

it may be observed, that Cato, in this passage, supposes that the landlord is not only perfectly acquainted with every kind of work proper on his farm, and the seasons of performing it, but that

purgari, frumentum transferri, stercus foras efferri, sterquilinum fieri, semen purgari, funes veteres sarciri, novosque fieri; centones, cuculiones familiam oportuisse sibi sarcire. Per ferias potuisse fossas veteres tergeri, viam publicam muniri, vepres recidi, hortum fodiri, pratum purgari, virgas vinciri, spinas runcari, expinfi far, munditias fieri. Cum servi aegrotarint, cibaria tanta dari non oportuisse. Ubi haec cognita aequo animo sient, quaeve reliqua opera sient, curare uti perficiantur: Rationes putare argentariam, frumentariam, pabuli causa quae parata sunt; rationem vinariam, oleariam, quid venierit, quid exactum fiet, quid reliquum fiet, quid fiet quod veneat; quae satis accipienda sient, satis accipiantur. Reliqua quae sient, ut compareant. Siquid deficit in annum, uti paretur; quae superfint, uti veneant; quae opus sient locato, locentur: Quae opera fieri velit, et quae locare velit, uti imperet, et ea scripta relinquat; pecus confideret. Auctionem uti faciat. Vendat oleum, si pretium habeat, vinum, frumentumque quod superfit. Vendat boves vetulos, armenta delicula, oves deliculas, lanam, pelles, plostrum vetus, ferramenta vetera, servum senem, servum morbosum, et siquid aliud superfit, vendat. Patremfamilias vendacem, non emacem esse, oportet; Cat. cap. 11.



that he is also a perfect judge how much work both without and within doors ought to be performed, by any number of servants and cattle, in a given time; the knowledge of which is useful to a farmer, and is what very few perfectly acquire. It may be observed likewise, that the landlord is here supposed to inquire into all circumstances, with a minuteness of which there is scarcely even an actual farmer in this age that has any conception.

Varro complains, that, in his time, the same attention to agriculture was not given as in former times; that the great men resided too much within the walls of the city, and employed themselves more in the theatre and *circus*, than in the corn fields and vineyards\*.

Columella complains, that in his time, agriculture was almost entirely neglected. However, from the directions which he gives to the proprietors of land, it appears that there were still a few that continued to pay a regard to it; for, after mentioning some things, which he  
says

\* Igitur quod nunc intra murum fere patresfamiliae correperunt, relictis falce et aratro, et manus movere maluerunt in theatra ac circo, quam in segetibus ac vineis; Var. de R. R. lib. 1. Praef.

says, by the justice and care of the landlord; contribute much to improve his estate, he adds,  
 ' But he should likewise remember, when he  
 ' returns from the city, immediately after paying  
 ' his devotions, if he has time, if not, next day,  
 ' to view his marches; inspect every part of his  
 ' farm, and observe, whether in his absence, a-  
 ' ny part of discipline or watchfulness has been  
 ' dispensed with; and whether any vine, any o-  
 ' ther tree, or any fruits, are missing. Then like-  
 ' wise he ought to review the cattle and servants,  
 ' all the instruments of husbandry, and house-  
 ' hold furniture. If he continues to do all these  
 ' things for some years, he will find a habit of  
 ' discipline established when he is old; and at  
 ' no age he will be so much impaired with years  
 ' as to be despised by his servants \*.

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G

When

\* Sed et illa meminerit, cum e civitate remeaverit, deos penates adorare; deinde si tempestivum erit, confestim; si minus, postero die fines oculis perlustrare, et omnes partes agri revisere, atque aestimare, num quid absentia sua de disciplina et custodia remiserit, num aliqua vitis; num arbor, num fruges, abiat: tum etiam pecus et familiam recenseat, fundique instrumentum, et supellectilem: quae cuncta si per plures annos facere instituerit, bene moratam disciplinam, cum senectus advenerit, obtinebit.

N&c

When agriculture in any country is brought to any degree of perfection, and farming reckoned an honourable employment, it becomes easy for those engaged in it, who either perform or direct its operations, to attain a proper knowledge of their business. They are bred to it from their infancy, and the knowledge and practices of the father are naturally communicated to the son. It was so amongst the Romans, and thus the knowledge of agriculture continued, long after industry in Italy had given way to that indolence that is the consequence of excessive luxury, and even after the farmers in the provinces were ruined by the rapacity and oppression of the governours.

The first farmers among the Romans seem not to have been upon the same footing as in Britain. The stock on the farm belonged to the landlord, and the farmer received a certain proportion of the produce for his labour. The farmer, who possessed a farm upon these terms, was called *politor* or *polintor*, from his business being the dresser of the land; and *partuarius*,  
from

Nec erit ulla ejus aetas annis ita confecta, ut spernatur a servis; Col. lib. i. cap. ix.

from his being in a kind of copartnership with his landlord, and his receiving a part of the produce of the farm for his labour. Cato takes notice of this kind of farmers only, and it is probable that there were no others in his time. The *coloni* whom he mentions, were probably the persons who farmed their own small paternal estates. That the landlords, who farmed their own estates, were called *coloni* in the time of Cato, appears from what this author himself has said; ‘It is better,’ says he, ‘to buy from a proprietor a good *colonus* \*.’

This author likewise mentions the proportion of the crop which the *politor* received: ‘The terms,’ says he, ‘upon which land ought to be let to a *politor*; in the good land of Casinum and Venafrum, he receives the eighth basket, in the second kind of land he receives the seventh, in the third kind he receives the sixth. In this last kind, when the grain is divided by the *modius*, he receives the fifth part; in the very best kind of land about Venafrum, when divided by the basket, he receives only the ninth. If the landlord and *politor* husk the far  
‘ in

\* De domino bono colono—melius emetur; Cat. cap. 1.

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‘ in common, the *politor* receives the same pro-  
 ‘ portion after as before ; of barley and beans  
 ‘ divided by the *modius*, he receives a fifth \*.’

The

\* Politionem quo pacto dari oporteat. In agro Casinate, et Venafro, in loco bono parte octava corbi dividat, satis bono septima, tertio loco sexta; si granum modio dividet, parte quinta. In Venafro ager optimus, parti corbi dividat. Si communiter pisunt, qua ex parte politori pars est, eam partem in pistrinum politor. Ordeum quinta modio, fabam quinta modio dividat; Cat. cap. cxxxvi.—Cato, in this passage, mentions two ways of measuring, the one by the basket, and the other by the *modius*. Amongst the Romans, there were several ways of reaping corn; in one of them, the ears were stripped from the stalks; when this was done, it is probable that the ears were measured and divided by the basket. In another way of reaping, a part of the straw was cut off with the ears; These in this form were carried to the *area*, and immediately threshed; when this was done, it is probable that the corn was measured and divided by the *modius*. Cato does not say whether it was the landlord or *politor* that received these proportions; but that it was the *politor* is evident from this circumstance, that he received the smallest proportion upon the best land. Neither does Cato expressly say upon which of the kinds of land the *politor* received the sixth part of the basket. Some of the commentators suppose that he intended the  
 first

The small proportion of the produce that the *politor* received, makes it evident that he was at no expence in cultivating the land, and that he received his proportion clear of all deductions. In Egypt, the king, as proprietor, received only

a

first kind; but this would make the expence of threshing and cleaning by far too great. One eighth which the *politor* received by the basket upon the first kind of land, is equal to  $\frac{5}{40}$ ; one fifth, which these commentators suppose the *politor* received upon the same kind of land by the modius, is equal to  $\frac{8}{40}$ . The difference betwixt these two, which is the expence of threshing and clearing, is  $\frac{3}{40}$  or nearly  $\frac{1}{11}$ , too large a proportion when it is considered that the *politor* threshed with oxen and a *trabula*, both of which were provided by the landlord; and that all that was done to clean corn in the area was to throw it across the wind. But if we suppose, as the passage has been rendered, that the *politor* received one fifth by the *modius* on the land, on which he received one sixth by the basket; then the expence of threshing and cleaning appears such as we have reason to expect it would be. One sixth which the *politor* received by the basket is equal to  $\frac{5}{30}$ , one fifth which he received by the modius is  $\frac{6}{30}$ ; the difference betwixt these is  $\frac{1}{30}$ . This is less than what is given for threshing and cleaning in Britain; but, from a difference of circumstances, seems to be enough in a warmer and drier climate; see ch. XL. and XLI.

a fifth part \*. But this was the bargain made by Joseph in the time of the great famine, which, it is natural to suppose, was made upon very easy terms: Besides, the king was at no expence in raising the crop, but received the fifth part of the produce as the rent of the land. In Britain, land is sometimes let to a farmer upon the same footing with the Roman *colitor*, as to the manner of paying the rent. But, instead of one sixth, which was the largest proportion received by the Roman *colitor*, the British farmer receives  $\frac{6}{10}$  or  $\frac{3}{5}$ , the rent paid to the landlord being  $\frac{2}{5}$ , and the tythe drawn, which two added make  $\frac{4}{10}$  or  $\frac{2}{5}$ . When land is let to a farmer for this rent, he not only cultivates the land, but provides cattle, utensils, and seed; and the landlord, except the expence of carrying home, threshing, and cleaning, has his  $\frac{2}{5}$  of the crop free of all burdens. It is impossible to suppose, that the Roman *colitor* provided all the things that are provided by the British farmer; this he could not afford, as his proportion of the crop was so small. Cato does not say by whom the seed was provided, whether out of the com-  
mon

\* Gen. XLVII. 24.

mon stock before it was divided, or by the landlord: It is evident that it was not provided by the *politor*; for it would have carried off about one half of his proportion; it is probable that it even was not provided in common, but by the landlord alone out of his share of the produce\*.

It

\* Cato mentions the division of the crop, as made in some cases immediately after reaping, as is done in this kingdom; and in others immediately after threshing. As this operation was performed in the fields as soon as the corn was cut down, if the seed had been provided by the landlord and *politor* as common, he would probably have mentioned the terms. But, as a further evidence that the seed was provided by the landlord, Cato, in the chapter immediately following the passage last cited, after observing that the landlord ought to be careful, when he lets his land in this manner, to have it properly managed, whether in a vineyard, an *arbusum*, or corn field, adds: Hay and fodder are to be provided for the cattle in common, and all other things are undivided. *Vineam curandam partiario bene curet, fundum, arbusum, agrum frumentarium, Partiario foenum et pabulum, quod bubus jatis fiet, qui illic sient. Caetera omnia pro indiviso*; Cap. cap. cxxxvii. In every farm there was a quantity of meadow land for hay; and such a quantity of arable land set off for pulse as was judged sufficient for the labouring cattle on the farm, for which the *politor* paid no rent. The *politor* being



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It may not be improper to inquire what reward a farmer of this kind might receive for his labour. In the worst kind of land about *Casinum* and *Venafrum*, when the crop was divided by the *modius*, after threshing and cleaning, the *politor* received a fifth part. Varro informs us, that in Tuscany, where *Casinum* was situated, it was common to reap fifteen after one, when five *modii* were sown upon the *jugerum*, and in other parts of Italy ten \*. Now, we may suppose, that the third kind of land mentioned by Cato, was equal to the lands in the other parts of Italy at a medium; if so, a *politor*, in a farm with one plow, would receive for his share  
of

being obliged to make the hay, plow for, and reap the pulse, while the landlord provided the land, and either the seed for the pulse, or had provided the land upon which it was raised; these things may be said to have been provided in common. All other things then, according to Cato, and among them the seed, were furnished by the landlord; and the *politor* had his share, as the price of his labour, free of all burdens.

\* Quare observabis quantum in ea regione consuetudo erit ferendi; ut tantum facias, quantum valet regio, ac genus terrae. Ut ex eodem semine aliubi cum decimo redeat, aliubi cum quinto decimo, ut in Hetruria, et locis aliquot in Italia; Var. de R. R. lib. 1. cap. XLIV.

of the crop nearly 500 modii of wheat. Columella informs us, that one yoke of oxen and one plowman, were sufficient to cultivate as much land as required for seed 125 modii of *triticum*, an equal quantity of pulse, and 75 modii of spring corn\*: This, allowing 5 modii to the *jugerum*, makes in all 65 *jugera*, that is, 25 of *triticum*, 25 of pulse, and 15 of spring corn. Now, let us suppose that the pulse was necessary for the labouring cattle, and that the *triticum* and spring corn produced at the rate of ten after one; of these there would be 200 modii sown upon 40 *jugera*; which, at the above rate, would produce 2500 modii; one fifth of this, which was the *politor's* share, amounts to 500 modii, equal to 132 bushels and  $1\frac{1}{2}$  peck Winchester measure, or to 31 bolls and 7 pecks Linlithgow measure †.

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H

But

\* Quae nos ratio docet, sufficere posse jugum boum tritici centum viginti quinque modiis, totidemque leguminum, ut sit in aestem autumnalis fatio modiorum ducentorum quinquaginta; et post hanc nihilominus conferat trimestrium modios quinque et septuaginta; Col. lib. II. cap. XIII.

† The *modius* was a third part of the *amphora*; the *amphora*

But then it is probable, that the *politor*, besides plowing and the other operations which the

*phora*, according to the opinion of some, was kept in the capitol as a standard, and measured a cubic foot, and therefore contained 1728 cubic inches; the Roman foot, as has already been observed, contains 11.604 English inches: In this proportion, the Roman cubic inch is to the English cubic inch as the cube of 12 or 1728 is to the cube of 11.604 or 1562.5; one third of this is 520.83, the number of cubic inches English in the Roman *modius*. But it is observed by Bishop Hooper, as a thing very probable, that the relation of the *amphora* to a cubit foot was accidental; for, had the Romans erected the cube of a foot for their principal concave, and then geometrically taken its suboctave the *congius* for the cube of half a foot, they would have proceeded lower in like manner, and divided the *congius* into eight parts in place of six, each of which would have been the cube of a quarter foot, their well known palm; see Arbuthnot's tables, chap. ix. It is supposed, therefore, that the *congius* was the principal standard, and contained ten pounds of water. If the Roman ounce is the same with the averdupoize ounce, as seems generally allowed, then as the troy pound, or 12 ounces troy, is to the averdupoize pound or 16 ounces Roman, as 175 is to 144, it follows that there are 7000 grains troy in 16 Roman ounces, and 5250 in the Roman pound; and as three cubic inches of rain water weigh

the plowman commonly performed, was obliged to provide persons to harrow, fardle, reap, and all of these it is certain he could not perform himself: The proportion of common labourers to plowmen, Columella makes very great; to a farm of 200 *jugera*, he assigns two plowmen, and six common labourers, that is, to every plowman

760 grains, a Roman pound contains 20.7236 cubic inches; and as a *congius* of water weighs ten Roman pounds, this measure must contain 207.236 cubic inches. On this supposition, the *amphora* contained 1657.888 cubic inches, the third part of which is 552.627, the number of cubic inches in the Roman *modius*. The Winchester peck contains 537.6 cubic inches, so that the Roman *modius* is equal to 1.059 parts of a Winchester peck, and 500 *modii*, the *politor's* share of the crop, are equal to 529.5 English pecks, or 132 bushels and 1.5 pecks: The Linlithgow wheat firloot contains 21.25 sterling jugs, the sterling jug contains 103.404 cubic inches; so that the wheat firloot contains 2197.335 cubic inches; and the peck, which is the fourth part of the firloot, contains 549.334. The Roman *modius*, therefore, is equal to 1.006 parts of a Linlithgow peck, and 500 *modii*, the *politor's* share, are equal to 503 Scots pecks, or 31 bolls and 7 pecks. It may not be amiss to observe here, that, as the Roman *modius* is so nearly equal to both the English and Scots pecks, it is very probable they were originally the same, and that the measure was left in Britain by the Romans.

plowman three labourers; he does not suppose a farm in which more than ordinary labour is required; for he says, that this is the proportion where there are no trees; but, if the farm is an *arbustum*, then there must be three additional labourers to the two plowmen\*. If every *politor* in a farm with one plow, was obliged to keep three servants or slaves, the proportion of the crop, as it has been stated, must appear insufficient for his maintenance. But, on the other hand, it is probable, that the labourers were slaves, and were provided by the landlord as well as the labouring cattle, and that the *politor* was obliged only to maintain them: It is probable likewise, that he had considerable perquisites of milk, fruit, and garden herbs produced by his farm, sufficient to supply his family†. For it appears

\* Hac consummatione operarum colligitur posse agrum ducentorum jugerum subigi duobus jugis boum, totidemque bubulcis, et sex mediastinis; si tamen vacet arboribus. At si sit arbustum, eundem modum *saena* tribus hominibus adjectis asseverat probe satis excoli; Col. lib. II. cap. XIII.

† That there were fruit trees on every farm, and on some farms a very great number, is certain. Cato mentions only two kinds of farms, and the one is planted with vines,

appears from the rustic writers, that in every farm there was not only a good garden, but also an olive yard and vineyard; and that the servants

vines, and the other with olives: He assigns to these farms all necessaries; and it is evident from some of the necessaries mentioned, that the one planted with olives was also sown with corn; and it is remarkable, that, when the *villicus* and all the different kinds of labourers are taken in, the proportion is the same with that mentioned by Columella; in the vineyard farm there is indeed a much greater proportion of labourers to the plowman, a greater number too than Columella assigns to the *arbutum*. So that it is probable, that, in this vineyard farm mentioned by Cato, there was little or no corn; and that the plowman and plow were employed in the culture of vines. *Olivetum agri ducentorum quadraginta jugerum, habere oportet villicum, villicam, operarios quinque, bubulcos tres, subulcum unum, asinarium unum, opilionem unum, summa hominum XIII.*; Cat. cap. x. However, it is evident from many passages in Cato and the other rustic writers, that there were not only olives, but also vines in the corn fields; and, although this might not be the case with the farm let to a *politor* upon the terms mentioned by Cato, yet there might be a small vineyard as well as a garden, for the use of the farmer's family. This is the more probable, as, among the things necessary for an olive farm mentioned by Cato, there are casks from grape kernels and wine, an evidence that in this farm there were vines.

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vants were often employed in these as well as in the corn fields\*: It is probable likewise, that in

\* The account which Columella gives of the work necessary in a corn farm, makes it very probable, that there were also vines, olives, and other crops on it, that required attendance and labour. Twenty-five *jugera* of *triticum*, twenty-five of pulse, and fifteen of spring corn, to which he assigns a plowman and three labourers, according to the account of work which he mentions as sufficient for these, take only  $363\frac{1}{2}$  days work of a labourer; a *jugerum* or 5 modii of *triticum*, take  $6\frac{1}{2}$ , which makes  $162\frac{1}{2}$  days for 25 *jugera*; a *jugerum* of pulse cannot be rated at more than 5 days; beans indeed, when thrice sowed, are represented as taking 6, *sesamum* 12, *cicer* 7, millet and panic 8. But then there were others that took only 3, and some no more than 2. Columella states the plowing of 25 *jugera* of pulse at 60 days work, which is at the rate of  $2\frac{3}{5}$  days to the *jugerum*: This seems to have been calculated upon the supposition, that an equal quantity of land was sown with each of the kinds of pulse mentioned; upon the same supposition, five days of a labourer is the proportion for the other work required; five days are likewise sufficient for a *jugerum* of spring corn, as it was not so often sowed as the corn sown in autumn. At this rate, 25 *jugera* of pulse and 15 of spring corn, take 200 days, which, with the  $163\frac{1}{2}$  days to the 25 *jugera* of *triticum*, make in all  $363\frac{1}{2}$  days: In these are included the whole operations

in every farm there was grafs for some cows, goats, or sheep; the politor had what was sufficient

operations necessary for raising the crop, and bringing it to the *area* or threshing floor; the threshing and cleaning however remain; these, in the way in which the threshing was performed by cattle and a machine in the open air and dry weather, cannot be reckoned at above two days work to the *jugerum*, more than was given by the plowman and his cattle: At this rate, 25 *jugera* of *triticum*, and 15 *jugera* of spring corn, would take 80 days more, which, added to the other, makes the whole amount to  $443\frac{1}{2}$  days. Now, it appears from this, that two labourers were more than sufficient for all the work that the plowing of one plowman required. In the year there are 365 days, of these amongst the Romans, there were of holy days and of days commonly so stormy as to prevent all work in the fields, 45; of idle days after finishing the sowing 30, which two sums make 75; these days set aside, there are left 290 working days in the year; two men employed on these days make of days work 580, no less than  $136\frac{1}{2}$  more than are necessary. The facts here mentioned are taken from the following passage in Columella: Et ut jam percenseamus quot operis in aream perducantur ea quae terrae credidimus. Tritici modii quatuor, vel quinque, bubulcorum operas occupant quatuor, occatoris unam, farritoris duas primum, et unam cum iterum farruntur, runcatoris unam, messoris unam et dimidiam; in  
totum



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cient, with his share of the crop, for his own maintenance, and that of his servants : Or, if he had only

totum summa operarum decem et dimidia ; filiginis modii quinque, totidem operas desiderant. Sefami modii novem, vel decem, totidem operas quot tritici modii quinque postulant. Hordei modii quinque bubulci operas tres exigunt, occatoriam unam, farritoriam unam et dimidiam, messoriam unam. Summa operarum sex et dimidia. Fabae modii quatuor vel sex in vetereto duas operas bubulcorum detinent, ac in restibili unam ; occantur sesquiopera, fariuntur sesquiopera, iterum fariuntur una opera, et tertio una, metuntur una ; summa fit operarum octo, vel septem. Viciae modii sex vel septem, in vetereto bubulcorum duas operas volunt, in restibili unam : item, occantur una opera, metuntur una ; summa fit operarum quatuor vel trium. Ervi modii quinque totidem operis conferuntur, occantur una ; item singulis fariuntur, runcantur, metunturque ; cuncta sex operas occupant. Siliquae modii sex, vel septem, totidem operis obruuntur, metuntur una. Phaeoli modii quatuor obruuntur totidem operis, occantur una, metuntur una. Cicerae, vel cicerulae modii quatuor, operas bubulcorum tres postulant, occantur opera una, runcantur una, velluntur una. Summa fit sex operarum. Lentis sesquimodius totidem operas desiderat, occatur una, farritur duabus, runcatur una, vellitur una : summa fit operarum octo. Lupini modii decem obruuntur una, occantur una, metuntur una.

Milii

only a garden with a small vineyard, and some olive trees in the fields, he might have only two servants

Milii sextarii quatuor, totidemque panici, bubulcorum operas occupant quatuor, occantur operis tribus, farruntur tribus; quot operis carpantur, incertum est. Ciceris modii tres, operis totidem feminantur, occantur duabus, farruntur una, runcantur una, velluntur tribus; summa fit decem operarum. Lini decem modii, vel octo, quatuor jugis conferuntur, occantur operis tribus, runcantur una, velluntur tribus: Summa fit undecem operarum. Sesami sextarii sex, tribus jugis a proscissione coluntur, occantur operis quatuor, farruntur quatuor, et farruntur iterum duabus, metuntur duabus: Summa fit operarum quindecim. Cannabis feritur, ut supra docuimus; sed incertum est, quantam impensam curamque desideret, At medica obruitur non aratro, sed, ut dixi, ligneis rastellis: Jugerum agri ejus occatur duabus, farritur una, metitur una. Hac consummatione operarum colligitur posse agrum ducentorum jugerum subigi duobis jugis boum, totidemque bubulcis, et sex mediastinis; si tamen vacet arboribus: At si fit arbuſtum, eundem modum ſaſerna, tribus hominibus adjectis, aſſeſerat probe ſatis excoli. Quae nos ratio docet, ſufficere poſſe jugum boum tritici centum viginti quinque modiis, totidemque leguminum, ut ſit in aſſem autumnalis ſatio modiorum ducentorum quinquaginta; et poſt hanc nihilominus conferat trimestrium modios quinque et ſeptuaginta. Hoc deinde ſic probatur. Semina, quae quarto ſulco ſeruntur in jugeribus viginti quinque, deſiderant bu-

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servants or slaves, who would be sufficient for all his labour\*.

After all, this may probably be thought a sorry maintenance to a farmer, at least it must appear so when compared with what is enjoyed by the farmers in many parts of Britain. But, let it be observed, that, in a farmer of the kind mentioned among the Romans, no stock was required, and even no more knowledge than is necessary

*bulcorum operas cxv. Nam proscinditur is agri modus, quamvis durissimi, quinquaginta operis, iteratur quinque et viginti, tertiat et conferitur xl. Caetera legumina occupant operas lx, id est menses duos. Pluviales quoque et feriarum computantur, quibus non aratur, dies quinque et xl. Item peracta sementi, quibus requiescunt, dies xxx. Sic in asse fiunt octo menses, et dies x. Superfunt tamen de anno tres reliqui menses, et dies v, et xx, quos absumamus aut in satione trimestrium, aut in vecturis foeni, et pabulorum, et stercoreum, aliorumque utensilium; Col. lib. ii. cap. xiiii.*

\* That the politor had a perquisite of milk, seems the more probable, as there was grafs belonging to every farm. Columella makes particular mention of pastures; and Julius Frontinus informs us, that in Campania, there were pastures in common to several farms: *Est et pascuorum proprietas pertinens ad fundos; sed in commune, propter quod ea compascua multis locis in Italia communia appellantur; Rei Agrar. p. 41.*

necessary in a common labourer; for he seems to have been entirely under the direction of the landlord with respect to the method of culture. This appears from a passage in Cato, already cited. ‘It is necessary,’ says he, ‘to take care that a vineyard, an *arbustum*, and a corn-field, when let to a *partuarius*, be well cultivated\*.’ This likewise appears from a passage in Pliny. After asserting, that too much culture is hurtful, except when a man’s own family or the farmer have nothing to do, and must be maintained, he adds, ‘In any other case, no landlord should collect his share of the crop, if the expence of the labour is computed †.’ The meaning of this is, if the landlord directs the farmer to cultivate in too expensive a manner, he ought to give up his share of the produce, as the extraordinary expence does more than overbalance it.

It may be proper to observe, likewise, that, in ascertaining the quantity of corn received by the

*politor,*

\* *Vineam curandam partiario bene curet, fundum, arbustum, agrum frumentarium; Cat. cap. cxxxvii.*

† *Bene colere necessarium est: optime, damnosum, præterquam sobole, suo colono, aut pascendis. Alioqui colentibus domino aliquas messes colligere non expedit, si computetur impendium operæ; Plin. Nat. Hist. lib. xviii. cap. vii.*

*politor*, as his share of the crop, the land is supposed to produce in the manner mentioned by Varro. But it is certain, that, from the time of Cato to the time of Varro, agriculture had declined: For this we have the authority of Varro himself. It is probable, therefore, that the produce of the lands had considerably decreased, and that more than ten after one sown should have been sated in the time of Cato. If so, the quantity of corn which the *politor* received as his share should have been reckoned greater.

The *coloni* mentioned by Columella seem to have been upon a footing very different from the *politores* or *partuarii*. They seem to have paid rent for their farms in the same manner as is done by the farmers in Britain. As there is something curious as well as important in the directions given by this author to landlords concerning them, I shall translate the whole passage.

‘He ought,’ says this author, ‘to treat his tenants with gentleness, should show himself not difficult to please, and be more rigorous in exacting culture than rent; because this is less severe, and upon the whole more advantageous: For, when a field is carefully cultivated, it for the most part brings profit, never  
 ‘ loss,

' los, except when assaulted by a storm or pil-  
 ' lagers; and therefore the farmer cannot have  
 ' the assurance to ask any ease of his rent. Nei-  
 ' ther should the landlord be very tenacious of  
 ' his right in every thing to which the farmer  
 ' is bound, particularly as to days of payment,  
 ' and demanding the wood and other small things  
 ' which he is obliged to, besides paying his rent,  
 ' the care of which is a greater trouble than ex-  
 ' pence to the rustics. Nor is every penalty in  
 ' our power to be exacted; for our ancestors  
 ' were of opinion, that the rigour of the law is  
 ' the greatest oppression. On the other, the  
 ' landlord ought not to be entirely negligent in  
 ' this matter; because it is certainly true, what  
 ' Alpheus the usurer used to say, that good debts  
 ' become bad ones, by being not called for. I  
 ' remember to have heard it asserted by L. Vo-  
 ' lufius, an old rich man, who had been consul,  
 ' that that estate was most advantageous to the  
 ' landlord, which was cultivated by farmers na-  
 ' tives of the country, and born upon the lands;  
 ' for these are attached to it by a strong habit  
 ' from their cradles. So, indeed, it is my opi-  
 ' nion, that the frequent letting of a farm is a  
 ' bad thing; however, it is still worse to let one

' to

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‘ to a farmer who lives in town, and chooses  
‘ rather to cultivate it by servants than by him-  
‘ self. Saferna used to say, that from such a  
‘ farm a law-suit was got in place of rent. For  
‘ which reason, we ought to be careful to retain  
‘ in our farms the same industrious farmers that  
‘ have been bred in the country, when it is not  
‘ in our power to cultivate them ourselves, or  
‘ convenient to do it by domestics; which, how-  
‘ ever, cannot happen except in those countries  
‘ that are laid waste by the severity of the cli-  
‘ mate, or barrenness of the soil. For where-  
‘ ever the climate is moderately healthful, and  
‘ the soil moderately good, lands never produce  
‘ so much under the care of a farmer as under  
‘ the care of a landlord, or even of a bailiff, un-  
‘ less his very great negligence or rapaciousness  
‘ prevent it, both of which are, for the most  
‘ part, owing to the fault of the landlord; for  
‘ it is in his power to prevent such a person from  
‘ having the management of his affairs, or to  
‘ remove him, if placed in that office. How-  
‘ ever, in farms that lie at a distance, to which  
‘ the landlord has not easy access, as all kinds  
‘ of them are better under the management of  
‘ free farmers than under bailiffs, so particular-  
‘ ly

‘ly corn farms, which a farmer cannot destroy,  
 ‘as he can a vineyard and other plantations;  
 ‘for when such farms are cultivated by distant  
 ‘landlords, the oxen are greatly harassed, these  
 ‘and the other cattle ill fed, the land ill plough-  
 ‘ed, and much more seed charged than sown.  
 ‘Besides these things, the produce of the land  
 ‘is not managed in such a manner as to turn  
 ‘out to any account; for, when the corn is  
 ‘brought to the threshing-floor, during the  
 ‘threshing, it is daily lessened by fraud or negli-  
 ‘gence; the servants themselves carry it off,  
 ‘and they allow it to be carried off by thieves;  
 ‘nor, even after it is laid up, is it faithfully ac-  
 ‘counted for; so that, when the manager and  
 ‘servants are in the fault, the land is rendered  
 ‘infamous: Wherefore a farm of this kind, if,  
 ‘as I have said, the landlord cannot be on the  
 ‘spot, in my opinion ought to be let\*.’

It

\* *Comiter agat cum colonis, facilemque se praebeat,*  
*et avarius opus exigat, quam pensiones; quoniam et mi-*  
*nus id offendit, et tamen in univcrsum magis prodest.*  
*Nam ubi sedulo colitur ager, plerumque compendium,*  
*nunquam (nisi si coeli major vis, aut praedonis incesfit)*  
*detrimentum affert, eoque remissionem colonus petere non*  
*audet. Sed nec dominus in unaquaque re, cui colonum*  
*obligaverit,*



It is needless to insist upon the propriety of these directions, as this must appear obvious to all.

obligaverit, tenax esse juris sui debet, sicut in diebus pecuniarum, ut lignis, et caeteris parvis accessionibus exigendis, quarum cura majorem molestiam, quam impensam rusticis affert. Nec sane est vindicandum nobis quidquid licet. Nam summum jus antiqui summam putabant crucem. Nec rursus in totum remittendum; quoniam vel optima nomina non appellando fieri mala, foenerator Alphius dixisse verissime fertur. Sed et ipse nostra memoria veterem consularem, virumque opulentissimum L. Volusium asseverantem audivi, patrisfamilias felicissimum fundum esse, qui colonos indigenas haberet, et tanquam in paterna possessione natos, jam inde a cunabulis longa familiaritate retineret. Ita certe mea fert opinio, rem malam esse frequentem locationem fundi; pejorem tamen urbanum colonum, qui per familiam mavult agrum, quam per se colere. Saferna dicebat ab ejusmodi homine fere pro mercede litem reddi. Propter quod operam dandam esse, ut et rusticos, et eosdem assiduos colonos retineamus, eum aut nobismetipsis non licuerit, aut per domesticos colere non expedierit; quod tamen non evenit, nisi in his regionibus, quae gravitate coeli, solique sterilitate, vastantur. Caeterum cum mediocris adest et salubritas, et terrae bonitas, nunquam non ex agro plus sua cuique cura reddidit quam coloni; nunquam non etiam villici, nisi si maxima vel negligentia servi, vel rapacitas intervenit. Quae utraque peccata plerumque vitio domini, vel com-

mitti,

all. It will be proper, however, to make a few observations.

Columella here calls the farmers he speaks of *free farmers* (sub liberis colonis); this probably to distinguish them from the *politores* or *partuarii*. The *politores*, as has already been observed, were entirely under the direction of the landlord with respect to their whole management; but the free farmers were bound only to the

mitti, vel foveri, nihil dubium est; cum liceat aut cavere ne talis praeficiatur negotio; aut jam praepositus, ut submoveatur curare. In longinquis tamen fundis, in quos non est facilis excursus patrisfamilias, cum omnigenus agri tolerabilius sit sub liberis colonis, quam sub villicis servis habere, tum praecipue frumentarium, quem minime (sicut vinias aut arbutum) colonus evertere potest; et maxime vexant servi, qui boves elocant, eosdemque et caetera pecora male pascunt, nec industrie terram vertunt, longaeque plus imputant feminis jacti, quam quod severint; sed nec quod terrae mandaverint sic adjuvant, ut recte proveniat; idque cum in aream contulerunt, per trituram quotidie minuunt vel fraude, vel negligentia: Nam et ipsi diripiunt, et ab aliis furibus non custodiunt; sed nec conditum cum fide rationibus inferunt. Ita fit, ut et actor et familia peccent, et ager saepius infametur. Quare talis generis praedium, si, ut dixi, domini praesentis cariturum est, censeo locandum; Col. lib. 1. cap. vii.

the conditions of the lease, and hence are represented as sometimes entering into law-suits with the landlord, and as in danger of destroying the farm.

It is evident, that the farmers here mentioned paid a sum of money as rent for their farms; for Columella recommends to landlords, on the one hand, not to be rigorous with respect to the terms of payment; and, on the other, not to neglect demanding the rent; because good debts, by not being called for, often become bad ones.

It is evident, likewise, that the cattle upon the farms were the property of these farmers; for he gives as a reason for letting them, that, when the landlord could not attend, and was obliged to trust the management to servants, the oxen were greatly harrassed, and they and the other cattle ill fed; which could not have been a reason for letting, if the cattle upon the farm, after it was let, continued still to be the property of the landlord.

One thing more may be observed with respect to these farmers; they were bound to give a particular culture to the lands. For our author recommends to landlords to be more rigid in exacting

exacting work than rent ; and that by work he means culture to the lands, is obvious from what follows ; ‘ for,’ says he, ‘ when a field is diligently cultivated, it for the most part brings profit, and the farmer cannot have the affluence to ask any ease of his rent.’

Upon the whole, these farmers seem to have been upon the same footing with the farmers in Britain, to have had the same security for their possessions, and to pay rent in the same manner for their farms.

The other persons employed in agriculture, as mentioned by Columella, were servants ; and of these there were two sorts, freemen and slaves. Both of these sorts were employed in all the operations of husbandry. In Cato’s time, and afterwards, in every farm where there was no farmer, there was a bailiff or overseer, as has been already observed. This author is very particular in his directions to him. These directions respect his care of the servants, of the cattle, and of the labouring utensils ; his attention to his business, and his carefulness in executing his master’s orders. There is one of this kind of servant’s qualifications mentioned by Columella, which it may not be amiss to take particular

particular notice of, as it is somewhat extraordinary. ‘ The bailiff,’ says he, ‘ may do his  
 ‘ business very well, though he is illiterate. Cor-  
 ‘ nelius Celfus says, that such a bailiff will bring  
 ‘ money to his master oftener than his book ;  
 ‘ because, being ignorant of letters, he is the  
 ‘ less capable to contrive accompts, and is afraid  
 ‘ to trust another, being conscious of fraud \*.’  
 There are some other things mentioned by this  
 author, with respect to the bailiff, that are very  
 proper, and show particularly the attention of  
 the Romans. ‘ He ought not,’ says he, ‘ to  
 ‘ trade upon his own account, nor employ his  
 ‘ master’s money in purchasing cattle or any  
 ‘ other goods ; for this trading takes off his at-  
 ‘ tention, and prevents him from keeping square  
 ‘ accounts with his master. But, when he is  
 ‘ required to settle them, he shows his goods in  
 ‘ the place of money. This, above all, he should  
 ‘ be careful of, not to think he knows any thing  
 ‘ he does not know ; and always be ready to  
 ‘ learn

\* Potest etiam illiteratus, dummodo tenacissimae sit memoriae, rem fatis commode administrare. Ejusmodi villicum Cornelius Celfus ait, saepius numos domino, quam librum afferre ; quia nescius literarum, vel ipse minus possit rationes confingere, vel per alium propter conscientiam fraudis timeat ; Col. lib. I. cap. VIII.

‘ learn what he is ignorant of: For, as it is of  
 ‘ great advantage to do a thing well, so it is  
 ‘ most hurtful to have it ill done. This one  
 ‘ thing holds true in all rustic work, to do but  
 ‘ once what the manner of culture requires;  
 ‘ because, when imprudence or negligence in  
 ‘ working is to be set to rights, the time for the  
 ‘ work is already wasted; nor are the effects of  
 ‘ the amendment such as to make up the lost  
 ‘ labour, and balance the advantages that might  
 ‘ have been gained by improving the season that  
 ‘ is past \*.’

Thus it was expected in an overseer, that he  
 should be careful, apt to learn, and capable to  
 execute

\* *Neve negotietur sibi, pecuniamque domini, aut anima-  
 libus, aut rebus aliis pro mercalibus occupet. Haec enim  
 negotiatio curam villici avocatur, nec unquam patitur cum  
 cum rationibus domini paria facere; sed ubi numeratio  
 exigitur, rem pro numis ostendit. In universum tamen  
 hoc maxime obtinendum ab eo est, nequid se putet scire  
 quod nesciat, quaeratque semper addiscere, quod ignorat.  
 Nam cum multum prodest perite quid facere, tum plus  
 obest perperam fecisse. Unum enim ac solum dominatur  
 in rusticatione, quicquid exigit ratio culturae, semel fa-  
 cere. Quippe cum emendatur vel imprudentia, vel ne-  
 gligentia, jam res ipsa decoxit; nec in tantum postmo-  
 dum exuberat, ut et se amissam restituat, et quaestum  
 temporum praeteritorum resarciat; Col. id.*

execute his master's orders with a proper attention to situations and circumstances.

The qualities of the other servants are represented by the same author in this manner :  
 ' The careful and industrious,' says he, ' should  
 ' be appointed masters of the works ; these qua-  
 ' lities are more necessary for this business than  
 ' stature, or strength of body ; for this service  
 ' requires diligent care and art.' Of the plough-  
 man he says, ' In the ploughman, though a de-  
 ' gree of genius is necessary, yet it is not enough.  
 ' There should be joined to it a harshness of  
 ' voice and manner, to terrify the cattle : But  
 ' he should temper strength with clemency ; be-  
 ' cause he ought to be more terrible than cruel,  
 ' that so the oxen may obey his commands, and  
 ' continue the longer at their work, not being  
 ' spent, at the same time, both with the severity  
 ' of labour and stripes. But what the offices of  
 ' masters of works and of ploughmen are, I  
 ' shall mention in their proper places. It is suf-  
 ' ficient at present to observe, that tallness and  
 ' strength are of great use in the one, and of  
 ' very little in the other ; for we should make,  
 ' as I have said, the tallest man a ploughman,  
 ' both for the reason I have already mentioned,  
 ' and

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‘and because there is no rustic work by which  
 ‘a tall man is less fatigued than by ploughing;  
 ‘because, when employed in this, walking al-  
 ‘most upright, he may lean upon the handle of  
 ‘the plough.’—Of the common labourer he  
 says, ‘The common labourer may be of any size,  
 ‘provided he is able to endure fatigue.’—And  
 of the vine-dresser, ‘Vineyards do not require  
 ‘such tall men, provided they are thick and  
 ‘brawny; for this constitution of body is most  
 ‘proper for digging, pruning, and the other  
 ‘culture necessary for them. In this work dili-  
 ‘gence is less necessary than in the other works  
 ‘of husbandry; because the vine-dresser ought  
 ‘to perform his work in company and under  
 ‘the eye of a director. Commonly wicked men  
 ‘are of a quicker genius, which this kind of  
 ‘work requires; and, as it requires not only a  
 ‘stout servant, but one of an active contrivance,  
 ‘vineyards are commonly cultivated by slaves in  
 ‘chains\*.’

Thus

\* *Magistros operibus oportet praeponere sedulos, ac frugalissimos. Ea res utraque plusquam corporis statura roburque confert huic negotio; quoniam id ministerium custodiae diligentis et artis officium est. Bubulco quam-  
 vis*



## 30 OF THE HUSBANDRY

Thus we see, that, among the Romans, labourers were appointed to the different works of husbandry, according to their strength, size, and genius.

This account, given of the persons employed in agriculture among the Romans, suggests to  
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*vis necessaria, non tamen satis est indoles mentis, nisi eum vastitas vocis, et habitus metuendum pecudibus efficit. Sed temperet vires clementia; quoniam terribior debet esse, quam saevior, ut et obsequantur ejus imperiis, et diutius perennent boves non confecti vexatione simul operum, verberumque. Sed quae sint magistrorum munia, quaeque bubulcorum, suo loco repetam. Nunc admonuisse satis est, nihil in his, in illis plurimum referre vires et proceritatem. Nam longissimum quemque aratorem, sicut dixi, faciemus, et propter id, quod paulo ante retuli, et quod in re rustica nullo minus opere fatigatur prolixior; quia in arando stivae pene rectus innititur. Mediastinus qualiscunque status potest esse, dummodo perpetiando labori sit idoneus. Viniae non sic altos, quemadmodum latos et lacertosos viros exigunt; nam his habitus fossuris, et putationibus, caeterisque earum culturis magis aptus. Minus in hoc officio, quam in caeteris agricolatio frugalitatem requirit, quia et in turba, et sub monitore vinitor opus facere debet. Ac plerumque velocior animus est improborum hominum, quem desiderat hujus operis conditio; non solum enim fortem, sed et acuminis strenui ministrum postulat. Ideoque vineta plurimum per alligatos excoluntur; Col. lib. 1. cap. ix.*

us a variety of things of such importance as to merit a very particular attention.

In the first ages of the state, the nobles of Rome cultivated their own lands. This suggests an important inquiry, Whether it would be an advantage to the country, if this practice was followed in Britain? That it was advantageous in Italy is certain. It has been observed, that Pliny gives it as a reason that corn in ancient times was in such plenty and at so low a price in Rome. But this was owing to the smallness of the estates, and the simplicity of the manners of the people; in both of which our situation in Britain is very different from the situation of the Romans in the first ages of their state. With us there are few very small estates, and the number of these is every day lessening. In a country where trade and manufactures are carried on, the gentlemen of small estates cannot subsist. Finding the merchant and manufacturer to exceed them in show and luxury, they are either tempted to live above their fortunes, or, if they have the resolution to bear with the superiority of tradesmen, they are obliged to breed their sons to business; and either the one or the other of these naturally brings

their lands to a sale. Our riches are not so great as to allow land to be an article of trade; and therefore, in time, all our small estates must be swallowed up by the large ones; an event that seems to be at no great distance; And, as our estates are not so small, so neither are our manners so simple, as those of the ancient Romans. A landed gentleman, though of a small fortune, considers himself as in a station different from the farmer; he imagines that he has a certain rank to maintain, and the very ideas of station and rank prevent that attention and care necessary in a man of business. In order to judge, therefore, whether it is an advantage to the country for proprietors to farm their own lands, we must suppose this practised by men of considerable estates and refined manners, with high ideas of station and rank: And, in this case, we may form a judgment the more certain, as many of these gentlemen have actually applied themselves to agriculture, and, to give full scope to their genius, have taken the management of very large farms. It is certain, that some farms, after having been some years in the hands of the proprietors, have been let at a rent considerably advanced. From this it is generally

rally supposed, that these gentlemen have by farming improved their estates. It appears to be so; but there is a fallacy in this appearance not always attended to. Of late, there has been a remarkable change in the situation of the kingdom and manners of the people, of such a nature as has naturally raised both the value and rent of lands; and, if allowance is made for this natural rise of rent, perhaps the artificial one by improvement will not make a very great figure. If inclosing is laid aside, it may be affirmed, that there are few farms under the management of the proprietors, that are much indebted to their skill and improvements for the rise of rent which has been obtained. This may seem a bold assertion; an assertion, too, of the truth of which it will be difficult to convince our gentlemen improvers. It will not, however, appear to them very absurd, if they consider, that improvements of soil are generally made by lime or marls; that a few of the first crops after these improvements are always the best; and that, in a few years, it is expected that the improver is indemnified for his expence. The farmer knows these things, and is therefore ready to risk something for the chance  
of

## 84 OF THE HUSBANDRY

of the benefit arising from the first crops after the improvement ; but the gentlemen commonly keep the improved lands for some years under their own management. Now, this renders them of no greater value to the farmer than before the improvement ; because, had the crops, which the proprietor has raised, been raised by the farmer, they would perhaps have done more than indemnify him for the expence of improvement. It may be alledged, that, though the improvements made by the proprietor do not in this case raise the rent of the farm, yet that he receives from them the same advantages that the farmer would receive. But it is not so ; and the reason is obvious. His improvements are carried on at much greater expence than those of the farmer, and the produce does not turn out to so good an account.

But our present inquiry is not, whether this practice, of gentlemen farming their own lands, is an advantage to themselves, but whether it is advantageous to the country. However, before we proceed further in this inquiry, it is necessary to distinguish betwixt the gentleman who farms a little for his amusement, and the gentleman who makes farming a business. There  
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is no doubt, that a gentleman, from the advantages of his education, from the opportunity which he has to observe the practices of different countries, and from his having no dependence upon his farming for his subsistence, has it in his power to make a greater progress in agriculture than an actual farmer, and to introduce real and solid improvements into the part of the country where he lives. While he farms a little only for his amusement, this is his view, and he may succeed; but, when he extends so far as to make farming a business, then his views become contracted, the true spirit of improvement subsides, and his operations become hurtful to the country. In attempting to establish this important point, it is not necessary to reason from conjectures; for so many gentlemen have become extensive farmers, as to furnish us with a sufficient number of undoubted facts.

There are two things in particular, in which the gentlemen, by their extensive farming, are hurtful to the country. They spoil the labouring servants, and they raise the price of provisions.

The

The labouring servants of a gentleman farmer, it is well known, do not work so many hours in the day as those of an actual farmer; neither are they so busy while employed. This ease which they enjoy, this indolence in which they are allowed to indulge themselves, has a bad effect upon them, becomes habitual, and makes them bad servants even to the most attentive master. These things, too, have a bad effect upon all the servants in the neighbourhood; for they never cheerfully, or even peaceably, perform their labour at times when they know that some of their fellows are lying at their ease, or diverting themselves. This, though hurtful to the country, is a thing which it is impossible for a gentleman farmer to prevent. He cannot be supposed to see his servants begin their work in the morning, nor can he attend them in their labours through the day: And such is the aversion that man naturally has to labour, that diligence is not to be expected, except under the immediate eye of a master. It is true, that the want of the master's presence may in some measure be supplied by an overseer; but, besides that this depends upon the activity and industry of a person in the concerns  
of

of another, it is certain, that an overseer has commonly some prudential considerations to prevent him from being severe upon the labouring servants.

But the raising the price of provisions, the other thing mentioned, is probably the more hurtful of the two: Wherever improvements are carried on by gentlemen to a great extent, there we find a demand for hay and oats, and perhaps too for carriages. So that these lands, instead of sending provisions to market for the service of the community, as ought to be done, they consume the produce of other lands; and, though the lands under this management, may bear but a small proportion to the other lands of the kingdom, yet the effect upon the prices of provisions may be considerable. But, even supposing that expensive improvements are not carried on, yet it is certain, that the farms in the hands of gentlemen do not send such a quantity of provisions to market in proportion, as those in the hands of actual farmers. The expence of management, as appears from what has been already said, is much greater; the number of labouring servants is greater, and, in consequence of this, the number of labouring cattle

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is greater likewise; and both of these occasions a greater consumpt of the produce upon the farm itself. Besides, the produce does not commonly turn to so good an account. This does not arise from want of skill in the business of farming; for in this the gentleman farmer is no doubt superior to the actual farmer; but it arises from his not being present with his labourers, and his not having it in his power to give that attention to circumstances that is necessary. Every person knows, that the presence and attention of the master are important in every business; but every person does not know, that these are perhaps more important in farming than in any other: So different is the weather in the same seasons, and so changeable in every season; so various are the sorts cultivated, and so variously affected by the differences and changes of weather, that it requires the greatest attention, and not a little knowledge, to find out at all times the real situation of soils, and the kind of culture that is best adapted to this situation. Often does the inattentive farmer give that culture which his fields are unfit to receive, and often does he let slip a favourable opportunity, that never returns. Even the most experienced  
and

and intelligent farmer, has not arrived at such a perfect knowledge of his business, as to be able to determine, upon inspection, what is the real situation of his fields; and, in every case, whether they are fit for receiving the culture which must be given for the intended crop. It is not an uncommon thing to see farmers in some seasons begin to plow a field, and immediately give it up upon observing the effects of the operation; a thing of this kind seldom happens with a person of skill in any other business, and it shows, that, when a farmer is not very attentive, and is not very frequently present with his servants, his fields will sometimes receive a culture in a situation in which such an operation ought not to have been performed; for servants, when left to themselves, must obey the orders given, without considering the consequences, of which indeed they are not judges: If this is the case with intelligent and attentive actual farmers, if they sometimes begin an improper culture in their fields, often must an improper culture be given to the fields of the most intelligent gentlemen farmers, who not only, from their situation in life, cannot give great attention to the state of their fields; but also,

though they give particular orders, are seldom present with their servants in the execution. This so often happens, that in every farm, where the attention and presence of the master are wanting, there are some of the fields, in which it may be observed, from their appearance, that they have received some kind of culture in an improper situation. Besides, though the gentleman may have much more skill and knowledge, yet his thoughts being employed about a variety of other objects, he cannot be supposed to improve the variety and change of circumstances, with the same exactness as the actual farmer, whose thoughts are constantly employed on his fields, and watching their different appearances. These things may well be supposed to account for a less quantity of provisions being carried to market from a gentleman's farm, than from one of the same kind in the hands of a farmer, without having recourse to the unnecessary waste of corn, that is more carefully preserved in the one than in the other. Upon the whole, therefore, we may conclude, that, though it is advantageous for gentlemen to have farms, for the purpose of introducing new schemes and practices,

yet

yet it is very hurtful for them to prosecute to a great extent farming as a business.

It appears, that the first farmers among the Romans were entirely under the direction of the landlord, and were distinguished from overseers only in this respect, that they had a fixed share of the produce for their wages and maintenance. It may not be amiss to inquire, whether it would be an advantage to have this practice introduced into Britain: Were the lands which our gentlemen farmers have at present in their own hands let in this manner, it cannot be doubted but it would be an advantage both to themselves and to the country; for ordinary overseers, such as they have, cannot be supposed to be so attentive and diligent in their business, as farmers of this kind would be; but it is probable that it will be found difficult to introduce this practice, though evidently advantageous. The generality of our gentlemen farmers are supposed to prosecute uncommon schemes of husbandry, and to have no great attention to oeconomy in their operations; a person therefore of honesty and industry must be afraid to risk his living to the success of these schemes. This opinion of the practices of the gentlemen farmers,

farmers, is probably false with respect to many; however, it is the general opinion of the actual farmers and the lower class of people; and, therefore, in this case, must have the same effect as if ever so well founded. It may perhaps be a proper means of removing the difficulty, either to fix the scheme of husbandry, or to give the farmer something certain, and likewise whatever the proportion of the produce agreed upon may exceed this. Was this practice introduced, though advantageous, yet it might be carried too far; this should be prevented, and no gentleman should let in this manner a greater number of farms, than it may be supposed he can easily manage.

It appears both from Cato and Columella, that the Roman farmers, in their leases, were restricted to a particular kind of culture: This suggests another important inquiry, whether it is for the advantage of agriculture, that farmers should be confined in their operations, and, if so, of what nature the restrictions ought to be. The Roman farmers seem to have been restricted in a very particular manner; they were obliged not only to a fixed plan in their manner of cropping, but also to give a certain culture to  
particular

particular crops. The propriety of these depends upon circumstances, the state of agriculture, the situation of the proprietors of the land, and the condition of the farmers; all of which are very different at present in Britain, from what they were in Italy, even after the time of Cato. In Italy, at that time, agriculture was brought to a high degree of perfection, its operations were well understood, the culture which the different soils required, according to the crops intended, was well known, and the particular times of applying this culture, from the regularity of the seasons, could be easily ascertained. But, in Britain, agriculture is as yet capable of great improvement, its operations may be performed with greater exactness, the best kind of culture to the different soils is not yet known, and the times of giving this culture, depending upon seasons irregular and inconstant, cannot be determined.

There is still a greater difference in the situation of the proprietors land. In the rude ages of the Roman Commonwealth, the greatest and wisest men not only applied themselves to agriculture, but performed all its operations with their own hands, and, from the smallness of their estates,

estates, were obliged to exercise the greatest carefulness, frugality, and oeconomy. In the rude ages of the British monarchies, the great men not only gave no attention to agriculture, but held it in contempt, and left it to the care of the meanest of the people.

When the great men of Rome became so much civilized, as not to perform the manual operations of agriculture, they were still educated in the knowledge of it, studied its improvement, and directed all its operations with exactness and oeconomy. When the great men in Britain are now become civilized, and begin to study the improvement of agriculture, they may indeed acquire a knowledge of the theory of it from reading and reflection; and, from a knowledge of men and the world, may become capable to form proper general plans for the improvement of lands, and the management of estates; yet, from their established manner of life, they cannot attain much knowledge of the practice of agriculture, and must remain in a great measure ignorant of that exactness and oeconomy in the several operations of husbandry, that are necessary for its success and improvement.

There

There is as great a difference in the condition of the farmers, as in the situation of the proprietors. The Roman farmers received all their knowledge from the proprietors, and at first were under their direction in the whole of their operations. But, in Britain, the farmer has as yet received but little instruction from the proprietor; all the knowledge which he possesses, he has acquired from his own observations, and the practices of his predecessors.

In cases, therefore, so very different, particular restrictions in leases may be very proper for the advantage of agriculture in the one, while they may be very improper in the other. That the particular culture, to which the Roman farmer was restricted, was considered as beneficial to agriculture in general, and to the farmer himself in particular, is evident from the manner in which Columella expresses himself on the subject: ‘The landlord,’ says he, ‘ought to be more rigorous in demanding culture than payment, in consequence of which, the farmer having a good crop will not have the assurance to demand an ease of his rent.’ But, whether the many particular clauses relating to the method of culture, found in some of our modern



dern leases, are of this kind, is not so evident. It may not be improper to observe in general, that it is impossible to devise a particular scheme of management, which, in the execution, does not become very hurtful in some seasons and situations; and, therefore, that to confine the farmer even to the best is a real disadvantage.

But it is necessary to consider this subject in a different view: Though in the present situation of agriculture, it may be true, that the British farmers, if left to themselves, are capable to make their farms produce more during their leases, than when tied down by restrictions; yet it must be observed, that it is likewise in their power to destroy their farms in such a manner as, for some years after the expiration of their leases, to deprive the proprietor of part of the rent which he ought to receive, and the surety of part of those provisions which should arise from the farm; And it is not to be doubted that the generality of the farmers will do this, if they have the prospect of the smallest gain; perhaps there are some, who, out of spite to their successors, will do it, even when they are in danger of being losers. To prevent this, therefore, restrictions in leases are not only proper, but even

ven necessary; and hence it is important to inquire of what kind these restrictions ought to be. One thing seems obvious, which is, that they should not be numerous; that they should be as general and as easily observed as possible. In many leases in Scotland, the restrictions are very numerous and very particular; the tenant is obliged to give his land a summer fallow once in so many years, he is obliged to raise particular crops, and in these to observe a certain rotation; and, in some cases, he is bound, even sometimes encouraged, to apply lime. These things are improper; for, by the management to which the tenant is bound by them, unless the farm is of remarkably good soil, or plenty of dung in his power, the land must be worn out as effectually, as by his following any plan that can be supposed beneficial to himself. Improper plowing and cropping, indeed, sooner wear out land; but then the land worn out in this manner is easier recovered, than when it is worn out by good plowing and proper cropping: In the one case, the powers of the soil, from bad culture and the increase of weeds, are prevented from acting; but, in the other case, these powers are actually exhausted. In place, therefore,

of many particular restrictions, which seldom serve any good purpose, this general and simple one may be introduced: Let the tenant be obliged to have a certain proportion of his farm annually in grass, and, at the expiration of the lease, let parts of this grass be a certain number of years old; if the quantity of grass is proportioned to the nature of the soil, the land will be both kept and left in good order.

It is a common covenant, in the leases of some counties in England, and these too where agriculture is supposed to be very far advanced, not to plough any land that is in grass; so that, if there is a proportional share of grass on the farm, one part must be in constant tillage, and the other continually in grass. This practice arises from the great value put upon old grass. But it is now found, that new grass of a good quality is very little inferior to the old; and it is certain, that arable land, after being some years in grass, when taken up, is in a much better condition for carrying crops of corn, than when it was laid off. This covenant, therefore, in the English leases, is a real hurt to agriculture.

It

It was already observed, that Columella calls one kind of the Roman farmers *free farmers*. One would think; that it is needless to inquire whether it is for the advantage of agriculture, that all our farmers in Britain should be free and independent; and yet the opinions and practices of some proprietors make this necessary. The farmers in Britain are indeed all free; but it is not a long time since many of them were in a different situation: And some persons seem to think that all of them ought to be dependent; and propose, as the only method which the law allows, that farms shall be made small and farmers rendered poor. How far it is good policy, in the government of mankind, to render a set of useful men poor, and thereby dependent upon the caprices of another set, does not belong to the present subject to determine; but it certainly belongs to it to inquire what effect this must naturally have upon the practice of agriculture. It does not require much penetration to observe, that independence in tenants is absolutely necessary to form and preserve in them the spirit of improvement. When men are dependent, their views are confined, their spirits are depressed, and they are afraid to  
 leave

leave the beaten track. Such persons, indeed, may be careful and anxious; but they are incapable of true industry and oeconomy. Unacquainted with the world, they cannot improve the advantages of their situation; and, having no opportunity of enlarging their minds, they are unable to comprehend any practices or customs that are superior to their own. Agriculture, in the hands of such persons, cannot be improved: On the contrary, if in an advanced state, it must quickly decline, and the bad consequences of this, perhaps, severely felt before any remedy could be applied.

It was already likewise observed, that the directions given by Columella to the gentlemen of estates are very proper. There is one of them that deserves our particular notice, and that suggests, too, an important inquiry. He advises landlords to retain upon their lands the same industrious farmers that have been bred upon them, declaring, upon the authority of L. Volufius, that that estate is most advantageous to the proprietor that is cultivated by such farmers. The generality of the present landholders in Britain seem to differ in opinion from this old senator of Rome. They are at no pains to re-  
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tain old tenants; there are even many who have so little regard for them, that they are ready to turn them out for the sake of strangers, who offer a trifle more of rent. That this should be done by persons who have lately purchased their lands, and consider them as a commodity of which they propose to make the most, is not unnatural; but that it should be done by the representatives of the ancient barons and chieftains, is indeed surprising. It is probable that all of them, in doing this, mistake the true interest of their families. Men with their education naturally imbibe attachments; they acquire a love to the place where they were born and brought up, and they continue to honour a family which from their infancy they have been taught to admire. Tenants, therefore, that have been brought up on the lands which they farm, must have an attachment to them, and a respect for the landlord. On these accounts, they are certainly preferable to strangers; for, with their attachments, having no thoughts of being removed, they do justice both to the land and landlord; whereas strangers, having no attachments, and expecting a removal, endeavour to make the most of both; and this they often  
have

have in their power, in spite of all restrictions. Where agriculture is in a low state, it is proper indeed to bring some farmers from places where it is farther advanced; but there ought to be no more changes than what are necessary for promoting improvement. When a total change is made, though this may procure a little more rent at the time, yet the estate at last will not be so profitable with the new tenants as it would have been with the old as well instructed; and certainly good husbandry may be introduced into an estate without totally rooting out the old tenants. Would landholders take some pains to get their tenants instructed; would they discover that they have their interest at heart; would they show, in granting leases of their lands, that they prefer them to strangers; they would certainly gain the highest respect, would secure the attachment of their tenants, and receive from them as much rent as their lands can afford.

This changing of tenants, justly complained of, naturally arises from that desire which every proprietor of land has to improve his rent. It may perhaps be thought not an improper inquiry, whether any bounds ought to be set to  
this

this practice, which at present prevails so much? There is one important advantage that arises from it, which is, quickening the industry of the farmer. When farmers are indolent, and do not make the most of their farms, it is certainly beneficial to the country to force them, if possible, to attention and industry; and there is nothing more proper for this purpose, than for the landlord to oblige him to pay more rent. But landlords are apt to be partial in judging of this matter, and to raise their rents, not only when farmers are indolent, but also when industrious, provided they appear to enjoy life, and do not submit to severe labour. If this practice is carried on, and rents raised, till farmers are obliged to renounce all the enjoyments of life, and labour with their servants, it is certain that bad consequences must follow; the farmers become dispirited, agriculture declines, and the rent and value of lands fall. This is not mere conjecture; for we have a remarkable instance of it in Italy in the time of the younger Pliny: And his authority may be the more depended upon, as it is certain he was at proper pains to inquire into the matter. The account of it we find in a letter to his friend

Calvifius



Calvifius Rufus. In this letter, Pliny consults his friend about a purchase of land which he proposed to make. After informing him of some things that disposed him to make the purchase, and of others that rendered him averse to it, he adds: ‘ But the chief point to be con-  
 ‘ sidered is this, the lands are fertile, rich, and  
 ‘ capable of being watered ; they consist of corn  
 ‘ fields, vineyards, and wood, which produce a  
 ‘ moderate but certain crop. These advantages  
 ‘ of the lands are lost by reason of the poverty  
 ‘ of those that cultivate them ; for the former  
 ‘ possessor frequently sold the forfeited stock of  
 ‘ the farmers ; and thus, while he from time to  
 ‘ time lessened what remained, he deprived them  
 ‘ of all power of doing any thing afterwards to  
 ‘ purpose. Many frugal farmers must therefore  
 ‘ be provided, for I have no slaves myself, nei-  
 ‘ ther are there any upon this estate. It may  
 ‘ be purchased for three millions of sesterces ;  
 ‘ formerly, indeed, it was reckoned worth five  
 ‘ millions ; but as, from a scarcity of farmers,  
 ‘ and the badness of the times, the produce of  
 ‘ the lands has been lessened, so the price has  
 ‘ fallen \*.’ Thus we may observe, that this e-

state,

\* Jam, quod deliberationis nostrae caput est, agri sunt  
 fertiles,

state, chiefly from the severity used towards the farmers, had fallen in Pliny's time two-fifths of its value. The same, no doubt, happened in other parts of Italy, as indeed may be inferred from the manner in which Pliny expresses himself\* ; and this, too, will happen in every country, in proportion as rents are raised higher than is necessary for promoting industry.

The account given of the persons employed in agriculture suggests another inquiry which may

fertiles, pingues, aquosi ; constant campis, vineis, sylvis, quae metieriam, et ex ea redditum, sicut modicum, ita statutum praestant. Sed haec felicitas terrae imbecillis cultoribus fatigatur : Nam possessor prior saepius vendidit pig-nora, et dum reliqua colonorum minuit ad tempus, vires in posterum exhaustit, quarum defectione, rursus reliqua creverunt. Sunt ergo instruendi eo plures, quod frugi man-cipiis, nam nec ipse usquam victos habeo ; nec ibi quisquam superest, ut scias quanti videantur posse emi. Se-tertio tricies, non quia non aliquando quinquagies fue-rint, verum et hac penuria colonorum, et communi tem-poris iniquitate, ut redditus agrorum, sic etiam pretium retro abiit ; Plin. Ep. lib. III. ep. 19.

\* The expression which Pliny uses is, ' Communi tem-poris iniquitate,' which supposes, that the bad practices of the times, which lessened the produce of the lands, were common.

may be thought not improper, though perhaps not very important, Whether the expence of labour amongst the Romans was greater or less than at present in Britain? There are no passages in the rustic writers from which it can be so much as conjectured what wages were given to labourers. However, as slaves were the ordinary labourers amongst the Romans, the point may be determined, if we can find out the price of these and the manner of maintaining them.

Mr Tull, after giving a description of the manner in which the Roman farmers cultivated the *medica*, to account for the immense labour bestowed upon it, observes, that they had not only servants, but plenty of slaves, for whom they had not sufficient employment; and that, thereby, the expence of their tedious method of planting and cultivating this grass might be lessened\*. In this manner Mr Tull represents the expence of labour as very trifling; but he gives no authority for what he asserts. He supposes only that it must have been so, because he cannot in any other way account for their bestowing so much culture upon the *medica*. In mat-  
ters

\* Tull's Husbandry.

ters of this kind conjectures must be laid aside, and nothing asserted without proper authority. Had Mr Tull been a little more careful in his inquiry, he would have observed, from this very case, how improper it is to reason from conjectures.

Columella, in giving an account of the expence of cultivating vines, states the price of the vine-dresser at eight thousand sestertii \*, which is equal to L. 66 : 13 : 4 †. Plutarch says, that Cato was so frugal, that he never paid more for a slave than 1500 drachmas ‡, which are equal to L. 50. A price that seems to be much higher in the time of Cato than L. 66 : 13 : 4 was in the time of Columella, and is indeed a certain evidence, that the number of slaves in Italy had

\* *Isque licet sit emptus sestertiis octo millibus*; Col. lib. III. cap. III.

† Doctor Arbuthnot states the Roman *denarius* at seven pence three farthings. But some later writers, that pretend to be more accurate in their calculations, make it equal to eight pence. The *sestertius* was a fourth part of the *denarius*; so that 1000 sestertii are equal to L. 8 : 6 : 8, and 8000 sestertii are equal to L. 66 : 13 : 4.

‡ See Plutarch's life of Cato. The *drachma* is supposed by all our antiquaries to have been equal in value to the *denarius*; 1500 drachmas, therefore, make L. 50.

had increased, from the time of Cato to that of Columella, almost in proportion to the increase of riches, currency, and luxury.

This price, mentioned by Columella, will appear the more extraordinary, if we consider that it is eight times as much as the price of a jugerum of very good land. In the same account of the expence of cultivating vines, Columella states the price of seven *jugera* at seven thousand *sestertii* \*, which is at the rate of L. 8 : 6 : 8 for the jugerum, and is equal to L. 13 : 9 : 8 for the English acre, and to L. 16 : 19 : 5 for the Scots acre. In this proportion, which is certainly the proper way of judging in the present case, a labourer in Britain should cost upwards of L. 100 ; so that there is no ground to conjecture, that, in the time of Columella, slaves were so numerous that there was not sufficient employment for them.

Columella, when treating of servants, in a passage already cited, and assigning to each of them their different work, according to their abilities, makes very little difference betwixt a vine-dresser, and a ploughman or common labourer :

\* Cum ipsum solum septem jugerum totidem millibus nummorum partum ; Col. lib. III. cap. III.

bourer: And, from what he fays, we may conclude, that, if a good vine-dresser cost L. 66:13:4, a good ploughman or a good common labourer would not cost less than L. 60.

The interest of money at that time was six *per cent. per annum* \*; and, if this was the common

\* Columella, after observing that the price of a vine-dresser, of seven *jugera* for a vineyard, and the expence of planting, &c. amount in all to 29,000 *sestertii*, proceeds thus: ‘ To these must be added two years interest, ‘ at six *per cent. per annum*, during which time the young ‘ vines do not bear any fruit, amounting to 3480 *sestertii*; so that the whole of the original price, expence, and ‘ interest, amount to 32,480; which sum, if the husband- ‘ man considers as lent to his vines at the said rate of six ‘ *per cent.* as the usurer deals with his debtor, then he ‘ must receive every year from them the value of 1950 ‘ *sestertii*.—Huc accedunt *semisses* usurarum *sestertia* tria ‘ millia, et *quadringenti octoginta numi biennii temporis*, ‘ quo velut *infantia* vinearum cessat a fructu. Fit in *as-* ‘ *sem* *summa fortis et usurarum xxxii millium quadrin-* ‘ *gentorum lxxx* *numorum*; quod quasi nomen, si, ut ‘ *foenerator cum debitore*, ita *rusticus cum vineis suis* *fe-* ‘ *cerit ejus summae*, ut in perpetuum *praedictam usuram* ‘ *semissium dominus constituat*, percipere debet in annos ‘ *singulos mille nongentos quinquaginta sestertios numos*;’ Col. lib. III. cap. III.—The phrase which Columella uses,

## 110 OF THE HUSBANDRY

mon interest paid for money, in stating the expence of labour, the interest of the price of a  
slave

to express the interest of the money, and which has been translated *six per cent.* is ' *femisses usurarum.*' To understand this, it may be proper to observe, that, before there were any laws regulating interest among the Romans, the ordinary interest given was at the rate of *12 per cent. per annum.* For the loan of 100 ounces of copper, the creditor received annually 12; but this he received monthly, that is, one each month. Now, *as* is a word that was used by the Romans to express the whole of any thing, and was therefore used likewise to express the whole year's interest at *12 per cent.* And as *as* expressed twelve months interest, *femis*, or the half of *as*, expressed six months interest; *triens*, or the third of *as*, four months; *quadrans*, or the fourth of *as*, three months; and *unciaria*, or the twelfth of *as*, one month's interest, at the same rate of *12 per cent.* When the Romans made laws concerning this matter, they retained the terms in use, but applied them differently. Thus the term *unciarium foenus*, or *unciaria usura*, was made to signify one *per cent.* not by the month as formerly, when one ounce was paid monthly for an hundred, but by the year; *sextans*, not two months interest, but two *per cent. per annum*; *triens*, three *per cent.*; *quadrans*, four *per cent.*; *quincunx*, five *per cent.*; and *femis*, six *per cent.* That six *per cent. per annum* is the rate of interest here mentioned by Columella, is evident from the particular sums which are stated.

Thus;

slave must be rated at 12 *per cent.* as he is a perishable commodity, and liable to be destroyed by accidents; so that a slave that cost L. 60 of original price, must be considered as an annual expence to his master of L. 7 : 4 : 0, besides his maintenance and clothing.

The expence of these was not so inconsiderable as some perhaps may imagine, from the small expence of some of the slaves of this age. This appears from the passages in the rustic authors, that relate to the maintenance and cloathing of labourers: Columella mentions what he

calls

Thus: For the vine-dresser	.	8000
For 7 jugera of land	.	7000
For planting the vines, &c.	.	14000

In all	29000
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The interest of this for two years, at six *per cent. per annum*, is precisely the sum mentioned by Columella

3480
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32480
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The interest of this sum, Columella says, is yearly

1950
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It should be no more than

1948 8
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But, as the difference is small, it is probable that he choosed to mark the even numbers, as is commonly done in such cases.



calls an old maxim, concerning the bailiff:  
 ‘ That he should not eat but in the sight of all  
 ‘ the servants, nor of any other thing but what  
 ‘ was given to the rest.’ He mentions the reason  
 of this: ‘ For thus,’ says he, ‘ shall he take care  
 ‘ that both the bread be well baked, and the o-  
 ‘ ther things prepared in a wholesome manner\*.’  
 The same author mentions the treatment that  
 masters ought to give their slaves: ‘ So much  
 ‘ the more attentive,’ says he, ‘ ought the mas-  
 ‘ ter to be in his inquiry concerning this kind  
 ‘ of servants, that they may not be injured in  
 ‘ their cloaths and other things afforded them,  
 ‘ in as much as they are subject to many, such  
 ‘ as bailiffs, masters of works, and goalers; and  
 ‘ the more they are liable to receive injuries,  
 ‘ and the more they are hurt through cruelty  
 ‘ or avarice, the more they are to be feared.  
 ‘ Therefore a diligent master ought to inquire,  
 ‘ both at themselves, and likewise the free ser-  
 ‘ vants in whom he may put greater confidence,  
 ‘ whether they receive the full of what is allow-  
 ‘ ed

\* Ne cibum nisi in conspectu familiae capiat, neve alium,  
 quam qui caeteris praebetur; sic enim curabit, ut et panis  
 diligenter confiat, et reliqua salubriter apparentur; Col.  
 lib. 1. cap. viii.

‘ ed them ; he himself ought likewise to try, by  
 ‘ tasting the goodness of the bread and drink, and  
 ‘ examining their cloaths, mittens, and shoes\*.’  
 In another place, he says, ‘ That the bailiff should  
 ‘ have the family dressed and clothed rather  
 ‘ usefully than nicely, and carefully fortified a-  
 ‘ gainst the wind, cold, and rain ; all which they  
 ‘ will be secured from, by sleeved leathern coats,  
 ‘ old *centones* for defending their heads, or cloaks  
 ‘ with hoods ; if the labourers are clothed with  
 ‘ these, no day is so stormy as to prevent them  
 ‘ from working without doors †.’

Cato

\* Tantoque curiosior inquisitio patrisfamilias debet esse pro tali genere servorum, ne aut in vestiariis, aut in caeteris praebitis injuriose tractentur, quanto et pluribus subiecti, ut villicis, ut operum magistris, ut ergastulariis, magis obnoxii perpetiendis injuriis, et rursus saevitia, atque avaritia laesi magis timendi sunt. Itaque diligens dominus, cum et ab ipsis, tum et ab solutis, quibus major est fides, quaerat an ex sua constitutione justa percipiant. Atque ipse panis potionisque bonitatem gustu suo exploret, vestem, manicas, pedumque tegmina recognoscat ; Col. lib. 1. cap. VIII.

† Cultam vestitamque familiam magis utiliter quam delicate habeat, munitamque diligenter a vento, frigore, pluviaque ; quae cuncta prohibentur pellibus manicatis,

Cato is still more particular, he informs us what quantity of bread and wine, what other kinds

*centonibus confectis, vel fagis cucullis. Id si fiat, nullus dies tam intolerabilis est, quo non sub divo moliri aliquid possit; Col. lib. 1. cap. viii.*

*Centones*, which Columella here mentions as intended for defending the head, commonly signify the coverings of beds, which for slaves would probably be made of some kind of coarse woollen stuff. They were sometimes made of old cloaths; this appears from a passage in Cato, in which he mentions the cloaths of the family, and which shall afterwards be cited. Caesar mentions *centones* as belonging to soldiers, and used by them in a siege, to defend their heads from the weapons and stones thrown from the walls of the town. This shows, that they were made of very thick stuff, and sufficient to defend from rain. Columella, in the passage under consideration, calls them *centones confecti*. The meaning of this phrase is not very obvious; it is uncertain whether it is *centones* wore out and no longer fit for bed coverings, or whether stuff of the same kind with bed coverings, made up in such a manner as to defend the head and shoulders from the weather. This is the more probable, as Cato mentions six of them only as necessary for 240 jugera of an olive field, where there were 13 servants; and the same number necessary for 100 jugera of a vineyard, where there were 16 servants. The *centones* mentioned by Columella served the same purposes with the hoods and cloaks: In a similar

kinds of meat, and what cloaths were given to labourers.

Of bread, he says, each labourer was allowed at the rate of 3 pounds averdupois, or of 3 pounds 12 ounces averdupois in the day, according to the severity of their labour: ‘ During the winter,’ says he, ‘ the bailiff should have four *modii* of wheat each month, and during the summer four *modii* and a half; and the housekeeper, or the bailiff’s wife, and the shepherd, should have three. During the winter, the slaves should have four pound of bread each in the day; from the time that they begin to dig the vineyard, to the ripening of the figs, they should have five pounds each; after which they should return again to four\*.’

To similar passage he mentions the hoods and cloaks without the *centones*. *Cultam vestitamque familiam utiliter magis quam delicate habeat, id est, munitam diligenter a frigidibus et imbribus, quae utraque prohibentur optime pelibus manicatis, et fagis cacullis; Col. lib. xi. cap. 1.*

\* *Familiae cibaria qui opus facient per hiemen, tritici modios iiii. per aestatem modios iiii. semis villico. villicae epistatae, opilioni modios iiii. Compeditis per hiemem panes pondo iiii. Ubi vineam fodere coeperint panis pondo v. usque adeo dum ficus esse coeperint; deinde ad pondo iiii. redito; Cat. cap. lvi.*

Possibly

To this bread, there was a daily allowance of wine; during the three months that immediately

Possibly it may be Cato's meaning, that the labourers who were free should get four *modii*, and the villicus, &c. only three, and that the slaves should get four pounds of bread. The Roman pound contains 12 ounces averdupois, so that 4 pounds Roman are equal to 3 pounds averdupois, and 5 pounds Roman to 3 pounds 12 ounces averdupois. The title of this chapter in Cato is, 'The victuals of the family for the labourers when employed at work.' The precise time when the *villicus*, or the free servants got the 4 *modii*, and the slaves the 4 pounds of bread, is not expressed; but, from the quantity mentioned, the one must have been for the month, and the other for the day; and, if so, the quantities given are nearly equal. Pliny informs us, that a *modius* of wheat weighed from 20 to 26 pounds; 'Now,' says he, 'of all the kinds brought to Rome, the Gallic, and that which comes from the Chersonesus, are the lightest; for, even when well dressed, the *modius* does not exceed 20 pounds: The kind from *Sardis* gives an half pound, and that from Alexandria a third of a pound more; this too is the weight of the Sicilian; the Boeotian gives a whole pound more, and the African three quarters of a pound. In Italy beyond the Po, I know that a *modius* of *far* weighs 25 pounds, and about Clusium even 26.' Nunc ex his generibus, quae Romam invehuntur, levissimum est Gallicum, atque e Chersoneso advectum: Quippe non excedunt

ately followed the vintage, the servants drank a weak kind of wine called *Lora*: The manner in

excedunt in modium vicenas libras, si quis granum ipsum ponderet. Adjicit Sardum se libras, Alexandrinum et trientes. Hoc et Siculi pondus. Boeoticum totam libram addit: Africum et dodrantes. In Transpadana Italia scio vicenas quinas libras farris modios pendere. Circa Clusium et senas; Plin. Nat. Hist. lib. xviii. cap. vii. Pliny likewise informs us, that, in the ordinary military bread, there was a third part more weight of bread than of wheat; and that it was reckoned very good grain that in baking took a congius of water to the *modius*. Lex certe naturae, ut in quocunque genere pani militari tertia portio ad grani pondus accedat. Sicut optimum frumentum esse, quod in subactu congius aquae capiat. In some passages that follow, Pliny mentions the quantity of bread that a *modius* of some kinds of triticum produced; but this is not agreeable to the general rule which he lays down in the passage above cited. Probably he gives the instances which he mentions, as exceptions to this general rule: ‘Some kinds of *triticum* unmixed,’ says he, ‘as the Balearian, produce 30 pounds of bread; some other kinds mixed together, as the Cyprian and Alexandrian, scarcely exceeding 20 pounds in weight, give 25 pounds of bread; the Cyprian is dusky, and makes black bread; and therefore the Alexandrian, which is fair, is mixed with it. The Theban gives a pound more than these.’ Quibusdam generibus per se pondus, sicut Balearico, modio

in which this liquor was made, is described both by Pliny and Columella; and from the de-

dio tritici panis pondo xxxv. reddit. Quibusdam binis mixtis, ut Cyprio et Alexandrino, xx prope libras non excedentibus: Cyprium fuscum est, panemque nigrum facit; itaque miscetur Alexandrinum candidum, redduntque xxv pondo. Thebaicum libras adjicit; Nat. Hist. lib. xviii. cap. vii. According to the weight of the foreign wheat, and the proportion of the weight of bread to the weight of wheat mentioned by our author, none of the kinds should produce so much as 30 pounds of bread, nor so little as 25 pounds; a *modius* of the lightest kind weighed 20 pounds, to which a third added, makes upwards of 26 pounds; and yet the Cyprian and the Alexandrian mixed together, are said to produce only 25 pounds; a *modius* of the heaviest kind weighed only 21 pounds, to which a third added, makes only 28 pounds; and yet the Balearian is said to weigh 30 pounds. Our author says likewise, that a *modius* of the best wheat grinded into flour, requires a *congius* of water in baking, which is nearly one half of the weight of the grain; a *congius* of water, as has already been observed, weighed 10 pounds; this added to 21 pounds, the weight of a *modius* of Balearian wheat, makes 31 pounds, only one pound more than the weight of bread produced by a *modius* of this kind of wheat, which, even with the addition of leaven and salt, cannot be supposed to have supplied the waste by firing: We must therefore consider these instances given by Pliny, as exceptions

description given by them, it may well be supposed to be as good as the small beer given to servants

ceptions to the general rule, which is the more probable, as he mentions the flour of some kinds of wheat as taking more water than that of others.

The passage in Pliny, in which he mentions the weight of the different kinds of foreign wheat brought to Rome, is translated by Doctor Arbuthnot a little differently from what it is above rendered; *adjicit Sardum selibras*, he renders, the sardum was a *selibra*, or half a pound heavier. The Alexandrian and Sicilian wheat added trientes or four ounces more, that is, weighed 20 pounds 10 ounces; the Boeotian an entire pound, being in all 21 pounds; the African added to that a *dodrans*, or in all 21 pounds 9 ounces. Thus he makes the African 9 ounces heavier than the Boeotian. This seems contrary to another passage in the same chapter, in which Pliny mentions the Boeotian as better than the African: 'There are many kinds of *triticum*,' says he, 'which the other nations have raised; none of them indeed to be compared to the Italian, either for brightness or weight, in which it chiefly excels. To that which is produced by the mountainous lands in Italy, the foreign *triticum* deserves only to be compared; the best of which is the Boeotian, next the Sicilian, and then the African.' *Tritici genera plura, quae fecere gentes. Italico nullum equidem comparaverim candore ac pondere, quo maxime discernitur; montanis modo comparetur Italiae agris externum, in quo*  
 pri-



servants in Britain \* : It does not appear that the Roman slaves were much restricted in the quantity

principatum tenuit Boeotia, deinde Sicilia, mox Africa. But, if we suppose that Pliny, as he began with the lightest wheat, would naturally go on gradually, and end with the heaviest, then the translation by Doctor Arbuthnot gives the true meaning of our author.

In the proportion that has been mentioned, a modius of Italian *far* or triticum weighing 24 pounds, produced upwards of 32 pounds of bread, and 4 modii produced 128 pounds, which, at 30 days in the month, is a little more than  $4\frac{1}{2}$  pounds in the day, nearly equal to the quantity given to the slaves; that the allowance of the house-keeper and shepherd should be less than the allowance of the ordinary labourers, is not surprising, as their work was far from being so severe; and that the same allowance should be given to the labourers as to the *villicus*, is agreeable to what Columella says, that he should eat in their presence, and of the same kind of meat.

\* ‘ We cannot,’ says Pliny, ‘ properly call these liquors  
 ‘ wines, which the Greeks call *deuteria*, and which Cato  
 ‘ and we call *lora*, made chiefly of grape kernels and  
 ‘ stones washed in water: However, they are reckoned  
 ‘ among the ordinary kinds of wine given to labourers.  
 ‘ There are three kinds of them; one kind is made in  
 ‘ this manner: Take of water one tenth of the wine ex-  
 ‘ tracted from the grapes, put this upon the pressed grapes,  
 ‘ let it stand 24 hours, and then press the grapes a second  
 ‘ time.

tity; Cato mentions no measure; he only says, that they have this to drink for three months after

‘ times. There is another way used by the Greeks: Take  
 ‘ of water one third of the quantity of wine extracted, put  
 ‘ this on the pressed grapes, and let what is pressed out  
 ‘ be boiled to a third part. A third kind is pressed out  
 ‘ of the lees of the wine, which Cato calls *faecatum*:  
 ‘ None of these are fit for use longer than one year. Non  
 possunt jure dici vina, quae Graeci deuteria appellant, Cato  
 et nos loram, maceratis aqua vinaceis: Sed tamen inter  
 vina operaria numerantur. Tria eorum genera. Deci-  
 ma parte aquae addita, quae multi expressa sit, et ita noc-  
 te ac die madefactis vinaceis, rursusque praelo subjectis.  
 Alterum, quomodo Graeci facitavere, tertia parte ejus-  
 quod expressum sit addita aquae, expressoque decocto ad  
 tertias partes. Tertium est, faecibus vini expressum, quod  
 faecatum Cato appellat. Nulli ex his plus quam anno us-  
 fus; Plin. Nat. Hist. lib. xiv. cap. x.

Columella likewise gives a receipt for making this li-  
 quor, which is still more particular than those of Pliny:  
 ‘ Consider,’ says he, ‘ what quantity of wine you may  
 ‘ have made in one day, take of water equal to one tenth,  
 ‘ and throw upon the pressed grapes that have only been  
 ‘ one day in the press; mix with these the foam of *must*,  
 ‘ boiled into one third or one half, and lees from the vat;  
 ‘ let these be well bruised and washed, and then stand for  
 ‘ a night; next day let them be well tread, and then put  
 ‘ into the press. He adds, that when properly made, it

after the vintage; he proceeds in this manner:

‘ In the fourth month, each should get a *hemina*  
 ‘ of wine in the day, which is at the rate of  $2\frac{1}{2}$   
 ‘ *congi* in the month; in the fifth, sixth, seventh,  
 ‘ and eighth months, each a *sextary* in the day,  
 ‘ which is 5 *congi* in the month; in the ninth,  
 ‘ tenth, and eleventh, each 3 *heminae* in the day,  
 ‘ which is an *amphora* in the month. More than  
 ‘ this, at the *saturnalia* and *compitalia*, even each  
 ‘ man a *congius*. The quantity of wine for  
 ‘ each man in the year is eight quadrantals;  
 ‘ however, as addition must be made according  
 ‘ to the work in which the slaves are employed,  
 ‘ it is not too much for each of them to drink

IO

‘ continues good for more than a year.’ Lora optima sic  
 fit: Quantum vini uno die feceris, ejus partem decimam,  
 quot metretas efficiat, considerato, et totidem metretas  
 aquae dulcis in vinacea, sed quibus unus diei vinum ex-  
 pressum erit, addito; eodem et spumas defruti, sive sa-  
 pae, et fecem ex lacu confundito et permisceto, eamque  
 intritam macerari una nocte finito, postero die pedibus  
 proculcato, et sic permistam prelo subjcito; quod deinde  
 fluxerit, aut doliis, aut amphoris condito, et cum deferbu-  
 erit obturato. Commodius autem fervatur in amphoris.  
 Hanc ipsam loram M. Columella et aqua vetere faciebat,  
 et nonnunquam plus biennio innoxiam fervabat.

‘10 quadrantals in the year\*.’ This allowance of wine, it must be acknowledged, was not inconsiderable, being at least 74 gallons in the year, or, at an average, 1.62 parts of a pint in the day †.

Besides

\* *Vinum familiae. Ubi vindemia facta erit, loram bibant menses III. Mense quarto heminas in dies, id est, in mense congios II. s. Mense quinto, sexto, septimo, octavo, in dies sextarios, id est, in mense congios quinque: Nono, decimo, undecimo, in dies heminas ternas; id est, amphoram. Hoc amplius saturnalibus, et compitalibus in singulos homines congios. Summa vini in homines singulos inter annum Q octo. Cum comeditis uti quicquid operis facient pro portione addito: Eos non est nimium in annos singulos vini quadrantalia x. ebibere; Cat. cap. LVII.* From this passage it appears, that, allowing 30 days to the month, one *sextarius* is equal to two *heminae*, one *congius* equal to a 6 *sextarii* or 12 *heminae*, and an amphora to 90 *heminae*. But, in this last, Cato mentions the amphora, because 90 *heminae* amount to within a small quantity of it. The amphora contained 8 *congii*, or 48 *sextarii*, or 96 *heminae*. This measure is here also called quadrantal, because the measure was the cube of a foot.

† The *congius*, as has already been shown, contained 207.236 cubic inches; the *sextarius* therefore contained 34.539, and the *hemina* 17.269: The English pint contains 28 cubic inches, and the Scots mutchkin 25.85, so

th

Besides bread and wine, the slaves got what was called *pulmentarium*, which answers to what in some parts of the country is called *kitchin* \*. For this purpose, Cato recommends the laying up as many fallen olives as can be gathered; afterwards the early olives from which the smallest quantity of oil is expected; at the same time observing, that these must be given sparingly, that they may last the longer. When the olives are finished, he desires salt fish and vinegar to be given, and besides, to each man a *sextarius* of oil in the month, and a *modius* of salt in the year.

that a *hemina* is nearly .616 parts of an English pint, and .667 parts of a Scots mutchkin. But this was the smallest quantity which the slaves received in the day, and that only for one month. If we suppose that they got 10 *quadrants* besides the *lora*, these would be more at an average than 2.4 parts of an English pint, or 2.6 parts of a Scots mutchkin, in the day; but, if this was the quantity given when there was no *lora*, then there was only 1.62 parts of an English pint, and 1.75 parts of a Scots mutchkin.

\* Pliny says it is derived from *puls*, which was the food of the ancient Romans. *Pulte autem, non pane, vixisse longo tempore Romanos manifestum, quoniam inde et pulmentaria modique dicuntur; Plin. Nat. Hist. lib. xviii. cap. viii.*

year\*. Columella for this purpose, directs apples, pears, and figs, to be laid up: He adds, if there is a great quantity of these, the rustics are secured in no small part of their meat during the winter, for they serve for *kitchen* †.

Cato likewise makes particular mention of the cloaths of the slaves: ‘The vestments of the family,’ says he, ‘a coat and a gown  $3\frac{1}{2}$  feet long should be given once in two years; whenever you give a coat or a gown, first receive the old one; of these make *centones*. Good shoes should be given once in two years ‡.’

Having

\* Pulmentarium familiae, oleae caeduae quam plurimum condito. Postea oleas tempestivas, unde minimum olei fieri poterit, eas condito, partito, uti quam diutissime durant, ubi oleae comesae erunt, hancem et acetum dato; oleum dato in menses unicuique sextarium i. salis unicuique in anno modium satis est; Cat. cap. LVIII.

† Eorum si est multitudo, non minimam partem cibarium per hiemem rustici vindicant. Nam pro pulmentario cedet, sicuti ficus, quae cum arida seposita est, hiemis temporibus rusticorum cibaria adjuvat; Col. lib. XII. cap. XIV.

‡ Vestimenta familiae tunicam, p. iii. s. faga alternis annis. Quoties cuique tunicam aut fagam dabis, prius veterem accipito, unde centones fiant. Sculponeas bonas alternis annis dare oportet; Cat. cap. LIX.

Having thus given some account of the expence of labouring slaves among the Romans, it may not be amiss to compare this with the expence of labouring servants in Britain. The annual expence of a slave arising from the purchase, I have already observed, cannot properly be rated at less than L. 7 : 4 : 0. This, I am persuaded, will be considered as very high wages, taking the kingdom in general, even in this age, in which they are much higher than at any former period; and the rather, when it is considered that money at Rome, in the time of Columella, giving six *per cent. per annum*, shows that there was not so much currency as with us at present; and, consequently, that the same sum was of more value with them than with us. It is not easy to determine, whether the meat given to the Roman slaves, of the kind that has been mentioned, is equal in value to that which is given to our labouring servants; the reducing these, as nearly as is possible, to quantities of corn, is the best way to form some judgment. At present, a labourer's meat, in the labouring counties of Scotland, must be reckoned highly rated at two pecks, or 17.57 pounds Averdupois, of oatmeal, and one shilling in the week. A  
Roman

Roman slave had of bread equal to 51 *modii* of wheat, with 10 *quadrantals* of wine in the year, and, besides these, something for kitchen. This last, according to the account given of it, cannot be reckoned much worse than any quantity of victuals that at present can be purchased for one shilling in the week. If this is allowed, we have only to compare the bread and wine given to the Roman slave with the oatmeal given to a Scots labourer. Now it may be observed, that the flour necessary to make up the daily allowance of bread to the Roman slave would weigh about 2.39 parts of an Averdupois pound; and that the allowance of oatmeal in the day to the Scots labourer amounts to about 2.51 parts of a pound, same weight \*. The flour, of which the  
bread

\* The Roman slaves received, at an average, 4.25 parts of a pound Roman of bread in the day; this is equal to 3.19 parts of a pound Averdupois, and this weight of bread is produced by 2.39 parts of a pound of flour. The Scots labourer receives 17.57 parts of a pound Averdupois of oatmeal in the week, which is at the rate of 2.51 parts of a pound in the day.

The difference betwixt the expence of a Roman slave and a British labourer might be determined with more exactness, if the comparative value of wheat and wine  
could



bread for the Roman slaves was made, having all the bran in it, is not so substantial as the same

could be ascertained. But this, I am afraid, cannot easily be done. Pliny, upon the authority of M. Varro, indeed, informs us what was the proportional value of *far*, wine, oil, and other viviers at the time of Metellus's triumph. 'M. Varro,' says he, 'informs us, that, when L. Metellus led elephants in triumph, a *modius* of *far* was sold for an *as*; likewise a *congius* of wine, thirty pounds of dried figs, ten pounds of oil, and twelve pounds of flesh.'—M. Varro auctor est, cum L. Metellus in triumpho plurimos duxit elephantos, assibus singulis farris modios fuisse; item vini congios, ficique ficcae pondo xxx, olei pondo x, carnis xii; Plin. Nat. Hist. lib. xviii. cap. iii. Ten *amphora*, or 80 *congi* of wine, the quantity given to a slave in the year, is, in this proportion, equal to 80 *modii* of *far*. It is probable that *far* was sold in the husk, as it was sown. Indeed, when Pliny says that a *modius* of *far* weighs 25 pounds, he certainly supposes that the *far* is freed from the husk; but, when he mentions the weight of the *arinca*, he certainly supposes that both it and the *far* are weighed in the husk; for he says the *arinca* makes the sweetest bread, it grows stronger than *far*, and has a larger ear; it is likewise heavier, a *modius* seldom weighing less than 16 pounds. Ex *arinca* dulcissimus panis; ipsa spissior quam *far*, et major spica, eadem et ponderosior; raro modius grani non xvi libras implet; Plin. Nat. Hist. lib. xviii. cap. x.—The reason

same weight of oatmeal; but, when the allowance of wine is added, it must appear both more substantial and more valuable.

In

reason why Pliny, in the other passage, mentions the weight of *far* without the husk, is, because he is there giving an account of the weight of the different kinds of *triticum*, and in this respect comparing the foreign with the Italian; and, having mentioned *far* along with *triticum* in this comparison, it was necessary to give the weight of the *far* without the husk. If *far*, then, was sold in the husk, 80 *modii* of it must be considered as equal to 40 *modii* of *triticum*. This added to 51 *modii*, the quantity allowed for bread, makes 91, which is nearly at the rate of  $4\frac{1}{2}$  pounds in the day; a quantity greatly preferable to  $2\frac{1}{2}$  pounds of oatmeal.

But it is uncertain whether the prices of corn and wine continued long in the same proportion. It seems, however, that they were so in the time of Polybius, who wrote after the death of Cato. He says, that a *medimnus* of wheat and a *metretes* of wine were each sold at 4 *oboli*.

The *medimnus* was equal to 6 *modii*. ‘The tenths,’ says Cicero, ‘of the Leontian fields amounted, on the third year, to 36,000 *medimna* of *triticum*; that is, 216,000 *modii*. Agri Leontini decumae anno tertio venierunt tritici medimnûm xxxvi millibus, hoc est, tritici mod. ccxvi millibus; Cic. Or. Accusationis in C. Verrem. Or. viii. The *metretes*, according to Doctor Arbuthnot, was nearly equal to  $1\frac{1}{2}$  *amphera*, or 12 *congi*. This makes a

In Britain, the wages and victuals mentioned are the whole of the expence of a labouring servant

*modius* of wheat equal in value to 2 *congi* of wine; and, if a *modius* of *triticum* was equal to 2 *modii* of *far*, a *modius* of *far* was of the same value with a *congius* of wine.

But, in the times of Columella and Pliny, the price of corn seems to have been raised much higher in proportion than the price of wine; at least, it appears so from the price that Pliny puts upon *far* and *triticum*, and the price that Columella puts upon ordinary wine. Columella values a *culleus* of wine at 300 *sestertii*, which is at the rate of 1.875 *sestertii* for a *congius*. ‘Suppose,’ says he, ‘vineyards of the worst kind, yet, if cultivated, each *jugerum* will produce a *culleus* of wine; and, as 40 urns are sold for 300 *sestertii*, which is the lowest market price, 7 *cullei* bring 2100.’ Quippe ut deterrimi generis sint vineae, tamen, si cultae, singulos utique culleos vini, singula earum jugera peraequabunt; utque tricentis nummis quadragenae urnae veniant, quod minimum pretium est annonae; consummant tamen septem cullei sestertia duomillia, et centum nummos; Col. lib. iii. cap. iii. Pliny again informs us, that a *modius* of wheat meal, made into bread, was sold at 40 *asses*. Pretium huic annona media in modios farinae xl *asses*. Supposing the *as* to be a tenth part of the *denarius*, and one *denarius* equal to 4 *sestertii*, as all are agreed in, then 40 *asses* are equal to 16 *sestertii*, and of our money at the rate of 2 s. 8 d. Pliny likewise informs us, in passages already cited, that it was

vant to his master; but, in Italy, besides the original price of the slave and his maintenance, the

a fixed rule, in military bread, to add a third to the weight of the wheat; and that a *modius* of Italian wheat weighed about 24 pounds. Had this bread, then sold for 2 s. 8 d. been produced by a *modius* of wheat, and not a *modius* of flour, we would have had precisely 32 Roman pounds of bread for 32 pence, which is at the rate of  $1\frac{1}{3}$  of a penny for a pound Averdupois, and would make the English peck loaf not fully 2 s. But the bread sold at 2 s. 8 d. was produced, not by a *modius* of wheat, but by a *modius* of flour, which, when all the bran is in it, is not of such value, nor produces so much bread, as a *modius* of wheat grinded into flour. That the bread made out of a *modius* of flour, and sold for 2 s. 8 d. had all the bran in it, is evident from the account which Pliny gives of the prices of the bread made of the finer flour. ‘When the bread,’ he says, ‘was made of bolted *similago*, it cost 8 asses more; and, when made of bolted *siligo*, it cost twice 40 asses.’ Pretium huic annonâ mediâ in modios farinae, xl asses; similagini castratae octonis assibus amplius, filigini castratae duplum; lib. xviii. cap. x. That a *modius* of wheat produces more than the same measure of flour with the bran in it, is certain likewise. The same author gives the produce of a *modius* both of *siligo* and *triticum*. ‘It is common for a *modius* of *siligo* of Campania,’ says he, ‘to produce 4 *sextarii* of bolted flour, or five of unbolted from the heap, half a *modius* of ordinary flour,

the master was obliged to provide him in clothes. The value of these, according to the account given

‘ flour, 4 *sextarii* fit for household bread, and 4 *sextarii* of ‘ bran.’ Justum est e grano Campanae, quam vocant castratam, e modio redire sextarios quatuor filiginis, vel e gregali sine castratura sextarios quinque, praeterea floris semodium. Et cibarii quod secundarium vocant, sextarios quatuor, furfuris sextarios totidem;’ lib. xviii. cap. ix. In another passage, he says the African *triticum* gives for the *modius* 13 *sextarii* of *pollen*. This, in the *triticum*, is of the same sort with what is called *flos* in the *siligo*. It is used in the manufactures of brazen ware and paper. Besides the above quantity of *pollen*, it produces four *sextarii* of a second kind, and as much bran. ‘ Similago e ‘ tritico fit laudatissima. Ex Africo justum est e modis ‘ redire semodios, et pollinis sextarios quinque. Ita au- ‘ tem appellant in tritico, quod florem in filigine. Hoc ‘ aerae officinae chartariaeque utuntur. Praeterea se- ‘ cundarii sextarios quatuor, furfurumque tantundem;’ lib. xviii. cap. x. Thus a *modius* of 16 *sextarii* of wheat, when grinded and dressed in the ways above described, produced of flour and bran 21 *sextarii*; but, when mixed together, as has been supposed, in the wheat meal that was sold in bread at 40 asses, there would not be quite so much; as bran, when separated from the flour, lies open in the measure; it is probable there would be about 20 *sextarii*, which is  $\frac{1}{4}$  more than of wheat, and is nearly the proportion between wheat and flour, found upon trial.

That

given by Cato, would not be an inconsiderable addition to the annual : So that, upon the whole,  
we

That a *modius* of flour, with all the bran in it, was about  $\frac{2}{3}$  lighter than a *modius* of wheat, appears from another passage in Pliny. A *modius* of Gallic wheat, he says, weighed about 20 pounds ; this, according to the established maxim already mentioned, produced near 27 pounds of bread ; whereas a *modius* of Gallic flour produced no more than 22 pounds. In like manner, a *modius* of Italian wheat, he says, weighed about 24 pounds, and therefore produced about 32 pounds of bread ; and yet a *modius* of Italian flour produced no more than 25 pounds. ‘ Siligineae farinae modius Gallicae xxii libras panis reddit, Italicae duabus tribusve amplius in artop-ticio pane ;’ Plin. Nat. Hist. lib. xviii. cap. ix.—If, then, a *modius* of flour made into bread sold at 40 asses, a *modius* of wheat would produce so much more as to sell at 50 asses. The price of wheat and bread, according to the assize in London, is nearly as 15 to 25 ; that is, when wheat is at 15 pence the peck, the peck loaf, or the produce of it in bread, is sold for 25 pence. In this proportion, the Roman *modius* was sold for 30 asses, or 12 fester-tii. That the prices of wheat, flour, and bread amongst the Romans, were nearly in the proportions mentioned, may be further inferred from the proportions of these at present in Britain. A peck of wheat, according to Sir John Moore’s tables, weighs 17 lib. 1 oz. Troy, which is equal to 14 lib. Averdupois. Of the flour of this, bolt-

ed,

we may conclude, that the expence of labour among

ed, is the ordinary peck loaf supposed to be made; and this peck loaf in London, by the Lord Mayor's standard, weighs 17 lib. 6 oz. Now, was the bran left in it, it is probable that the loaf would weigh 18 lib. 10 oz. which is in the proportion of the weight of the military bread to the weight of wheat among the Romans. In the explication of the passage from Pliny, from which the price of corn has been calculated, I have followed Doctor Arbuthnot, who supposes that Pliny, in this passage, mentions the price of the bread made out of a *modius* of flour. But it is not certain that this is Pliny's meaning. He seems rather to mention the price of the flour itself. In the first part of the sentence, his words, indeed, may be explained in such a manner as to refer to the bread mentioned immediately before; but, in the other parts of the sentence, had he intended to give the price of bread, instead of *similagini* and *siligini castratae*, it would probably have been *similaginis* and *siliginis*. On this supposition, the price of a *modius* of wheat is 20 *sestertii* in place of 12 *sestertii*. If the price of wheat was 12 *sestertii*, then a *modius* of *far* was more than three times the price of a *congius* of wine, and  $12\frac{1}{2}$  *modii*, equal in value to 80 *congiis*, the quantity given to a slave in the year. This, added to 51 *modii*, the quantity of wheat given for bread, makes  $63\frac{1}{2}$  *modii*, which is at the rate of 3.12 pounds in the day. If the price of the *modius* of wheat was 20 *sestertii*, then a *modius* of *far* was upwards of five times the price of a *congius*

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mong the Romans was as great, if not greater, than in Britain at this day.

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*congius* of wine, and  $7\frac{1}{2}$  *modis* equal in value to 80 *congi*. This is at the rate of 2.9 pounds in the day; which may be considered as equal to  $2\frac{1}{2}$  pounds of oatmeal.



## C H A P. III.

*Of Soil in general, and the Qualities of  
good Soil.*

**T**H E R E are many different kinds of soils capable of carrying useful crops, and those different kinds in very different situations. It is important to know the nature and qualities of each. By this we are directed to the plants we ought to cultivate, and to the culture most proper for them.

Lands are distinguished both by their situation and qualities. Columella distinguishes their situation in this manner. ‘Those,’ says he, ‘who have the greatest knowledge of husbandry, mention three kinds of land, champain, hilly, and mountainous.’ He describes also what was reckoned the best situation of these different kinds; for he adds, ‘Those chiefly approve of champain lands not exactly on a level,

‘ level, but a little declining ; hilly lands gently  
 ‘ rising ; and mountainous lands high and rug-  
 ‘ ged, provided they are covered with trees and  
 ‘ grafs \*.’

Palladius

\* Callidissimi rusticarum rerum, Silvine, genera terreni tria esse dixerunt, campestre, collinum, montanum ; campum non aequissima situm planicie, nec perlibrata, sed exigue prona ; collem clementer et molliter assurgentem, montem sublimem et asperum, sed nemorosum et herbidum, maxime probaverunt ; Col. lib. 11. cap. 11. Some copies have *montem non sublimem* ; but it is probable that *montem sublimem* is the true reading, as appears from the following passage in Palladius : ‘ Situs vero terrarum  
 ‘ neque planus, ut stagnet ; neque praeruptus, ut defluat ;  
 ‘ neque obrutus, ut in imum dejecta valle subsidat ; neque  
 ‘ arduus, ut tempestates immodice sentiat et calores : Sed  
 ‘ ex his omnibus utilis semper est aequata mediocritas, et  
 ‘ vel campus apertior, et humorem pluvium clivo fallente  
 ‘ subducens ; vel collis molliter per latera inclinata de-  
 ‘ ductus ; vel vallis cum quadam moderatione, et aëris  
 ‘ laxitate submissa ; vel mons alterius culminis defensus  
 ‘ objectu, et a molestioribus ventis aliquo liber auxilio, vel  
 ‘ sublimis, asper, sed nemorosus et herbidus ;’ Pal. lib. 1.  
 tit. v. This passage from Palladius explains the above  
 cited passage from Columella. The situation of the mountainous lands to which Palladius gives the preference, is that which is defended by still higher ground from the hurtful blasts. Lands in this situation were probably

Palladius declares himself to be of the same opinion with respect to the best situations of these lands; and he is particular in giving his reasons. He says, that the best situation of lands is not so much on a level as to make the water stagnate, nor so steep as to make it run off with violence; nor so low as to be buried in the bottom of a valley; nor so exposed as to feel the violence of storms and heats; but that, in all these, a mediocrity is always best; champain lands exposed, and whose declivity affords  
the

found proper either for corn or vines. But, when not defended in this manner, the best, he says, are the high and rugged, when covered with trees and grass. Varro, in some passages, assigns reasons for this. 'Some trees, says he, grow taller and stronger in mountains, occasioned by the cold, as firs and pines. Those that cultivate champain lands have the advantage in the winter season, because then there is good pasture in the meadows; on the other hand, the mountainous lands have the advantage in summer, because in this season the mountains produce plenty of food for cattle, when the grass is burnt up on the plains.'—*Quaedam in montanis prolixiora nascuntur ac firmiora, propter frigus, ut abietes ac fappini.—Plerumque hiberna iis esse meliora, qui colunt campestria, quod tum prata ibi herbose.—Contra aestiva montanis locis commodiora, quod ibi tum et pabulum multum, quod in campis aret; Var. lib. 1. cap. vi.*

the rain a free passage; or a hill whose sides gently decline; or a valley not too much confined, and into which the air has easy access; or a mountain defended by a higher top, and thereby secured from the winds that are most pernicious; or, if high and rugged, at the same time covered with trees and grasses\*.

The situation of lands which Cato reckons the best, is at the foot of a mountain with a south exposure †. Varro mentions this, and declares himself of the same opinion ‡. Pliny likewise mentions this; and observes, at the same time, that this is the situation of Italy in general ||.

There are some other things in a situation, which, although they do not affect the fertility of the lands, yet, as they add to the value of the estate or farm, and are mentioned by these authors,

\* See the preceding note.

† Si poteris, sub radice montis fiet, in meridiem spectet; Cat. cap. 1.

‡ Quod ad hanc formam naturalem pertinet, de eo non incommode Cato videtur dicere, cum scribit optimum agrum esse, qui sub radice montis situs sit, et spectet ad meridianam coeli partem; Var. lib. 1. cap. vii.

|| Idem (Cato) agrum optimum judicat ad radicem montium planitie in meridiem excurrente; qui est totius Italiae situs; Plin. Nat. Hist. lib. xvii. cap. v.

thors, it may not be improper to take notice of them. Cato recommends a place where there are plenty of artificers and good water, which has a fortified town in its neighbourhood, is near the sea or a navigable river, or where the roads are easy and good \*. Varro mentions four things of this kind to be particularly inquired into, with respect to the situation of a farm: Whether there is a proper market for disposing of the produce of the farm, and buying things necessary for it? Whether there is a good road or navigable river? Whether there is security from thieves and robbers? and, Whether the boundaries are planted with useful trees †?

All these things, with respect to the situation of a farm, it is very proper to attend to; but it is still of greater importance to attend to the qualities

\* *Operariorum copia fiet, bonumque aquarium, oppidum validum prepe fiet, aut mare, aut amnis, qua naves ambulant, aut via bona, celebrisque; Cat. cap. 1.*

† *Ejus species totidem: si vicina regio est infesta; si quo neque fructus nostros exportare expediat, neque inde quae opus sunt, apportare. Tertium, si viae, aut fluvii, qua portentur, aut non sunt, aut idonei non sunt. Quartum, si quid ita est in confinibus fundis, ut nostris agris profit aut noceat; Var. lib. 1. cap. xvi.*

qualities of the different soils, as the method of culture, in a great measure, depends upon a knowledge of these. In this we are directed by the ancient rustic authors, who are very particular in distinguishing these qualities.

Columella divides soils into six kinds, fat and lean, free and stiff, wet and dry: These, mixed one with another, he says, make great varieties, which, however, it is not the business of the farmer to enumerate\*. After this, he proceeds to give his opinion of the different soils in these words: ‘It is to be observed, that of all the things which the earth produces, there are many more that thrive upon champain, than hilly lands; many more upon a fat than a lean soil. I cannot determine whether dry or wet lands excell in this particular, as there are an infinite number of plants that do well on both. But, of all these, there are none that succeed so well on a stiff as a free soil, which Virgil too adds to the qualities of a fruitful field, in these

\* His autem generibus singulis sene species contribuuntur, soli pinguis vel macri, soluti vel spiffi, humidi vel ficci; quae qualitates inter se mistae vicibus, et alternatae, plurimas efficiunt agrorum varietates, eas enumerare non est artificis agricolae; Col. lib. 11. cap. 11.

' these words; *and whose mould is loose and crumb-*  
 ' *ling, for to produce this is the design of plowing.*  
 ' And, indeed, to cultivate is nothing more than  
 ' to pulverise and ferment the earth, by which  
 ' a field is enabled to produce the largest crops.  
 ' The soil that is fat, and at the same time free,  
 ' is justly reckoned the most excellent; because,  
 ' while it produces the greatest crops, it requires  
 ' the least culture, and the culture too the least  
 ' laborious and expensive. The next in value  
 ' to this, is the fat stiff soil, which rewards the  
 ' expence and labour of the husbandman with a  
 ' large increase. Stiff and lean soil, when it can  
 ' be watered, is the third in value, and prefera-  
 ' ble to the same kind of soil when dry; for this  
 ' reason in particular, because it may be mana-  
 ' ged so as to carry a crop without any expence.  
 ' Cato, who greatly preferred the produce of  
 ' meadows to that of other fields, reckoned land  
 ' that can be watered the most valuable: But  
 ' we are speaking of the value of land in tillage,  
 ' and not in , rafs. The very worst kind is that  
 ' which is dry, and at the same time is stiff and  
 ' lean; because it is not only laboured with dif-  
 ' ficulty, but also makes a bad return, and when  
 ' allowed

‘ allowed to rest, is neither good meadow nor  
‘ pasture\*.

It

\* Atque etiam significandum est, ex omnibus, quae terra progeneret, plura campo magis quam colle, plura pingui solo quam macro, laetari. De ficcaneis et riguis non comperimus, utra numero vincant, cum utique pene infinita sint, quae ficcis, quaeque humidis locis gaudent; sed ex his nihil non melius resoluta humo, quam densa provenit. Quod noster quoque Virgilius cum et alias foecundi arvi laudes retulisset, adjecit. *Et cui putre solum; namque hoc imitamur arando.* Neque enim aliud est colere, quam resolvere et fermentare terram: Ideoque maximos quaestus ager praebet. Idem pinguis ac putris, quia cum plurimum reddat, minimum poscit: Et quod postulat, exiguo labore atque impensa, conficitur. Praestantissimum igitur tale solum jure dicatur. Proximum deinde huic pinguius densum, quod impensam coloni, laboremque magno foetu remuneratur. Tertia est ratio loci rigui, quia sine impensa fructum reddere potest. Hanc primam Cato esse dicebat, qui maxime redditum pratorum caeteris anteponebat: Sed nos de agitatione terrae nunc loquimur, non de situ. Nullum deterius habetur genus, quam quod est ficcum, pariter et densum, et macrum; quia cum difficulter tractetur, tum ne tractatum quidem gratiam refert: Nec relictum pratis, vel pascuis abunde sufficit; Col. lib. II. cap. II. This author, when mentioning the order in which the land that can be watered ought to be placed, does not express himself with such perspicuity



It is proper to observe, that Columella, in this passage, not only gives land that can be watered the preference to the same kind of soil that has not this advantage, but also declares that he cannot determine, in general, whether dry lands are preferable to wet lands. In Britain, at least in the northern parts of it, we are at no loss to determine in favour of dry lands. This difference of opinion is owing to the difference of soil and climate. In Italy, the soil in general is

as is to be wished. He only says that watered land is the third in order, without mentioning the kind of soil: But, as the kind which he mentions immediately after, is stiff and lean soil in a dry situation, it is probable, that, when he mentions land in such a situation as to be watered, he had the same kind of soil in view. But this is not all; he gives as a reason for placing watered land third in order, that it may be managed so as to produce a crop without expence, and yet afterwards, he says, he is speaking of land in tillage, not at rest. To reconcile these, we must suppose that stiff and lean soil, if in a situation to be watered, was, in his opinion, even when in tillage, preferable to the same kind of soil, if dry; and that he adds its being proper for a meadow, as an additional reason for preferring it to the dry soil, which, he says, is proper neither for corn nor grass. That it was a practice of the Romans to water their own fields, shall be shown afterwards.

is not so strong and stiff as in Britain, neither is their climate so wet. Wet lands, therefore, in that country, may in some cases be preferable to dry lands; though, in this country, they are almost universally reckoned inferior.

Palladius makes the same division of soils, and gives them the preference in the same order with Columella, only does not mention the land that can be watered, and declares that the soil that is stiff and lean, and at the same time dry, should be shunned, as one would shun the land that breeds the pestilence\*.

Theophrastus declares it as his opinion, that the kind of soil most proper both for trees and corn, is possessed of opposite qualities in a proper medium, is free and firm, dry and moist,  
light

\* Sed cum sint genera terrarum plurima, ut pinguis aut macra, spissa vel rara, sicca vel humida, et ex his pleraque vitiosa, tamen propter seminum differentiam saepe necessaria maxime, sicut supra dixi, eligendus est pinguis ac resolutus ager, qui minimum laborem poscit, et fructum maximum reddit. Secundi meriti est spissus, qui labore quidem maximo, tamen ad vota respondet. Illud vero deterrimum genus est, quod erit siccum simul et spissum, et macrum vel frigidum; qui ager pestiferi more fugiendus est; Pal. lib. 1. tit. v.

light and heavy, and has the bottom of the same nature with the top\*.

These qualities of good soil mentioned by Theophrastus, though, at first sight, they appear so opposite to each other, as to render it impossible for them to exist in the same soil; yet are very well understood by every intelligent farmer. The soil he describes is one that is firm when in its natural estate, but when plowed is soon dissolved by the air and weather; easily admits water and retains it, and yet soon parts with a superfluity; is easily moved, and yet is not spongy; nor, when dry, is blown with the wind; and is so deep as not to be changed by the deepest plowing.

There is a kind of soil called *tenera* or *pulla*, which is greatly commended, and seems to be the best kind of the fat and free soil mentioned by Columella and Palladius. Cato recommends  
this

\* Verum (ut simplicius asseram) solum, quod mediam obtinet confusionem contrariorum, id est, soluti et spissi, ficci et humidi, levis et ponderosi; atque etiam superiora modice inferioribus respondentia, in his ipsis fortitur: Hoc omnium optimum omnibus fere arboribus atque frugibus est; Theoph. de causis plantarum, lib. II, cap. VI.

this kind as proper for cypress seed \*. Pliny, upon the authority of Cato, declares it to be the best kind of soil: He says that the word *tenera* comprehends every thing that is to be wished for in soil, that it is of a moderate fruitfulness, easily cultivated, and neither too wet nor too dry †. This soil is of the free putrid kind, as appears from a passage in Columella. Treating of the culture of the *sesima*, he says, that they commonly require a free putrid soil, such as the Campanians call *pulla* ‡.

But, as the qualities of soil mentioned by these authors cannot be found out but by experience, in order to assist the farmer in forming a proper judgment

\* Per ver ferito (semen cupressi) in loco ubi terra tenerissima erit, quam pullam vocant; Cat. cap. cli.

† Idem (Cato) agrum optimum judicat, &c. — ter-ram vero teneram quae vocetur pulla: Erit igitur haec optima et operi et fatis. Intelligere modo libeat dictam mira significatione teneram; et quicquid optari debet, in eo vocabulo invenietur. Illa temperatae ubertatis, illa mollis facilisque culturae, nec madida, nec sitiens; Plin. Nat. Hist. lib. xvii. cap. v. The meaning of *temperatae ubertatis*, must be, that the corn upon it does not grow so luxuriant as to be in danger of lodging

‡ Putre solum, quod Campani pullam vocant, plerumque desiderant; Col. lib. ii. cap. x.

judgment of them; they mention several things by which the good and bad qualities of soil may be distinguished.

Virgil, representing the qualities of a soil most proper for corn, mentions among others, a blackish colour\*. Palladius likewise mentions this as a mark of good soil †. Pliny seems to allow that this is true in the general ‡; however, he observes, that in some places the black soil, and likewise other kinds possessed of qualities commonly reckoned good, were unfruitful §. It seems that some of the ancients, before the time of Columella, had asserted that the black colour of soil is a certain mark of its fatness.

This

\* *Nigra fere, et presso pinguis sub vomere terra,  
Et cui putre solum (namque hoc imitamur arando)  
Optima frumentis.*——Vir. Geo. II. V. 203.

† Palladius, after saying that in soils fruitfulness ought to be sought for, and mentioning several kinds of unfruitful soils, adds, ‘*Sed gleba putris et fere nigra;*’ lib. I. tit. V.

‡ Pliny, speaking of the received marks of good soil, adds, ‘*Item nigra terra, et cinerei coloris;*’ Nat. Hist. lib. XVIII. cap. VI.

§ *Invicem sabulum album in Ticinensi, multisque in locis nigrum, itemque rubrum, etiam pingui terrae permixtum, infocundum est;* Plin. Nat. Hist. lib. XVII. cap.

This opinion he opposes with a more than ordinary keenness: 'I remember,' says he, 'that many of the ancients, who have written upon husbandry, have asserted that a peculiar sweetness of soil, a particular produce of herbs and trees, a colour black or like that of ashes, are acknowledged as certain marks of a soil fat and fertile in corn. Concerning some of these I am doubtful; but, concerning the colour, I cannot enough wonder, that, besides others, Cornelius Celsus, a man remarkable, not only for his knowledge of agriculture, but also for knowledge of every kind, should have erred so much both in opinion and observation, when there were before their eyes so many marishes, and so many fields where there are salt pits, which are almost of the same colours. For it requires little attention to convince us, that there is not a field that contains any quantity of unfruitful juices, that is not either of a black colour, or of a colour like that of ashes. Unless perhaps I am deceived, when I am persuaded that good crops of corn cannot be produced by the soil of a slimy marish, or of four wet land, or by those places on the sea shore  
' where

where there are salt pits \*. Columella is certainly in the right; a black colour is not a certain mark of good soil; for moss, the worst of all soils, is of this colour; and, in some parts of the country, it is found, that the blacker the soil is, it is the more worthless. But then it must be observed, that this is not asserted either by Virgil or Palladius; all that they assert is, that the best kind of land is of this colour. This is what Columella himself acknowledges. For the soil in Campania called *pulla*, which is declared

bona  
 \* Plurimos antiquorum, qui de rusticis rebus scripserunt, memoria repeto, quasi confessa, nec dubia signa pinguis ac frumentorum fertilis agri prodidisse, dulcedinem soli propriam, herbarum et arborum proventum, nigrum colorem vel cinereum. De caeteris ambigo, de colore fatis admirari non possum, cum alios, tum Cornelium Celsum, non solum agricolationis, sed universae naturae prudentem virum, sic et sententia, et visu deerrasse, ut oculis ejus tot paludes, tot etiam campi salinarum non occurrerent, quibus fere contribuuntur praedicti colores. Nullum enim temere videmus locum, qui modo pigrum contineat humorem, non eundem vel nigri, vel cinerei coloris: Nisi forte in eo fallor ipse, quod non putem aut in solo limosae paludis, et uliginis amarae, aut in maritimis areis salinarum gigni posse laeta frumenta; Col. lib. 11. cap. 11.

clared by all to be good, and which he himself commends, is called by him a *black earth* \*.

The being glutinous is likewise declared to be a quality of fat soil: ‘Land that is fat,’ says Virgil, ‘may be known by this mark, when  
 ‘tossed by the hand, it does not crumble, but,  
 ‘in handling, sticks to the fingers like pitch †.’ Columella likewise mentions this: ‘Therefore,’ says he, ‘we ought to be careful that the soil  
 ‘which we resolve to cultivate is fat; yet this  
 ‘is of little importance, if it wants sweetness;  
 ‘both of which, however, may be known in a  
 ‘very easy way; for, if a small piece of earth  
 ‘is sprinkled with water, and wrought with the  
 ‘hand, and is found to be glutinous, and adheres, though pressed by the slightest touch, and  
 ‘in handling sticks to the fingers like pitch, as Virgil says, and, if thrown upon the ground, is  
 ‘not broken in pieces, this thing discovers to  
 ‘us that there is in this piece of earth a natural  
 ‘fat

\* Atque in aliis regionibus nigra terra, quam pullam vocant, ut in Campania, est laudabilis; Col. lib. 1. Praef.

† Pinguis item quae sit tellus, hoc denique pacto Discimus: haud unquam manibus jactata fatiscit, Sed picis in morem ad digitos lentescit habendo;

Vir. Geo. 11. V. 248.



‘sap and fatness \*.’ Palladius too mentions this as a mark of good soil †. Pliny indeed asserts, that this is not a certain mark: ‘It is not,’ says he, ‘always wet land that produces tall grass; nor indeed is it always fat soil that sticks to the fingers; for this is a quality of potters’ clay ‡.’ Pliny, no doubt, is in the right in this case, as Columella in the other: But then it must be observed, that those authors who represent a glutinous quality as a mark of good soil, do not assert that every glutinous soil is a good one; but only that every good soil has this quality

\* Itaque considerandum erit, ut solum, quod ex colore destinamus, pinguescit. Per se tamen id parum est, si dulcedine caret, quod utrumque satis expedita nobis ratione contingit discere: Nam perexigua conspergitur aqua gleba, manuque subigitur, ac si glutinosa est, et quovis levissimo tactu pressa inhaerescit,

*Et picis in morem ad digitos lentescit habendo,*  
ut ait Virgilius; eademque illisa humo non dissipatur, ea res admonet nos, inesse tali materia naturalem succum, et pinguitudinem; Col. lib. 11. cap. 11.

† Pinguem sic agnoscis: Glebam parvulam dulci aqua cum spargis et subigis, si glutinosa est et adhaeret, constat illi inesse pinguedinem; Pal. lib. 1. tit. v.

‡ Nec semper aquosa est terra, cui proceritas herbarum; non Hercules magis, quam pinguis, adhaerens digitis, quod in argillis arguitur; Plin. Nat. Hist. lib. xvii. cap. iv.

lity in a certain degree. Besides, it is certain, that, if soil does not become too hard when dry, the more glutinous it is when wet, it is the fatter. In Italy, they continue still to judge of good soil in the same manner. ‘ Let a lump or piece of earth,’ says Vincenzo Janara, ‘ put into a vessel of water, let it be mixed with the hand, to which if it sticks, and has a glutinous quality, this is a sign of fatness; if on a sudden it is dissolved into sand or mud, it is bad \* :’ And, a little after : ‘ There is another way of knowing whether or not soil is good : Squeeze a handful of it, when it is neither very soft nor hard, and, if it sticks and continues in one lump, and is united together, it is good ; but if, when the hand is opened, the particles of the piece of earth open again into their former state, it is bad. This rule, however, fails when applied to clay or chalk ; for these kinds of earth, when treated in this manner, unite into a lump, and yet are not good †.’

There

\* Si pone ancora una gleba, ovvero mattone di terra in un vaso d’acqua, si mistica con la mano, alla quale se la terra s’attacca et habbi del’ viscoso, è segno di grassezza; se subito si resolve in rena, over fango, è tristo; Vin. Jan. in Bologna, 1651, p. 17.

† Si cognosce ancora il terreno buono pigliandone un

There is something in the appearance of clay, that, when viewed with attention, makes it easily distinguished. When soil, then, has not this appearance, this experiment, mentioned by these authors, may be considered as a certain way of distinguishing good soil.

There is another way of judging of soil, mentioned by the ancient authors : They propose to cast a trench in the firm ground, to throw back the earth and tread it down ; according as the earth is superabundant or deficient, they say the soil is free or stiff. ‘ Now I will show,’ says Virgil, ‘ in what manner each kind of soil may ‘ be distinguished. If you would know whether ‘ it is free or uncommonly stiff, as the free soil ‘ is most proper for vines, and the stiff for corn, ‘ choose a place where a pit may be properly ‘ digged in the solid earth, and, when the earth ‘ is thrown out, let it be returned again into its ‘ place, and trod down : If there is a deficiency ‘ of earth to fill up the pit, the soil is free ‘ and

*pugno mentre è morbido, cioè tra'l molle e lasciutto, e si stringe, se s'ammassa, et unisce, è buono ; se subito che s'apre il pugno, s'apra ancor la terra, è trista, Falisce questo regola nell' aegilla e nella creta, perche s'ammassano, e non son' buone ; p. 16. et 18.*

‘ and more proper for vines and pasture ; but, if  
 ‘ the whole earth cannot be forced back into  
 ‘ the pit, but there is still some remaining after  
 ‘ the pit is full, the soil is stiff; expect hard clods  
 ‘ and gross furrows, and plow with stout oxen\*.  
 Columella likewise mentions this experiment :  
 He considers the superabundance of the earth, as  
 owing to a certain fermentation of the soil, and,  
 on this account, an evidence of fatness as well  
 as of stiffness. At the same time, he observes,  
 that this quality of fermenting, and the other  
 glutinous quality which he had mentioned be-  
 fore, though in some cases perhaps not certain  
 marks of good soil, yet are qualities of that kind  
 of

\* Nunc, quo quamque modo possis cognoscere, dicam  
 Rara fit, an supra morem fit densa, requiras ;  
 (Altera frumentis quoniam favet, altera Baccho :  
 Densa, magis Cereri ; rarissima quaeque, Lyaeo ;)  
 Ante locum capies oculis ; alteque jubebis  
 In solido puteum demitti, omnemque repones  
 Rursus humum, et pedibus summas aequabis arenas.  
 Si deerunt, rarum, pecorique et vitibus almis  
 Aptius uber erit : Sin in sua posse negabunt  
 Ire loca, et scrobibus superabit terra repletis,  
 Spissus ager ; glebas cunctantes crassaque terga  
 Expecta, et validis terram proscinde juvencis.

VIR. GEO. II. v. 226.

of soil called *pulla* or *pullula*, which is approved of as the very best for corn \*. Palladius likewise mentions this experiment, and is of the same opinion with Columella, that the superabundance of the earth is an evidence that the soil is fat †. Pliny indeed alledges, that it is impossible to make the experiment with such exactness, as to infer any thing from it. ‘No earth,’ says he, ‘thrown back into ditches, can fill them in such a manner, as to know thereby whether the soil is stiff or free ‡.’

That it may be known by this experiment, whether the soil upon which it is made, is fat or lean, as Columella and Palladius seem to assert,

\* Sed et si velis scrobibus egestam humum recondere, et recalcare, cum aliquo quasi fermento abundaverit, certum erit, esse eam pinguem; cum defuerit, exilem; cum aequaverit, mediocrem. Quanquam ista quae nunc retuli, non tam vera possunt videri, quam si sit pullula terra, quae melius proventu frugum approbatur; Col. lib. II. cap. II.

† Item scrobe effossa et repleta, si superaverit terra, pinguis est: Si defuerit, exilis; si convenerit aequata, mediocris; Pal. lib. I. tit. V.

‡ Scrobes quidem regeſta in eos nulla complet, ut densa atque rara ad hunc modum deprehendi possit; Plin. Nat. Hist. lib. XVII. cap. IV.

fert, is indeed uncertain. But there can be no doubt, that it may be known by it when properly made, whether the soil is stiff or free. When soil is of a free spongy kind or sandy, the more that it is wrought, the particles of which it is compounded are made the smaller, and consequently may be pressed into less bulk. On the contrary, stiff soil, when moved, has its pores opened, and it is scarcely possible for some time to render it as solid as it is in its natural state, or after it has lain many years without being touched. Now, it must be remembered, that Virgil proposes this experiment, not to determine whether soil is fat or lean, but whether it is stiff or free. However, as the soils in Italy are generally of the free light kind, and as the stiff soil was found to be generally the best for corn, this experiment may be considered as a very proper one, in that country, to determine whether soil is good or bad. This is the more probable, as the Italian authors likewise mention this experiment, as proper for the same purpose; to determine not only whether soil is stiff or free, but also whether it is good or bad. Thus, Vincenzo Janara says, that, if the earth is superabundant,

perabundant, the foil is good \*. And Crescen-  
zio, who cites Palladius, explains his words as  
meaning, that, when the earth is superabundant,  
the foil is stiff and fat; and, when there is a de-  
ficiency, the foil is loose and lean †.

It has been observed, that Pliny remarks that  
this experiment cannot be made with such ex-  
actness as to infer any thing certain from it.  
To make it upon land that has a soft surface is  
indeed impossible; but it certainly may be made  
where the surface is firm, and upon all kinds of  
land in grass. In this case, however, care must  
be taken to pare off the turf, and not allow it to  
mix with the earth that is returned into the  
trench.

All the ancient authors mention a faltness or  
bitterness in the earth, which renders it barren,  
and which it is difficult to expel. Hence they  
mention

\* Si fa ancor una buca come per piantar' un arbore,  
e quello stesso terreno subito, ò fra due ò tre giorni si re-  
torna nell' istessa buca, se sopravanza terra, è buono, se  
appareggia, è mediocre, se manca, over non la riempa,  
è tristo terreno; Vin. Jan. p. 17.

† Item scrobe effossa et repleta, si superaverit terra,  
pinguis, si defuerit, exilis, si convenerit equata, medio-  
cris; Cres. lib. 11. cap. xxvi.

mention sweetness as necessary, as well as fatness, to render soil fertile\* : And they point out an easy experiment, by which it may be known whether or not any soil is possessed of this quality. ‘But soil,’ says Virgil, ‘that is of a salt kind, and what is accounted bitter, unfit for corn, that neither mellows by ploughing, nor preserves to vines and other fruits their kinds and qualities, will discover itself upon this trial. Take a thick woven basket and wine-strainer, fill it with some of the suspected soil and water ; let all the water drop through the twigs, and the taste of it, thus strained, will make a certain discovery, and its bitterness will distort the offended countenances of the tasters †.’ Columella likewise gives

2

\* *Pingue fit ; per se tamen id parum est, si dulcedine caret ; Col. lib. II. cap. II.*

*Color tamen non magnopere quaerendus, sed pinguedo atque dulcedo ; Pal. lib. I. tit. v.*

† *Salsa autem tellus, et quae perhibetur amara,  
Frugibus infelix ; ea nec mansuescit arando,  
Nec Baccho genus, aut pomis sua nomina servat :  
Tale dabit specimen. Tu spisso vimine qualos,  
Colaque praelorum fumosis deripe tectis.  
Huc ager ille malus, dulcesque a fontibus undae*

Ad



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a particular description of this experiment, and adds, that, according to the taste of the strained water, they judged of the nature of the soil \*. Palladius, too, mentions it, but is not so full in his description †: However, he is copied by Crescenzio ‡. Vincenzo Janara describes the experiment in a different manner. Immediately after mentioning the trial of soil, by putting a piece of it into water, he adds, ‘ Let these remain till the water, after the earth falls to the  
‘ bottom,

Ad plenum calcentur : aqua eluctabitur omnis  
Scilicet, et grandes ibunt per vimina guttae ;  
At fapor indicium faciet manifestus, et ora  
Tristia tentantum sensu torquebit amaror.

Virg. Geor. II. v. 238.

\* Sapore quoque dignoscemus, si ex ea parte agri, quae maxime displicebit, effossae glebae, et in fictili vase madefactae, dulci aqua permisceantur, ac more ficulenti vini diligenter colatae, gustu explorentur : Nam qualem traditum ab eis retulerit humor saporem, talem esse dicemus ejus foli ; Col. lib. II. cap. II.

† Dulcedo autem cognoscitur, si ex ea parte agri, quae magis displicet, glebam fictili vase dulci aqua madefactam judicio saporis explores ; Pal. lib. I. tit. v.

‡ Dulcedo autem cognoscit, si ex ea parte agri, quae magis displicet, si ejusdem qualitatis totus ager videtur, glebam fictili vase aqua madefactam judicio saporis explores ; Cresc. lib. II. cap. XXVI.

‘ bottom, becomes clear, and then taste it; if it  
 ‘ is sweet, the soil is good; but, if it is bitter,  
 ‘ or brackish, or ill tasted, the soil is bad \*.’

All these authors inform us, that soil good for corn may be known by its natural produce. Columella, after relating the experiment last mentioned, adds: ‘ But, besides this experiment, there are many things that discover a  
 ‘ soil that is sweet and proper for corn, as rushes, reeds, grass, trifoil, dwarf elder, bramble,  
 ‘ wild plumbs, and many other things, which  
 ‘ are well known to those that search for water,  
 ‘ and which require sweet soil to nourish them †.’  
 ‘ The goodness of land,’ says Pliny, ‘ may be  
 ‘ known by certain marks. Although I have  
 ‘ said, that the appearances of the best kind of  
 ‘ soil

\* *Sì lascia da poi, che quest’ aqua col deponer la terra al fondo, venga chiara, e gustandola con un dito in quello bagnato, s’ è dolce è buono, s’ è amara, o salmastra, o puzzolente, è terra trista; Vin. Jan. p. 17.*

† *Sed citra hoc experimentum multa sunt, quae et dulcem terram et frumentis habilem significant, ut juncus, ut calamus, ut gramen, ut trifolium, ebulum, rubi, pruni silvestres, et alia complura, quae etiam indagatoribus aquarum nota, non nisi dulcibus terrae venis educantur; Col. lib. II. cap. II.*

‘ soil are evident enough, yet I shall mention the  
 ‘ marks that have been delivered down, chiefly  
 ‘ in the words of Cato. The dwarf elder, the  
 ‘ wild plumb, the bramble, small bulb roots,  
 ‘ trifoil, meadow grass, the oak, the wild pear  
 ‘ and apple, are marks of a soil fit for corn\*.’

Palladius mentions the same plants with Columella, and differs from him only in this respect, that he calls the trifoil not poor, and the bramble luxuriant. But he mentions a circumstance with respect to the whole, necessary to be attended to, which is, that the plants be neither covered with scurf, nor shrivelled, nor destitute of natural sap †. The Italian authors are still more particular. ‘ As one kind of soil,’ says

Crescenzio,

\* *Agri ipsius bonitas, quibus argumentis judicanda sit, quanquam de terrae optimo genere differentes abunde dixisse possumus videri, etiamnum tamen traditas notas subsignabimus, Catonis maxime verbis: Ebulum, vel prunus silvestris, vel rubus, bulbus minutus, trifolium, herba pratensis, quercus, silvestris pirus, malusque, frumentarii foli notae; Plin. Nat. Hist. lib. xviii. cap. vi.*

† *Quae protulerit nec scabra sint, nec retorrída, nec fucci naturalis egentia. Ferat, quod frumentis dandis utile signum est, ebulum, juncum, calamum, gramen, trifolium non macrum, rubos pingues, pruna silvestria; Pal. lib. i. tit. v.*

Crescenzo, ' is proper for corn, and another for vines, let it be observed, that that kind of ' soil is best for corn which naturally and of it- ' self produces dwarf elders, rushes, thick grass, ' reeds, trifol, luxuriant briars, wild plumbs, ' burdock, folefoot, hemlock, mallows, and all ' other herbs of this kind, which, by their lux- ' uriancy and the largeness of their leaves, dis- ' cover a rich and fertile soil \*.' Vincenzo Janara mentions the same plants, and adds very properly, that they must be tall, and must have large and beautiful leaves. He mentions like- wise, as marks of good soil, good crops of corn, thick stubble and large stalks, tall beautiful trees with good bark, and straight and long branches †. Virgil and Palladius make particular mention

\* Sciendum est autem, quod frumentis dandis utilis est, quae naturaliter, et sua sponte producit ebulum, jun- cum, gramen pingue, trifolium, calamum, rubos pingues, pruna silvestria, lappas, malvam, et caeteras hujusmodi herbas, quae latitudine et pinguitate foliorum laetum so- lum, et foecundum demonstrant; Cres. lib. ii. cap. xxvi.

† Con vista si può ancor cognoscer la qualità del ter- reno poiche oltre la bellezza, et abbondanza de' raccolti, la stopia speffa, e di canna grossa, e la molt' herba dentro, ti danno a denotare la bonta di quello; ove poi vedrai ar- bori

mention of thick grafs; and the first of thefe authors joins to this the exhaling of mifts and flying fmoke, the imbibing water, the giving an eafy paffage to a superfluity, and not hurting the plough irons with falt ruft.

The trees, fhrebs, and other vegetables mentioned by thefe authors, muft be confidered as the produce of land lying in its natural ftate, without having ever received any culture; and, when

bori belli, puliti con bella fcorza, rami dritti, e longhi, e buono terreno, fi come quello, che é coperto di molt' herbe e in particolare ove nofce la gragmegna, nibbi, malva, cicuta, graliga, pruni, cannelle, lappe, e meglio di tutti il trifoglio, è buono; ogni volta pero, che in fuo genere queft' herbe vengona alte, e di belle elonghe foglie; e la ragione è quefta, che nascendo quefte senza seminarfi, forza è, che vengano da particular putredine, che fia nella terra, e mentre, che la terra è abbondante de putredine, e graffa; Vin. Tan. p. 18.

Quae tenuem exhalat nebulam fumosque volucres,  
 Et bibit humorem, et cum vult ex se ipsa remittit,  
 Quaeque suo viridi semper se gramine vestit,  
 Nec scabie et salsa laedit rubigine ferrum;  
 Illa tibi laetis intexit vitibus ulmos;  
 Illa ferax oleae est; illam experiere colendo,  
 Et facilem pecori, et patientem vomeris unci.

Virg. Georg. II. v. 217.

when any of them are found growing in plenty on any of our waste lands, they may be considered as marks of the goodness of the soil. The kinds chiefly to be looked for are rushes, thick meadow grafs, and trifoil or clover. These are to be found in many waste lands, and are, perhaps, the best marks we have of lands capable of solid improvement. But cultivated lands, as well as those that are lying waste, are sometimes in a state of rest, and allowed to produce the plants natural to the soil. Perhaps there is no situation of land in which the farmer may judge of it with more certainty than in this. Wherever is found the thick bushy grafs, with a small leaf of a lively dark green, or even where the wild daify and trifoil are in great plenty, one need not hesitate to determine that the soil is good, and will turn out to a good account either in grafs or tillage.

There is a particular quality of good soil mentioned by Virgil, in the passage above cited, which our farmers are very well acquainted with, the imbibing water, and giving an easy passage to a superfluity. This is known to be a quality of the very best soil; but there is another

other mentioned in the same passage, which I know not whether any of them have observed, which is, the exhaling of mists and flying smoke. When, in a calm summer day, the sun breaks forth after a shower, all dunghills, and even many fields lately stirred, send forth smoke. Now, it is natural to suppose, that the richer and warmer any soil is, it will, in this situation, send forth the thicker vapour; and, therefore, that rich and warm soils may send forth this mist or vapour, when there is no appearance of it in those that are poor and cold. This is the more probable, as we observe this vapour most frequently, as well as in the greatest plenty, exhaled from dunghills and newly dunged fields.

Pliny gives a very particular description of that kind of soil called *pulla* or *tenera*, which was reckoned so good for corn. After observing, that it is soft and easily cultivated, neither too wet nor too dry, he adds: ‘ It shines after  
 ‘ the plough-share, as Homer, that source of  
 ‘ genius, has represented the ploughed field car-  
 ‘ ved by Vulcan upon the shield of Achilles,  
 ‘ who has added, too, a most extraordinary  
 ‘ thing, that the soil appeared black, though  
 ‘ made of gold. This is the kind of soil which,  
 ‘ when

when new ploughed, the crows and other o-  
 minous birds search, following close upon the  
 heels of the ploughman. In this place, too,  
 may be mentioned an opinion in matters of  
 luxury, as something to the present purpose.  
 Cicero, for certain, another person of great  
 knowledge, said, that those perfumes that fa-  
 vour of the earth are better than those that fa-  
 vour of saffron. But this he should rather  
 have said, than those that smell disagreeably of  
 it. So it is truly; and that is the best kind  
 of soil that favours of perfumes. If I should  
 be asked, of what kind the smell of the earth  
 is? he who inquires may feel it; for often, in  
 a calm evening before sun-set, the earth, in  
 the place over which the ends of the rain-bow  
 have passed, and when it is wet with a shower  
 after a continued drought, then sends forth  
 that divine favour of its own, conceived by the  
 sun, to which no sweetness can compare. This  
 is the smell of the land when turned up, and,  
 being found, can deceive no person. So the  
 smell is the best thing for determining the na-  
 ture of the soil; such is the smell that is found  
 in new broken-up land, where an old wood  
 has



‘ has been cut down, which all persons approve  
‘ of \*.’

One of the marks of this good soil, given by Pliny in this passage, is mentioned by Vincenzo Janara, who gives a reason for the crows following the plough, in these words: ‘ Because, ‘ in the putrefaction of its fatness are bred in-  
‘ fects,

\* *Illa post vomerem nitescens : qualem fons ingeniorum Homerus in armis a Deo coelatam dixit, addiditque miraculum nigrescentis, quamvis fieret in auro. Illa quam recentem exquirunt improbae alites, vomerem comitantes, corvique aratoris vestigia ipsa rodentes. Reddatur hoc in loco luxuriae quoque sententia et aliqua in propositum. Certe Cicero, lux doctrinarum altera ; meliora, inquit, unguenta sunt, quae terram, quam quae crocum sapiunt. Hoc enim maluit dixisse, quam redolent. Ita est profecto : illa erit optima, quae unguenta sapiat. Quod si admonendi sumus, qualis sit terrae odor ille qui quaeritur, contingit saepe etiam quiescente ea sub occasum solis, in quo loco arcus coelestis dejecerit capita sua ; et cum a ficitate continua immaduit imbre, tunc emittit illum suum halitum divinum ex sole conceptum, cui comparari suavitas nulla possit. Is esse odor in comota debet, repertusque neminem fallit : ac de terra odor optime judicabit. Talis fere est in novalibus caesa vetere silva, quae consensu laudatur ; Plin. Nat. Hist. lib. xvii. cap. v.*

‘sects, which, being discovered by the ploughing, serve for food to these birds\*.’

The different ways of distinguishing the different soils mentioned by these ancient authors, and the marks which they give of good soil, discover a very particular attention to these matters. That the attention which they have given may be of greater advantage to the British farmer, it may be proper to bring under one view such of their marks of good soil as may be of use to him. The best soil, they say, is of a blackish colour, has an agreeable smell, is of a glutinous nature when wet, and easily crumbles when dry, imbibes water, retains a proper quantity, and easily parts with the superfluity. When ploughed, sends forth mists; and, in the time of this operation, the ploughman is followed by rooks, crows, &c. and, when at rest, carries a thick grassy turf. Now, although there are many good soils that have very different appearances, and some bad ones that have some of the

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marks

\* Se quando si lavora il terreno, e massime quando s’aravi si fermano corvi, storni, piche, e simili, è signo di buono perche nel putrido della sua pinguedine nascono animoletti, quali lavoriere scoperti servono a’ sudetti animali di vitto; Vin. Jan. p. 18.

marks here mentioned in a higher degree than the good soils; yet it may be asserted, that there is no land good for corn but has several of these marks, and that the best land in the kingdom has all of them. The best kind of soil is of a blackish colour, but not so black as moss, is glutinous, but not so glutinous as clay; it admits water, but not so easily as sand or moss; and it retains water, but not so strongly as moss or clay; and it parts with water, but not so easily as sand. It may be further asserted, not only that land which has these qualities is the best, but also, that the nearer the qualities of any soil approach to the qualities mentioned, it is the better.

The qualities of particular soils are found out from observation and experience; and, by attending to the appearances of those that are known, and applying them, the farmer is able, from inspection, to form a judgment of others. This, indeed, is what few are capable of doing with exactness, though there are many that pretend to it. However, as this is a matter of very great importance to the farmer, it will not be improper to mention some general things that may be of advantage to him.

Before

Before a farmer inspects the farm, or field, of which he proposes to form a judgment, it is proper that he get as particular information as possible of its character in the country, and to keep this character in his view, while examining the soil. As every part of a country has a character with respect to its soil, so has every farm, and also every field. These characters are commonly very just, as they are founded upon long experience; and they are so well known, that there is scarcely a ploughman, who has been for some years on the same farm, that cannot point out with exactness both the best and the worst fields of it. It would be improper for a farmer to found his judgment upon the characters which he receives; but, when acquainted with them, he is not so easily deceived as a stranger is by appearances.

But, to form a proper judgment of soil, it is proper likewise to get as particular information as possible of the manner in which it has been cultivated. The same soil, under different culture, has a very different appearance. When land is under bad culture, it always looks much worse than it really is; on the contrary, when under good culture, it always looks much better.

ter. This observation is particularly applicable to land that has lately been properly fallowed and well dunged. Very indifferent soil, in this situation, appears good, and is apt to deceive a very good judge. To prevent being deceived by these appearances, it is necessary to attend to the culture which the land has received. Besides, by comparing the culture with the situation of a field, one can more easily judge of the qualities of the soil. If the culture has been bad, and yet the land tolerably clean, it is certain that it is of a kind that is both easily put and easily kept in good order; on the contrary, if the culture has been good, and the land foul, it is equally certain that it is of a kind very difficult to manage, and not to be kept in good order by any degree of care and attention. It is proper for the farmer who would judge of a farm, to know, if possible, not only the general culture that has been given, whether it has been good or bad, but also the particular manner in which it has been managed. When land has been long confined to some particular methods of culture, it appears worse from its situation than it really is; and, by changing the management, a great improvement is often made. When  
land

land has been ill ploughed, and seldom or never fallowed, good ploughing and complete fallowing seldom fail to produce an extraordinary effect; or, when land has been long in constant tillage, the laying it off in grass is commonly attended with equal success. Fallowing land, that has often been fallowed before, and turning land into grass that has often been in grass before, do not succeed so well.

When a person intends to inspect a farm, he ought, if possible, to choose a time when the generality of the fields are dry on the surface, and when a considerable quantity of the land is ploughed and not sown. When land is dry on the surface, he sees the appearance of the soil in both situations, both dry and wet; and this is a very great advantage; for soils, similar in appearance when wet, discover themselves to be very different when dry. Besides, by viewing land in this situation, he can more easily observe what *spouts*, or breakings out of water, there are in it; he can likewise more easily judge of the degree of its spunginess, by comparing the heights of a field with the hollows, or the crowns of the ridges with the furrows. But it is an advantage to inspect a farm not only in this situation,

tuation, but also when a considerable part of it is ploughed. It is obvious, that land, when ploughed, is better seen than when under stubble, or even when the surface is smoothed by harrowing; besides this, when a field has been some time ploughed, the effects of the air upon the soil may be observed, by which some of its qualities are discovered.

Before this subject is concluded, it may not be improper to observe, that no attempt has been made to describe the different appearances by which the different soils are distinguished. To do this, so as to be understood, is impossible; for there are no words in our language by which the ideas can be expressed with such exactness as to prevent mistakes. The directions given must, therefore, be considered as intended for persons already acquainted with these appearances. Those who have most frequently attempted to judge of soils must be sensible, that, in this business, they stand in need of all advantages; and, therefore, that it is proper not only to pay some regard to the directions here offered, but also to take the assistance of the experiments mentioned by the ancients.

## C H A P. IV.

*Of the different kinds of crops raised by the Romans, and their care in adapting them to the different soils.*

**I**N Britain, we have not so many different kinds of crops as the Romans had. We have different kinds of corn, pulse, grafs, and roots; we have likewise some others, but they are so trifling, that they do not deserve to be mentioned as the produce of our country. The Romans had a greater variety of these different kinds: And, besides them, had vines, olives, willows, and other plantations of different sorts of trees, all of which were considered as profitable crops.

Cato compares the different kinds of land with each other, according to the crops, which, from their nature and situation, they were found capable of carrying: And he gives an account  
of



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of these crops in their order, according to their value to a purchaser of the land: ‘ If you ask me,’ says he, ‘ what kind of farm is best? I will answer in this manner; suppose one should buy an hundred *jugera*, properly situated, of all fields the vineyard is the best, if it produces plenty of good vines; in the second place, is a garden that can be watered; in the third place, a willow grove; in the fourth, an olive field; in the fifth, a meadow; in the sixth, a corn field; in the seventh, a wood that grows up again after it is cut; in the eighth, a field planted with trees for vines; and, in the ninth, a wood for masts\*.’

Varro cites this passage, but gives the preference to meadows. Perhaps circumstances had so far changed, as to render vineyards of less value in the time of Varro, than they had been in the time of Cato. The culture of vines may have

\* *Praedium quod primum fiet, si me rogabis, sic dicam. De omnibus agris, optimoque loco si emeris jugera agri centum, vinea est prima, si vino multo fiet. Secundo loco hortus irriguus, tertio salictum, quarto oletum, quinto pratum, sexto campus frumentarius, septimo silva caedua, octavo arbuſtum, nono glandaria silva; Cat. cap. 1.*

have been so much increased in Italy, and such quantities of foreign wine imported, as to lessen the value of this commodity. Varro takes occasion, as a proof of his opinion, to mention the great fertility of the *campus roseae*: I know,' says he, 'that Cato has given this as his opinion, but all persons do not agree with him; for there are many that give the preference to good meadows, of which number I am; because they require little or no expence; for which reason the ancient Romans called meadows *parata*, ready prepared. Caesar Vopiscus the Ædile, pleading a cause before the censors, asserted, that the *campus roseae* is the richest field in Italy, in which, when a pole is left, it is not seen next day by reason of the grass \*.'

Columella

\* Cato quidem inquit, gradatim praeponens, alium alio agrum meliorem dicit esse in novem discriminibus, quod sit primus, ubi vineae possint esse bono vino et multo; secundus ubi hortus irriguus, &c. Scio, inquit, scribere illum; sed de hoc non consentiunt omnes, quod alii dant primatum bonis pratis, ut ego quoque; *quia modicas aut nullas expensas requirunt*, a quo antiqui prata parata appellarunt. Caesar Vopiscus Ædilicius, causam cum ageret

Columella agrees in opinion with Cato. He compares meadow pasture, trees, and corn with vineyards, and gives the preference to the last: ‘Now,’ says he, ‘before we treat of the planting of vines, I think it is proper that it be laid down as the foundation of our future reasoning, that we have thoroughly inquired and considered, whether or no the culture of vines is a proper way to enrich the proprietor of land; for it is needless to give any directions about planting them, while it is not yet determined whether or not it is worth while to cultivate them. There are many that so much doubt

*apud censores, campos roseae Italiae dixit esse fumen, in quo relicta pertica postridie non appareret propter herbam; Var. lib. i. cap. vii.*

The words above in Italicks are not in the copies of Varro; but seem necessary to compleat the sense. Pliny assigns this reason for the name given by the ancients: ‘Et prata antiqui parata dixere.—Summa omnium in hoc spectando fuit, ut fructus is maxime probaretur, qui quam minimo impendio constaturus esset;’ *Plin. Nat. Hist. lib. xviii. cap. v.* To the same purpose Columella: ‘Prati cui veteres Romani primas in agricolatione tribuerunt. Nomen quoque indiderunt ab eo, quod protinus esset paratum, nec magnum laborem desideraret;’ *Col. lib. ii. cap. xvi.*

‘doubt of this, that not a few are afraid of and  
 ‘averse to lands in this situation, and declare  
 ‘that the possession of meadows, pasture ground,  
 ‘and woods, is more to be wished for.’ And,  
 after mentioning the produce of vineyards, re-  
 lated by Cato and Varro, and of those that be-  
 longed to Seneca near Numentum, he adds :  
 ‘The increase that happened in our fields at Ce-  
 ‘retanum, seems to be prodigious, that one vine  
 ‘in your vineyard should carry 2000 grapes,  
 ‘and that with me eight hundred stocks planted  
 ‘only two years before, should produce seven  
 ‘*cullei* ; or even that the best vineyards should  
 ‘produce an hundred amphora by the *jugerum*,  
 ‘when meadows, pasture, and woods, if they  
 ‘produce one hundred *sestertii* by the *jugerum*,  
 ‘are thought to answer very well to the propri-  
 ‘etor. And, as for a field in corn, we can  
 ‘scarcely remember when, over the greatest part  
 ‘of Italy, it produced four after one sowing\*.’

These

\* Nunc prius quam de fatione vitium differam, non a-  
 lienum puto, velut quoddam fundamentum jacere disputa-  
 tioni futurae, ut ante perpensum et exploratum habeamus,  
 an locupletet patremfamilias vinearum cultus. Est enim  
 pene adhuc supervacuum de his conferendis praecipere,  
 dum

These different opinions might have arisen from changes of circumstances, or perhaps from the different

dum quod prius est, nondum concedatur, an omnino sint habendae? Idque adeo plurimi dubitent, ut multi refugiant, et reformident talem positionem ruris; atque optabiliorem pratorum possessionem, pascuorumque vel silvae caeduae judicent.—Nam illa videntur prodigialiter,—et apud me octogenae stirpes insitae intra biennium septenos culleos peraequant, ut primae vineae centenas amphoras jugeratim praebent, cum prata, et pascu, et silvae, si centenos sestertios in singula jugera efficiant, optime domino consulere videantur: Nam frumenta majore quidem parte Italiae quando cum quarto responderint, vix meminisse possumus; Col. lib. III. cap. III.

The meaning of these words used by Columella, *quando eum quarto responderint*, is not very plain: Some of the commentators suppose that *decimo* should be added to *quarto*, and that the meaning of our author is, that corn upon the lands of Italy, in general, does not produce fourteen after one sowing: In support of this, they cite a passage from Varro, in which he says, that in Hetruria, and some other places of Italy, the produce of wheat is fifteen after one. But, if Columella, in the passage above mentioned, means fourteen after one, he differs from Varro, who says, that ten after one was the ordinary produce, and that it was only in some places that they had fifteen. The ordinary produce is certainly what Columella is speaking of, and he insinuates that it was less than it had been formerly.

different views which these persons had of things. When proper culture is given to the different crops, the value of the land which produces them depends upon the price that is given for the produce; and this again depends upon the increasing

ly. The meaning of this passage will be more particularly inquired into afterwards. In the common copies, instead of *oclingentae*, we read *octogena*, which makes Columella assert, that he had the greatest crop ever known. When vines are planted at six feet distance every way, there are about 800 on the *jugerum*, and, when at ten feet, which was the greatest distance, there are about 325. Let us suppose, that there was only this smallest number on the *jugerum* in Columella's vineyard; if 80 of these stocks produced 7 *cullei*, the whole would produce 28.4. Now, according to the same passage in Columella, it was thought extraordinary, that the best vines should produce 100 amphora by the *jugerum*, which is no more than 5 *cullei*; and, according to what he says a little before, Seneca's famous vineyards produced only 8. Those mentioned by Varro, which he speaks of as exceeding any thing in his days, produced only 600 urns, which is no more than 15 *cullei*. From this, it is probable, that the true reading is *oclingentae*, and that Columella, by 800 stocks, meant a *jugerum*. Upon this supposition, his crop was a very good one, though not so great as the produce of the vineyards mentioned by Varro, and even one *culleus* less than the produce of those belonging to Seneca.

increasing or decreasing of the demand. At the same time, it must be observed, that some crops require very little culture, and others very much. The comparative value, therefore, of the lands that carry these crops, depends upon the expence of the culture given, which in one age is very different from what it is in another. Besides, the proper culture that a crop requires is not always given; and, from the situation of affairs in many cases, cannot be expected: For there are some crops that require not only more culture than others, but also this culture to be given with more attention and exactness. Hence it often happens, that the crop that requires the least attention and least exactness in the culture, is the most profitable for the farmer. From these different views of things, arise the different opinions of men with respect to the comparative value of crops. A good vineyard ought certainly to be more profitable to the proprietor than either a good meadow, or wood of barren timber; for this reason, that it requires more care and attention in the culture, and, when this care and attention is given, it certainly is so: But when from certain circumstances, this care and attention cannot be given by the proprietor,  
and

and the culture and management are committed to servants, or slaves, as among the Romans; then a good meadow or wood may be more advantageous.

The different kinds of crops cultivated by the ancients, were by them with very great care adapted to the different soils. The Romans are very particular in their directions: ‘ In whatever places,’ says Cato, ‘ you sow your fields, ‘ it is proper that these things be observed; a ‘ field that is rich and strong and in good heart, ‘ without trees, should be sown with corn: ‘ The same kind of soil, if wet or moist, should ‘ be sown with turnip, raddish, millet, and panic\*.’ ‘ Sow beans,’ says he in another place, ‘ in stiff soils not liable to accidents: Vetches ‘ and fenugreek in fields where there are few-  
‘ est

\* *Agrum quibus locis conseras, sic observari oportet: Ubi ager crassus, et laetus est, sine arboribus, eum agrum frumentarium esse oportet. Idem ager si nebulosus est, rapa, raphanos, milium, panicum id maxime feri oportet; Cat. cap. vi.* It is probable, that the *nebulosus ager*, here mentioned by Cato as proper for turnip, &c. was a wet or moist land, and this kind of land is more proper, in such a climate as Italy, for these crops, than dry land, as they were summer crops.



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‘ est weeds ; *siligo* and *triticum* in open and well  
 ‘ aired places, upon which the sun continues  
 ‘ longest to shine ; lentils on an uncultivated  
 ‘ red coloured soil, where there is not much  
 ‘ grass ; barley upon new grounds, or so rich  
 ‘ as to carry a crop every year \*.’

‘ All things,’ says Varro, ‘ do not succeed  
 ‘ well on the same fields ; for, as one soil is  
 ‘ most proper for vines, and another for corn,  
 ‘ so another kind for some other crop †.’ In  
 another place : ‘ Two things are to be consider-  
 ‘ ed ; what crops it is proper to cultivate, and  
 ‘ in what particular place each should be sown  
 ‘ or planted : For some soils are proper for hay,  
 ‘ some for corns, some for vines, and some for  
 ‘ olives ; so likewise some are proper for the  
 ‘ things that are sown for fodder, among which  
 ‘ are

\* *Fabam* in locis validis non calamitosis ferito. *Viciam*  
 et *foenum Graecum* quam minime herbofis locis ferito.  
*Siliginem*, *triticum* in loco aperto, celfo, ubi sol quam  
 diutiffime fiet, feri oportet. *Lentem* in rudefto et rubri-  
 cofo loco, qui herbofus non fiet, ferito. *Hordeum*, qui  
 locus novus erit, aut qui restibilis fieri poterit, ferito ; *Cat.*  
*cap. xxxv.*

† Non enim eadem omnia in eodem agro recte possunt.  
 Nam ut alius est ad vitem appofitus, alius ad frumentum,  
 fic de caeteris alius ad aliam rem ; *Var. lib. i. cap. vii.*

‘ are *ocimum, farrago, vieia, medica, cytibus,*  
‘ *lupines.* Upon rich land, all things cannot be  
‘ sown to advantage; upon poor land some  
‘ things may \*’. And, a little after, ‘ a proper  
‘ place ought to be chosen for making planta-  
‘ tions of willows and reeds, and the other things  
‘ that require wet land. So likewise for crops  
‘ of corn and beans, which require the stiffest  
‘ soil †.’ In giving an account of the soils pro-  
per for the different kinds of corn, he mentions  
the directions given by Cato: ‘ As to those things,’  
says he, ‘ what Cato writes concerning sowing  
‘ the different crops, is very well ‡.’ After which,  
he

\* Quoniam fructum, inquit, arbitror esse fundi eum,  
qui ex eo fatus nascitur utilis ad aliquam rem; duo confi-  
deranda restant; quae, et quo quidque loco maxime ex-  
pediat ferere: Alia enim loca apposita sunt ad foenum,  
alia ad frumentum, alia ad vinum, alia ad oleum: Sic ad  
pabulum quae pertinent, in quo est *ocimum, farrago, vi-*  
*cia, medica, cytibus, lupinum.* Neque in pingui terra  
omnia feruntur recte, neque in macra nihil; Var. lib. 1.  
cap. xxiii.

† Idoneus locus eligendus est ubi facias salictum et a-  
rundinetum; sic alia, quae humidum locum quaerunt;  
contra ubi segetes frumentarias, ubi fabam potissimum se-  
ras; Var. lib. 1. cap. xxiii.

‡ Quod ad haec pertinet, Cato non male quod scribit de  
VOL. I. A a sationibus,

he proceeds to represent the kind of soil proper for olives, poplars, elms, reeds, willows, and vines.

‘ All kinds of corn,’ says Columella, ‘ thrive  
 ‘ best in plains, open, exposed to the sun, warm,  
 ‘ and of a loose soil: Hilly ground, though it  
 ‘ produces larger grain, yet not so large a crop  
 ‘ of *triticum*: Stiff, chalky, and wet ground,  
 ‘ does very well for *siligo* and *far*: Barley will  
 ‘ not answer in any but loose and dry soils\*.’  
 And afterwards, when treating of the culture of the different kinds of pulse, he mentions the soils proper for each of them: Palladius, to the same purpose, says, that ‘ all corn thrives best  
 ‘ upon a plain, open, of a free soil, and incli-  
 ‘ ning towards the south; stiff, chalky, and wet  
 ‘ land, does very well for *far* and *triticum*: Bar-  
 ‘ ley

*sationibus, ager crassus et laetus, si sit sine arboribus, eum agrum frumentarium fieri oportere. Idem ager si nebulosus sit, rapa, raphanos, milium, panicum fert; Var. id.*

\* Omne autem frumentum maxime campo patente, et ad solem prono, apricoque et soluto laetatur. Collis enim quamvis granum robustius aliquanto, minus tamen tritici reddit. Densa, cretosaque et uliginosa humus, filiginem, et far adonum non incommode alit. Ordeum nisi solutum et siccum locum non patitur; Col. lib. 11. cap. 15.

‘ley delights in free and dry foil; for, if it is  
‘sowen in miry land, it dies \*.’

But, in adapting crops to soils, Pliny is rather more particular than any of the others; and, as he mentions all the maxims with respect to this in one place, I shall give the whole passage: ‘Such a difference of foil,’ he says, ‘points out  
‘the necessity of describing the kinds proper for  
‘the different crops. This is Cato’s opinion,  
‘that corn should be sowen on land that is stiff,  
‘rich, and in good heart; that radish, millet,  
‘and panic, should be sowen upon the same kind  
‘of land, if moist or wet; that seed should be  
‘first sowen in cold and wet soils, and afterwards  
‘in warm; that lupines should be sowen in the  
‘red foil, the foil called *pulla* or sandy foil, if  
‘they are not wet; *far* in moister fields, where  
‘the foil is chalky and red; *triticum* in dry  
‘land, not liable to weeds, nor in a shade; beans  
‘in strong soils; *siligo* and *triticum* in open  
‘and exposed fields, that receive greatest bene-  
‘fit

\* Frumenta omnia maxime laetantur patenti campo et soluto, et ad solem recliui. Spissa et cretosa, et humida terra bene far et triticum nutrit. Ordeum agro soluto delectatur et sicco: Nam in lutofo sparsum moritur; Pal. lib. 1. tit. vi.

' fit from the heat of the sun; lentils in uncultiva-  
 ' ted and red soil, where there is not much grass;  
 ' barley on fallow, and land so rich as to carry  
 ' a crop every year. Spring sowing should be  
 ' used in places that cannot conveniently be  
 ' sown in autumn, and in soil whose fatness  
 ' can carry constant crops: This maxim too is  
 ' exact. These things should be sown in shal-  
 ' low soil, that do not require much sap, as the  
 ' *cytissus* and *cicer*; legums are excepted, which  
 ' are pulled up and not cut in reaping; hence  
 ' they are called *legums*, because thus gathered.  
 ' In fat soil, should be sown such things as re-  
 ' quire much food, as garden herbs, *triticum*,  
 ' *siligo*, flax. So, for the same reason, the shal-  
 ' low soil is allotted for barley, because it does  
 ' not require much food, the richer and stiffer  
 ' for *triticum*. In low lying grounds, *far*, rather  
 ' than *triticum*, should be sown: In grounds  
 ' neither very high nor low, both *triticum* and  
 ' barley; hilly ground produces plumper *triti-*  
 ' *cum*, but not so large a crop: *Far* and *siligo*  
 ' may be appointed to chalky and wet soils \*.'

Theophrastus

\* Tanta foli differentia admonet terrae genera in fru-  
 ges describere; igitur Catonis haec sententia est: In agro  
 crasso

Theophrastus does not enter into particulars, as the Roman authors do; but he declares, in general,

crasso et laeto frumentum feri. Si vero nebulosus sit idem, raphanum, milium, panicum: In frigido et aquoso prius ferendum, postea in calido. In solo autem rubricoso, vel pullo, vel arenosa, si non sit aquosum, lupinum. In creta, rubrica, et aquosiore agro adorem. In sicco et non herbofo, nec umbroso, triticum: In solo valido, fabam. Viciam vero quam minime in aquoso herbidoque; filiginem et triticum in loco aperto editoque, qui sole quam diutissime torreatur. Lentem in frutescofo (rather *rudeto* from Cato) et rubricoso, qui non sit herbidas. Hordeum in novali, et in arvo quod restibile possit fieri; trimestre ubi fementem maturam facere non possis, et cujus crassitudo sit restibilis. Subtilis et illa sententia; serenda esse ea in tenuiore terra, quae non multo indigent succo, ut cytissus; et, cicere excepto, legumina, quae velluntur e terra, non subsecantur. Unde et legumina appellata, quia ita leguntur. In pingui autem, quae cibi sunt majoris, ut olus, triticum, linum. Sic ergo tenue solum hordeo dabitur; minus enim alimenti radix poscit; lenior (it should rather be *laetior*) terra densiorque tritico. In loco humili far adorem, potius quam triticum, feretur; temperato et triticum et hordeum. Colles robustius, sed minus, reddunt triticum; far et filigo, et cretosum, et uliginosum solum fortiuntur; Plin. Nat. Hist. lib. xviii. cap. xvii. Instead of *frutescofo*, we have in Cato *rudeto*: This word signifies land in its rude state, and the other a place where shrubs

general, that, to know how to adapt plants to soils, is one of the principal things in agriculture\*.

In this part of agriculture, the ancients seem to have greatly the advantage of the moderns: It is true indeed, that the schemes of agriculture, profecuted by the Romans, made it more easy for them to attend to this than for us: However, it is certain, that greater attention may be given to it, than is done any where in Britain; and thereby a real improvement made in agriculture. In many soils of very different qualities, we observe the same schemes of agriculture carried on, the same crops cultivated, and these in the same order: This, at first sight, must appear improper. From experience it is found, that some of our lands are proper for corn, others for pasture grass, others for hay, and others for roots. Of these proper for corn, some answer best with wheat, others with barley, a third sort with oats, and a fourth with  
rye.

shrubs grow: This is commonly the case with all uncultivated land, where there is not much grass.

\* *Sed ante haec, vel etiam simul agrum cuique accommodandum nosse oportet; Theo. de caus. plant. lib. III. cap. xxv.*

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rye. Would our farmers give attention to this, and, in their manner of cropping, humour their soils by cultivating their favourite crops, and prosecute such schemes as introduce these most frequently, agriculture by this would be improved, and the produce of our fields, upon the whole, much greater and more valuable.

CHAP.



## C H A P. V.

*Of the maxims of the Ancients, and some general directions to the farmer in his operations.*

**I**N every nation there are maxims of agriculture handed down from one age to another. In no nation there are more of these, than there were among the Romans. In the Gothic nations, among whom, in their barbarous state, agriculture was in no repute, and practised only by the vulgar, no regard is paid to these maxims, or rather, they are held in the greatest contempt, and an attachment to them made a subject of ridicule: But, among the Romans, who held agriculture in high estimation, and whose nobles and senators studied and practised it, the maxims of the ancients were respected with veneration: They were considered as founded upon the experience and observations of men,  
who

who had given the strongest evidence of capacity and knowledge in governing a state, forming laws, and commanding armies. Such of these maxims as are recorded by the authors on that subject, when considered with attention, and a proper allowance made for situation and circumstances, appear indeed worthy of the highest regard. They extend to all the branches of agriculture: A few of them I have already taken notice of; I shall have occasion to mention many others, when inquiring into their practices in these different branches: At present, I propose to mention such only as relate to agriculture in general.

Farmers in every country, from the immediate prospect of gain, are tempted to sow more of their land than they ought, and possess larger farms than they are capable to manage. Now, to prevent these, there was a maxim established among the Romans, which is mentioned by Pliny: ‘The ancients,’ says he, ‘were of opinion, that, above all things, the extent of farms ought to be kept within proper bounds. Wherefore it was a maxim amongst them, to sow less and plow better.’ Pliny further ob-

erves, that Virgil was likewise of this opinion \*.

So much care and exactness were thought necessary in agriculture, that some of the writers upon the subject mention, as an allowed maxim, that large farms were prejudicial, because in them this necessary attention and exactness

\* *Modum agri in primis servandum antiqui putavere. Quippe ita censebant, fatius esse minus ferere, et melius arare. Qua in sententia et Virgilium fuisse video; Plin. Nat. Hist. lib. xviii. cap. vi.* The passage in Virgil, to which Pliny probably refers, is to this purpose: 'You may admire a large farm, but cultivate a small one.' The poet having represented the great pains and labour necessary in cultivating vineyards, particularly in preventing the shade from over-growing the grapes, and the weeds from hurting the vines, mentions this maxim:

———Bis vitibus ingruit umbra;

Bis segetem densis obducunt sentibus herbae.

Durus uterque labor. Laudato ingentia rura;

Exiguum colito.———Vir. Geo. II. v. 410.

The meaning of which is, that, although one naturally admires the extent of a large vineyard or *arbusum*; yet it is much more profitable to cultivate a small one. This maxim is indeed properly applied to a vineyard, as it requires the greatest care, and the nicest culture: However, such is the care and exactness required in the culture of corn fields, that it may be also applied to them, as Pliny does.

ness could not be exerted. Pliny says expressly, that large farms were the ruin of Italy, and likewise of the provinces. These indeed were very large, as appears from what follows: Six men, says he, living at home possessed the half of Africa: That large farms, and not large estates, are mentioned by Pliny in the passage above referred to, is evident from what he says in commendation of Pompey, that he never bought any land contiguous to his own, so as to add to his farm\*.

Columella very strongly recommends a proper measure in farms: ‘To the other precepts,’ says he, ‘we add this, which one of the seven wise men has pronounced as a maxim, that holds true in all ages, that there ought to be limits and measures of things; and this ought to be understood, as applied not only to those that do any other business, but also those that buy land, that they may not buy more than they

\* Verumque contentibus latifundia perdidere Italiam: Jam vero et provincias; sex domi semissem Africae possidebant, cum interficit eos Nero princeps: Non fraudando magnitudine hac quoque sua Cn. Pompeio, qui nunquam agrum mercatus est conterminum; Plin. Nat. Hist. lib. xviii. cap. vi.

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' they are fully able for. To this is applicable  
 ' the famous sentence of our poet, *You may ad-*  
 ' *mire a large farm, but cultivate a small one;*  
 ' which ancient precept this most learned man,  
 ' in my opinion, expresses in numbers: This,  
 ' too, is agreeable to an acknowledged maxim  
 ' of the Carthaginians, a very acute nation,  
 ' *That the land ought to be weaker than the husband-*  
 ' *man;* for, when they struggle together, should  
 ' the farm prevail, the master must be ruined.  
 ' And, indeed, there is no doubt, but a small  
 ' field well cultivated produces more than a  
 ' large field ill cultivated.' This he illustrates  
 by observing, that the seven *jugera* which were  
 distributed by Licinius to every citizen, gave  
 larger returns to the ancients, than the most ex-  
 tensive fallows to those of his age \*.

Pliny,

\* Nos ad caetera praecepta illud adjicimus, quod fa-  
 piens unus de septem in perpetuum posteritati pronuncia-  
 vit, (*μετρον αριστον*) adhibendum modum mensuramque  
 rebus; idque, ut non solum aliud acturis, sed et agrum pa-  
 raturis dictum intelligatur, ne majorem, quam ratio cal-  
 culorum patiat, emere velit: Nam huc pertinet prae-  
 clara nostri poetae sententia.—*Laudato ingentia rura, Exi-*  
*guum colito.* Quod vir eruditissimus, ut mea fert opinio,  
 traditum

Pliny, having mentioned a time when provisions were very cheap, says, that this did not arise from the large farms in the hands of single persons, who restrained their neighbours; for, at that time, by the law of Stolo, no person could possess more than five hundred jugera; a law which could not be evaded; for, he observes,

traditum vetus praeceptum numeris signavit: Quippe acutissimam gentem Poenes dixisse convenit, Imbecilliorrem agrum, quam agricolam esse debere: Quoniam, cum sit colluctandum cum eo, si fundus praevaleat, allidi dominum. Nec dubium quin minus reddat laxus ager non recte cultus, quam angustus eximie. Ideoque post reges exactos Liciniana illa septena jugera, quae plebis tribunus viritim diviserat, majores quaestus antiquis retulere, quam nunc nobis praebent amplissima veruacta; Col. lib. 1. cap. 111. Some copies, instead of *veruacta*, have *vetereta*; and the commentators cannot determine which is the true reading. *Veteretus ager* signifies a field that has lain a year or more without being plowed: *Veruactum* signifies a field that has been plowed, but not carried a crop. If *vetereta* is the true reading, Columella's meaning is, that, on account of the largeness of the farms, these plowed fields were but as *vetereta*, when compared to the plowed fields of the ancients. But *veruacta* is probably the true reading, and his meaning is, that the large fields among them, the best cultivated, were not so fruitful as the small fields of the ancients.

ferves, that Stolo himself was condemned for having more, though the overplus was in his son's name\*.

Among the maxims of the ancients, recorded by Palladius, there is one to the same purpose with that mentioned by Columella, 'A small farm cultivated is more fruitful than a large farm neglected †.'

There are some other maxims of the ancients, from which it appears how much, as they imagined, depended on care and industry. To engage masters to be often at their country-houses on their farms, Cato recommends, that neat and convenient houses be built, and these pleasantly situated. 'If you have built,' says he, 'a convenient house on a good farm, and chosen an agreeable situation; if you have good lodging in the country, you will go there the oftener, and the more willingly; your farms will be  
' in

\* *Nec e latifundiis singulorum contingebat arcentium vicinos. Quippe etiam lege Stolonis Licinii incluso modo d jugerum, et ipso sua lege damnato, cum substituta filii persona amplius possideret; Plin. Nat. Hist. lib. xviii. cap. iii.*

† *Fœcundior est culta exiguitas, quam magnitudo neglecta; Pal. lib. i. tit. vi.*

‘ in better order, less evil will be done in the  
 ‘ family, and the produce of the fields will turn  
 ‘ out to much better account.’ Then he adds  
 an old proverb, ‘ A man’s forehead is prefer-  
 ‘ able to his hindhead\*.’ The meaning of  
 which is, ‘ Affairs are much better managed in  
 ‘ a master’s presence than in his absence.’ Co-  
 lumella, for the same reason, recommends the  
 planting of vines, and other fruit-trees, in such  
 order as to appear beautiful and elegant; and  
 then adds: ‘ But, though these things are very  
 ‘ agreeable, yet their utility is still greater than  
 ‘ their pleasantness. For the master goes to see  
 ‘ his affairs so much the more willingly, as they  
 ‘ afford a pleasant prospect; and what the poet  
 ‘ says of the Deity, *Where-ever the God displays*  
 ‘ *his head divine*, is true with respect to the ma-  
 ‘ ster’s presence; where-ever his eyes most fre-  
 ‘ quently approach, in that place there is the  
 ‘ greatest increase †. The same author takes  
 occasion,

\* In bono praedio si bene aedificaveris, beneque posueris  
 eam, ruri si recte habitaveris, libentius et saepius venies,  
 fundus melior erit, minusque peccabitur, fructi plus ca-  
 pies: Frons occipitio prior est; Cat. cap. iv.

† Sed haec quamvis plurimum delectent, utilitas tamen  
 vincit voluptatem. Nam et paterfamilias libentius ad  
 spectaculum



occasion, in several other passages, to mention how advantageous a thing a master's presence is. 'Neither,' says he, 'these advantages I have mentioned, nor the assiduity and experience of the bailiff, nor the power and willingness of the master to lay out money in improvements, are so effectual as this one thing, the presence of the master; which, unless it is frequent with the operations, it will happen to him as in an army when the general is absent; all things will be at a stand.' In illustration of this, he mentions a direction given by Mago the Carthaginian, in these words: 'I am persuaded that Mago the Carthaginian had this chiefly in view, when he introduced the subject on which he wrote with such sayings as these: *Whoever would buy a field ought to sell his house, lest he delight more in the town than in the country. He who is very fond of a town-house has no need of a country farm.* Which precept I should not change, if it could be observed  
' in

*spe&ccaron;culum rei suae, quanto est ea luculentior, descendit; et, quod de sacro numine poeta dicit, Et quocunque Deus circum caput egit honestum, verum quocunque domini praesentis oculi frequenter accessere, in ea parte majorem in modum fructus exuberat; Col. lib. III. cap. XXI.*

' in these times. But ambition now calls many  
 ' to town, and still oftener detains those that are  
 ' there. Hence I am of opinion, that a farm  
 ' near the city is the most advantageous; to  
 ' which, as if one lived upon the spot, daily ex-  
 ' cursions can easily be made after business is  
 ' over. For those who buy lands at a distance,  
 ' not to say beyond seas, give them up to their  
 ' servants as if they were the heirs to their e-  
 ' states, and, what is still worse, while they  
 ' themselves are alive; as these, indeed, are not  
 ' only corrupted by reason of the great distance  
 ' of their masters, but expecting to be turned  
 ' off after the crimes which they have commit-  
 ' ted, apply themselves more to rapine than agri-  
 ' culture\*.' There is another passage in Columella

\* Ac ne ista quidem praesidia, ut diximus, non assiduus labor, et experientia villici, non facultates, ac voluntas impendendi tantum pollent, quantum vel una praesentia domini; quae nisi frequens operibus intervenerit, ut in exercitu cum abest imperator, cuncta cessant officia; maximeque reor hoc significantem Poenum Magonem, suorum scriptorum primordium talibus auspiciatum sententiis: *Qui agrum parabit, domum vendat, ne malit urbanum, quam rusticum larem colere; cui magis cordi fuerit urbanum domicilium, rustico praedio non erit opus; quod ego praecep-*

mella to the same purpose, in which he directs vineyards to be laid out in such a manner as most easily to admit the master's eye. 'But, when you would lay out your vineyard,' says he, 'let an hundred plants be placed in each division, separated from the others by a foot-path, or (as it pleases some) let the whole extent be divided into different plots, of half a jugerum each. This division, besides the advantage of exposing the vines better to the influence of the sun and winds, easily admits the eyes and steps of the master; things most advantageous to the vineyard; and enables him to determine exactly what culture should  
 ' be

tum, si posset his temporibus observari, non immutarem. Nunc quoniam plerisque nostrum civilis ambitio saepe evocat, ac saepius detinet evocatos, sequitur, ut suburbicum praedium commodissimum esse putem, quo ut occupato quotidianus excursus facile post negotia fori contingat. Namque longinqua, ne dicam transmarina rura mercantur, velut haeredibus patrimonio suo, et quod gravius est, vivi cedunt servis suis; quoniam quidem et illi tam longa dominorum distantia corrumpuntur, et corrupti post flagitia, quae commiserunt, sub expectatione successorum, rapinis magis, quam culturae student; Col. lib. 1. cap. 1.

' be given ; nor, indeed, can we be deceived, if  
' jugera are divided by such intervals \*.'

To these passages, it may not be amiss to add a story told by the same author, upon the authority of Graecinus, with an intention to show the great effects of industry. ' Believe me, Sil-  
' vinus,' says he, ' who have experience, that a  
' vineyard well situated, planted with good  
' vines, and under good culture, never failed to  
' repay all the trouble and expence bestowed,  
' with large interest. This Graecinus has de-  
' monstrated, in that book in which he treats of  
' vineyards, not only from the reason of the  
' thing, but also by a remarkable instance, which  
' he declares he has often heard from his father.  
' It was of one Paridius, a neighbour of his,  
' who had two daughters and a vineyard ; when  
' his eldest daughter was married, he gave her  
' a

\* Sed quando vineta placuerit ordinare, centenae stirpes per singulos hortos semitis distinguantur ; vel, ut quibusdam placet, in semijugera omnis modus dirimatur ; quae distinctio praeter illud commodum, quod plus folis et venti vitibus praebet, tum etiam oculos et vestigia domini, res agro saluberrimas, facilius admittit, certamque aestimationem in exigendis operibus praebet. Neque enim falli possumus per paria intervalla jugeribus divisis ; Col. lib. iv. cap. xviii.

‘a third of his vineyard for a portion; notwithstanding of which, he had the same quantity of fruit as formerly. When his younger daughter was married, he gave with her the half of what remained, and still the produce of his vineyard was not diminished.’ To this story Columella naturally subjoins, ‘How is this to be accounted for? Only by supposing, that the remaining third part was much better cultivated than the whole was before\*.’

To the same purpose there is another story told by Pliny, that shows, in a very extraordinary manner, what diligence and industry can do.

\* *Experto mihi crede, Silvine, bene positam vineam, bonique generis, et bono cultore, nunquam non cum magno foenore gratiam reddidisse: Idque non solum ratione, sed etiam exemplo nobis idem Graecinus declarat eo libro, quem de vineis scripsit, cum refert ex patre suo saepe se audire solitum, Paridium quendam Veterensem vicinum suum duas filias, et vineis constitum habuisse fundum; cujus partem tertiam nubenti majori filiae dedisse in dotem, ac nihilominus aequae magnos fructus ex duabus partibus ejusdem fundi percipere solitum. Minorem deinde filiam nuptui collocasse in dimidia parte reliqui agri: nec sic ex pristino reditu detraxisse. Quo quid conjicit? Nisi melius scilicet postea cultam esse tertiam illam fundi partem, quam antea universam; Col. lib. iv. cap. iii.*

do. ‘ I cannot,’ says he, ‘ but produce one ex-  
 ‘ ample from antiquity, from which it may be  
 ‘ known, that it was a custom to charge persons  
 ‘ before the assemblies of the people for their  
 ‘ methods of culture, as well as other things,  
 ‘ and how these persons were in use to defend  
 ‘ themselves. C. Furius Cresinus, a freedman,  
 ‘ having much larger crops upon a small field  
 ‘ than his neighbours had upon their extensive  
 ‘ farms, was greatly envied, and accused of  
 ‘ withdrawing the produce of other people’s  
 ‘ fields by witchcraft. Being brought to a trial,  
 ‘ and fearing that he would be condemned, im-  
 ‘ mediately before the question was put, he pro-  
 ‘ duced in the forum all his labouring utensils,  
 ‘ and brought along with him a stout daughter,  
 ‘ and (as Piso says) well fed and clothed, his  
 ‘ iron tools of the most excellent construction,  
 ‘ large spades, heavy shares, and oxen in the  
 ‘ best order. Then he said, “ These, Romans,  
 “ are my charms; nor can I show you, or  
 “ bring into the forum, my night meditations,  
 “ my watchings, and my toils.” He was una-  
 ‘ nimously acquitted \*.’

These

\* Nequeo mihi temperare, quo minus unum exem-  
 plum

These passages that have been cited, show how much, in the opinion of the Romans, depended upon the presence and attention of the master. Every person knows, that these are important in every business; but every person does not know, that, perhaps, in no business are they so important as in farming. The most experienced and intelligent farmer has not arrived at such a perfect knowledge of his business, as to be able to determine, upon inspection, what is the real situation of his fields, and, in every case, whether they are fit for receiving the culture which must be given for the intended crop. It is not an  
 uncommon

*plum antiquitatis afferam, ex quo intelligi possit, apud populum etiam de culturis agendi morem fuisse, qualiterque defendi soliti sint illi viri. C. Furius Cresinus e servitute liberatus, cum in parvo admodum agello largiores multo fructus perciperet, quam ex amplissimis vicinitas, in invidia magna erat, seu fruges alienas pelliceret veneficiis. Quamobrem a Sp. Albino curuli die dicta, metuens damnationem, cum in suffragium tribus oporteret ire, instrumentum rusticum omne in forum attulit, et adduxit filiam validam, atque (ut ait Piso) bene curatam ac vestitam, ferramenta egregie facta, graves ligones, vomeres ponderosos, boves saturos. Postea dixit: Veneficia mea, Quirites, haec sunt; nec possum vobis ostendere, aut in forum adducere lucubrationes meas, vigiliaeque, et sudores; Plin. Nat. Hist. lib. xviii. cap. vi.*

uncommon thing to see farmers, in some seasons, begin to plough a field, and immediately give it up, upon observing the effects of the operation. A thing of this kind seldom happens with a person of skill in any other business; and it shows, that, when a farmer is not very attentive, and is not very frequently present with his servants, his fields will sometimes receive a culture in a situation in which such an operation ought not to have been performed: For servants, when left to themselves, must obey the orders given, without considering the consequences; of which, indeed, they are not judges. If this is the case with intelligent and attentive farmers, if they sometimes begin an improper culture in their fields, often must an improper culture be given to the fields of the most intelligent gentlemen farmers, who, not only from their situation in life, cannot give great attention to the state of their fields, but also, though they give orders, are seldom present with their servants in their operations. This so often happens, that, in every farm where the attention and presence of the master are wanting, there are some of the fields in which it may be observed, from their appearance, that they have received



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ceived some kind of culture in an improper situation.

There are some general maxims relating to this subject recorded by Pliny, and which, he says, were handed down from the ancients. ‘From them,’ says he, ‘these other maxims :  
‘He is a naughty husbandman who buys what  
‘his farm can produce to him : A bad master  
‘of a family who does in the day-time what he  
‘may do at night, except in the time of a storm :  
‘A worse, who does on common days what is  
‘lawful on holy days : The worst of all, who  
‘on a good day is employed more within doors  
‘than in the fields \*.’

It is certain, that industry in agriculture cannot be too much recommended. The advantages of it are well known ; when it is attended with proper oeconomy, it never fails to succeed. It is likewise certain, that there is scarcely any  
branch

\* *Inde illa reliqua oracula : Ne quam agricolam esse, quisquis emeret, quod praestare ei fundus posset. Malum patremfamilias, quisquis interdium faceret, quod noctu posset, nisi in tempestate coeli. Pejorem, qui pro festis diebus ageret, quod feriatis deberet. Pessimum, qui sereno die sub tecto potius operaretur, quam in agro ; Plin. Nat. Hist. lib. xviii. cap. vi.*

branch of agriculture brought to such perfection amongst us, that additional labour, if given with judgment, will not prove beneficial.

But, although the ancient Romans showed, by many of their maxims, that the culture of their lands required much labour, yet they were also of opinion, that the expence of labour might in many cases exceed the profit. To prevent this, they had a maxim which is mentioned by Pliny, but at the same time with very great caution; for he introduces it in this manner: ‘ It may seem rash to assert, perhaps it may appear altogether incredible, that the ancients should be unanimous in asserting, *that nothing turns out to less account than to give land a great deal of culture.*’ He gives, however, an instance of this. ‘ L. Tarius Rufus, a man of the lowest birth, but who deserved the consulship for his care in military affairs, acted in a manner very different from the ancient frugality; for a thousand *sestertia*, which he had gathered together, through the liberality of Augustus, he spent, and left his heir a bankrupt, by buying lands in Picenum, and cultivating them, for ostentation.’ Having told this story, he very naturally puts this question: ‘ Shall we con-

' clude, then, that a great deal of culture is fa-  
 ' mine and destruction?' To which he answers,  
 ' Yea, truly, it is my opinion, that a measure  
 ' in all things is best. To cultivate well is ne-  
 ' cessary; to cultivate in an extraordinary man-  
 ' ner is hurtful, except when a man's own fa-  
 ' mily, or the farmer, have no other thing to  
 ' do, and must be maintained. In any other  
 ' case, no master should collect his share of the  
 ' crop, if the expence of the labour is compu-  
 ' ted\*.' In support of the ancient maxim, he  
 further adds: ' Men ought not rashly to culti-  
 ' vate an olive garden, nor some soils diligently,  
 ' such as those in Sicily, by which they say stran-  
 ' gers are deceived †.' Having mentioned these  
 things,

\* This alludes to the manner in which some of the  
 Roman farms were set. The proprietor provided cattle  
 and utensils, and directed the way of labouring. The  
 farmer performed all the operations, and received a cer-  
 tain proportion of the produce for his trouble. Now Pli-  
 ny says, if the proprietor cultivated more for show than  
 profit, he should give up his share of the produce.

† The lands that Pliny had here in his view, it is pro-  
 bable, were those about Syracuse, which he mentions, lib.  
 xvii. cap. iv. ' In the lands about Syracuse,' says he,  
 ' a stranger farmer having cleared his ground of stones,  
 ' lost

things, he puts this question : ‘ In what manner, then, are lands to be cultivated to the best advantage?’ He answers, according to the oracle, ‘ In the cheapest manner, if it is good.’ The phrase used by Pliny signifies literally, ‘ By good bad things ;’ which, at first sight, appears to be a contradiction in terms ; and, therefore, that the persons who used it as a maxim deserved to be condemned. Pliny, therefore, sets himself to vindicate them, and adds : ‘ But it is just to vindicate our ancestors, who, in all their maxims, had a view to life ; for, when they

‘ lost his crop till he replaced them. *At in Syracusa agro advena cultor elapidato solo, perdidit fruges luto, donec regressit lapides.*’ This Pliny takes from Theophrastus, *de Caus. Plant.* lib. III. cap. xxv. ‘ which,’ says he, ‘ happened to him, who, coming from Corinth to Syracuse, continued to exercise the Corinthian culture in the Syracusan fields. And, when he had carefully gathered the stones from off his corn fields, rendered them much worse ; for the corn was burnt up, because, being deprived of the stones, it had nothing to protect it.’ *Quod illi evenerat qui ex Corintho Syracusas profectus, culturam Corinthii agri in Syracusano fervavit. Cum enim lapides e segete frugali legisset, reddidit multo deteriore ; frumentum enim exarescebat, cum, exemptis lapidibus, nihil haberet quo se posset protegere.*

## 212 OF THE HUSBANDRY

‘ they said *bad things*, they meant the cheapest,  
‘ Their greatest care was to do things at the  
‘ smallest expence. For these precepts were  
‘ taught by persons who condemned a general  
‘ for having ten pounds of silver in his trium-  
‘ phant equipage; who, upon the death of their  
‘ bailiffs, desired to leave their victories to re-  
‘ turn to their estates, whose lands the senate  
‘ undertook to cultivate, who continued to com-  
‘ mand the armies, the senate acting as their  
‘ bailiffs \*.’ From what Pliny here says, it is  
evident,

\* *Temerarium videatur unam vocem antiquorum po-  
uisse, et fortassis incredibile penitus aestimetur: Nihil  
minus expedire, quam agrum optime colere. L. Tarius  
Rufus infima natalium humilitate, consulatum militari in-  
dustria meritis, antiquae alias parsimoniae, circiter mil-  
lies H. S. liberalitate divi Augusti congestum, usque ad  
detractionem haeredis exhaustit, agros in Piceno coënen-  
do, colendoque. In gloria internecionem ergo famemque  
censemus? Imo Hercules, modum judicem rerum om-  
nium utilissimum. Bene colere necessarium est; optime  
damnosum, praeterquam sobole, suo colono aut pascendis.  
Alioqui colente domino aliquas messes colligere non expedit,  
si computetur impendium operae. Nec temere olivam; nec  
quasdam terras diligenter colere, sicut in Sicilia, tradunt.  
Itaque decipi advenas. Quonam igitur modo utilissime  
colentur agri? Ex oraculo scilicet, malis bonis. Sed de-  
fendi*

evident, that by *good bad things*, in this maxim, was meant the cheapest way, if it was good.

This precept of the ancients, here mentioned by Pliny, though it would be a great check to improvements, if carried too far, yet is certainly a very just and profitable one, when it is understood as meaning no more, than that all things should be managed with frugality and oeconomy; and needs particularly to be inculcated when improvements are carried on with rapidity.

As the Roman authors record a variety of maxims, transmitted down to them from their forefathers, so they mention many things necessary for the farmer to attend to, and be acquainted with, that so he may cultivate his lands to the best advantage. As these things regard agriculture in general, they fall naturally to be considered

fendi aequum est abavos, qui praeceptis suis prospexere vitae. Namque cum dicerent malis, intelligere voluere vilissimos. Summum providentiae illorum fuit, ut quam minimum esset impendii. Praecipiebant enim ista, qui triumphali denas argenti libras in supellectile crimini dabant; qui mortuo villico relinquere victorias, et reverti in sua rura postulabant; quorum praedia colenda suscipiebat respublica, exercitusque ducebant, senatu illis villicante; Plin. Nat. Hist. lib. xviii. cap. vi.

considered in this place. 'Whoever,' says Columella, 'would be perfect in this science, must be well acquainted with the qualities of soils and plants; must not be ignorant of the various climates, that so he may know what is agreeable and what is repugnant to each; he must know exactly the succession of the seasons, and the nature of each, lest, beginning his work when showers and wind are just at hand, his labour shall be lost. He must be capable to observe exactly the present temper of the sky and seasons; for these are not always regular, nor in every year does the summer and winter bring the same kind of weather, nor is the spring always rainy and the autumn wet. To know these things before they happen, without a very good capacity, and the greatest care to acquire knowledge, is, in my opinion, in the power of no man\*.'

To

\* Nam qui se in hac scientia perfectum volet profiteri, fit oportet rerum naturae sagacissimus, declinationum mundi non ignarus; ut exploratum habeat, quid cuique plagae conveniat, quid repugnet; siderum ortus et occasus memoria repetat, ne imbribus ventisque imminentibus opera inchoet, laboremque frustretur. Coeli et anni  
praesentis

To these things, mentioned by Columella, Virgil adds several others. ‘ Before we plough a field to which we are strangers,’ says he, ‘ we must be careful to attain a knowledge of the winds, from what points they blow at the particular seasons, and when and from whence they are most violent; the nature of the climate, which in different places is very different; the customs of our forefathers; the customs of the country; the qualities of the different soils, and what are the crops that each country and climate produces and rejects \*.’

These

praesentis morès intueatur; neque enim semper eundem, velut ex praescripto, habitum gerunt; nec omnibus annis eodem vultu venit aestas, aut hyems; nec pluvium semper est ver, aut humidus autumnus. Quae praenoscere sine lumine animi, et sine exquisitissimis disciplinis non quemquam posse crediderim; Col. lib. 1. Praef.

*Natura rerum* commonly signifies the *world*, or *universe*; but here this phrase probably signifies the nature or qualities of those things in which the husbandman is chiefly concerned, and which it is difficult to understand.

\* At prius ignotum ferro quam scindimus aequor,  
 Ventos et varium coeli praediscere morem  
 Cura sit, ac patrios cultusque habitusque locorum;  
 Et quid quaeque ferat regio, et quid quaeque recuset.

Virg. Georg. I. l. 50.

There



These things it is necessary that the farmer attend to. By these his principal operations are directed ;

There is a passage in Columella that explains what Virgil means here by the *varium morem coeli*. ‘ But, besides ‘ these,’ says he, ‘ the landlord should not be ignorant, ‘ that the quality of the climate has great influence, whether it is cold or hot, dry or wet, stormy or calm, cloudy ‘ or serene.’ *Sed et post haec non ignorabit dominus loci, plus posse qualitatem coeli frigidam vel calidam, siccam vel roscidam, grandinosam ventosamque vel placidam, serenam vel nebulosam ;* Col. lib. III. cap. 1.—By *patrios cultus*, some understand the kind of culture used in the country ; and by *cultus locorum*, the kind of culture used in particular places. But in these there seems to be little or no difference. If by *patrios cultus*, then, we are to understand the custom of the country in general, it is probable that, by *cultus locorum*, is meant the preceding management of the field that is to be cultivated. Perhaps, by *patrios cultus* is meant the maxims of the ancients ; and, by *cultus locorum*, the customs of the country ; and, by *habitus locorum*, the particular qualities of the situation and soil. There is a passage in Columella, that favours this interpretation : ‘ Wherefore,’ says he, ‘ as it is the business of a wise man ‘ not to buy in every part of the country, nor allow himself to be deceived by the charms of a fruitful soil, or a ‘ pleasant and agreeable situation ; so it is the business of ‘ a landlord to render the lands, that he buys or receives, ‘ fruitful and useful. To assist him in this, the ancients ‘ have

directed; and, therefore, they cannot be too often inculcated.

The

‘ have delivered many remedies for a bad climate, by  
 ‘ which its noxious qualities may be lessened; and, in a  
 ‘ barren country, the knowledge and diligence of the far-  
 ‘ mer can do a great deal to mend the soil; and these we  
 ‘ shall obtain, if we trust to the most excellent poet, as an  
 ‘ oracle, who says——’ Then follows the passage from  
 Virgil, already cited; after which he adds: And, not  
 even contented with the authority of the former or pre-  
 sent farmers, ‘ *Quapropter cum sit sapientis, non ubique e-*  
 ‘ *mere, nec aut ubertatis illecebris, aut deliciarum concin-*  
 ‘ *nitare decipi; sic vere industrii patrisfamilias est, quid-*  
 ‘ *quid aut emerit aut acceperit, facere fructuosum, atque*  
 ‘ *utile: quoniam et gravioris coeli multa remedia priores*  
 ‘ *tradiderunt, quibus mitigetur pestifera lues, et in exili*  
 ‘ *terra cultoris prudentia ac diligentia maciem soli vin-*  
 ‘ *cere potest. Haec autem consequemur, si verissimo na-*  
 ‘ *ti, velut oraculo, crediderimus dicenti,*

‘ *Ventos, et varium coeli praediscere morem*  
 ‘ *Cura fit, ac patrios cultosque, habitusque locorum,*  
 ‘ *Et quid quaeque ferat regio, et quid quaeque recuset.\**

*Nec contenti tamen auctoritate vel priorum vel praesentium  
 colonorum; Col. lib. i. cap. iv.*—Now, if we consider this  
 passage of Virgil, and compare it with the passage of Co-  
 lumella immediately before, we will observe, that *patrios*  
*cultos* of Virgil is explained by these words of Columella,  
*quoniam et gravioris coeli multa remedia priores tradiderunt,*

The making experiments is a thing very strongly recommended to the farmer by some of our authors. ‘Nature,’ says Varro, ‘has pointed out to us two paths which lead to the knowledge of agriculture, viz. experience and imitation. The ancient husbandmen, by making experiments, have established many maxims. Their posterity, for the most part, imitate them; we ought to do both, imitate others and make experiments ourselves, not directed by chance, but reason\*.’ ‘And not content-  
ed,

*et cultosque habitusque locorum*, by these, and *in exili terra cultoris prudentia ac diligentia maciem soli vincere potest*. Further, if we consider the passage in Columella that follows this passage of Virgil, we will observe, that *auctoritas priorum colonorum* refers to *patrios cultos*, and *auctoritas praesentium* to *cultos habitusque locorum*. That *habitus locorum* signifies the qualities of the soil, appears from another passage in Columella: ‘Such,’ says he, ‘are even the varieties of earth, and such the qualities of soil, that few know what it refuses and what it promises.’ *Jam ipsa terrae varietas, et cujusque soli habitus, quid nobis neget, quid promittat, paucorum est discernere*; Col. Praef.

\* Bivium enim nobis ad culturam dedit natura, experientiam et imitationem. Antiquissimi agricolae tentando pleraque constituerunt, liberi eorum maximam partem imitando. Nos utrumque facere debemus, et imitari alios,  
et

‘ ed, however,’ says Columella, ‘ with the au-  
 ‘ thority either of former or present farmers,  
 ‘ we should go beyond the examples which we  
 ‘ have, and try new experiments. This thing,  
 ‘ though sometimes it may be hurtful in some  
 ‘ places, yet, upon the whole, is advantageous ;  
 ‘ because no field is well cultivated without pro-  
 ‘ fit. At the same time, the possessor, by ma-  
 ‘ king trials, raises his land to the highest pitch  
 ‘ of fertility of which it is capable. This me-  
 ‘ thod, too, renders the most fruitful lands most  
 ‘ profitable.’ I have cited these passages, chief-  
 ly to introduce a direction that Columella gives  
 to those that make experiments, which ought  
 particularly to be attended to. Therefore, he  
 adds to what he had said before, ‘ A variety of  
 ‘ experiments are to be made, and these may be  
 ‘ particularly ventured upon in rich land, be-  
 ‘ cause the advantages arising from the culture  
 ‘ of such land never fail to answer the trouble  
 ‘ and expence \*.’ As making experiments is,  
 in

et aliter ut faciamus experientia tentare quaedam; se-  
 quentes non aleam, sed rationem aliquam; Varro, lib. 1.  
 cap. xviii.

\* Nec contenti tamen auctoritate vel priorum vel prae-  
 sentium

in general, the best way of improving agriculture, so this direction given by Columella is, in particular, most proper for rendering this practice useful, as the reason he gives for it is also most just. The richer that land is, the expence of the culture given to it bears always the smaller proportion to the value of the produce. Upon the richest land, therefore, where the expence bears the smallest proportion to the value, we can try experiments with the least danger, and commonly, too, with the greatest success.

I shall not pretend to determine, whether, in making experiments in agriculture, the preference ought to be given to the ancients or to the moderns. When we consider the maxims of the ancients, founded upon their experiments,

we

*sentium colonorum, nostra praeter miserimus exempla, novaque quae tentaverimus experimenta. Quod etsi per partes nonnunquam damnosum est; in summa tamen fit compendiosum, quod nullus ager sine profectu colitur: simul attendendo possessor efficit, ut in id formetur, quod maxime praestare possit. Ea res etiam feracissimos agros utiliores reddit. Itaque nusquam experimentorum varietas omittenda est: longeque etiam in pingui solo magis audendum, quoniam nec laborem nec sumptum frustratur effectus; Col. lib. 1. cap. 14.*

we must be convinced, that, in making these, they were very careful and attentive. The maxims, founded upon the experiments of the moderns, are not, I am afraid, of such importance, neither are they so numerous. To render experiments of any use, such a knowledge of the practice of agriculture, such care and attention are necessary, as few of our modern experiment-makers are possessed of, or can give: At least, in these things, it must be confessed, that they are greatly inferior to the first Roman farmers, whose capacity is well known, whose army depended upon their industry, and whose whole care and attention were confined to the culture of a very few acres.

It may not be amiss, upon this occasion, to mention in what manner useful experiments ought to be made, not only because this may be of advantage to the persons who are disposed to make experiments, but also because it may enable us to judge of those with which the world is already favoured.

Experiments are of two kinds, which may be called simple and comparative. All experiments, indeed, properly speaking, are comparative; for every person that makes an experiment  
has

has always something in view, with which he proposes to compare the event, that so he may know whether the kind of husbandry tried is good or bad. But, by a simple experiment, is meant the trial of a method of husbandry different from the methods used in the country. In this case, the event of the experiment is compared with the events of the common practices in this article; and, as the one is better or worse than the others, the kind of husbandry tried is judged to be good or bad. By a comparative experiment, is meant a trial of two different kinds of husbandry, the events of which to be compared, that so a judgment may be formed, which of the two ought to be preferred. Now, it may be asserted, notwithstanding the confidence with which some persons talk of experiments in agriculture, that almost all of them are fallacious; and that the farmer is as much in danger of being misled by the manufacturer of experiments as by the theorist. In making experiments in agriculture, though persons are very careful, yet it is almost impossible to attend to every circumstance with such exactness, as to determine whether or not the proper culture has been given; and, without this, a just conclusion cannot

cannot be drawn. The success of any culture given depends upon a variety of circumstances: the situation of the land from former management; its particular situation when ploughed, sown, and harrowed; the kind of weather that follows these operations; and the nature of the season in which the experiment is made. In a simple experiment, it requires great experience, as well as attention, to determine whether these circumstances have been more favourable or unfavourable than ordinary; and whether justice has been done in timing and adapting to them the several operations. And, in a comparative experiment, it is very difficult to determine whether the circumstances have been equally favourable or unfavourable to both crops, or whether, in the several operations, equal justice has been done. Some persons may alledge that this is refining too much; and that, in making experiments of either kind, it is in the power of the farmer to judge as exactly as is necessary. But these persons are unacquainted with the influence of circumstances in things of this kind. Every attentive farmer acknowledges, that the crops upon some of his fields are frequently much better, and upon others much worse,



worse, than he expected; and that, even upon reflection, he cannot always account for these events. This shows what effect circumstances have, and how far we are as yet from knowing how to manage these to the best advantage. Hence it is that experiments are so defective, and turn out so differently in different hands, soils, and seasons. I do not mention this to discourage persons from making experiments, but to prevent them from being too hasty in drawing conclusions from them, to engage them to be very attentive to the minutest circumstance, and to persevere for some years in any scheme from which they have reason to expect success. It is this perseverance that renders experiments useful; for, when a practice is continued for a course of years, circumstances must have been both favourable and unfavourable; and if, notwithstanding this, it has succeeded, no doubt can remain of its utility.

I observed, in the beginning of this chapter, that, amongst the Gothic nations, no regard is paid to the maxims established by former ages. We have not, indeed, much reason to do this in Britain, as it is well known that agriculture was, till the present century, but in a wretched situation.

situation. However, some persons are apt to carry too far their contempt of established maxims, and to consider our forefathers as men incapable of making any just observations, who followed each other in the same beaten track, without attempting the smallest variation. But, if human nature is the same in all ages, and if it is by civilization alone that one age is distinguished from another, it must be acknowledged that our forefathers would give as great attention to husbandry, and study its improvement, as much as their situation and circumstances allowed. One of the principal parts of agriculture is the knowledge of adapting its several operations to the soil, climate, and weather; and this knowledge may be acquired by a man of plain sense, who is capable to give attention to the nature of his operations, and the effects which they produce. This certainly has been done; and hence it is that, in every corn country, there are established maxims and practices that have a relation to those things. To observe all these maxims, or to follow all these practices, would no doubt be absurd; but it is no less absurd to reverse, or even entirely to despise them. They certainly merit so much re-

gard as to engage us to inquire into the reasons of their establishment ; and, in this inquiry, we should particularly have in view their relation to the things mentioned, the soil, climate, and weather. If we do this, we will probably find, that even those maxims and practices which appear most absurd were well founded, and real improvements when introduced and established, though perhaps, from a change of circumstances not attended to, are now become improper or insignificant. To reverse old practices, without knowing the reasons of their establishment, is always dangerous, and has often proved fatal. To confirm this, I might mention a variety of unsuccessful attempts that have been made to introduce the agriculture of the southern countries of this island into the northern, and even the culture of the lands on the eastern shores of it into those of the western. But, if men once know the relation of established practices to the situation of the country, they have it then in their power to determine what kind of new practices may be introduced, and what changes the practices of one country must undergo to accommodate them to the situation of another. To illustrate this, it will not be improper to produce

duce an instance. In some parts of the kingdom, it is an established maxim, not to begin to plough after a crop till the winter is over. Now, should any person, without inquiring into the reason of this maxim, attempt to introduce the husbandry of a different part of the kingdom, he would find the attempt attended with very great difficulties, and an entire stop frequently put to his operations. But, if he is at pains to inquire into the reason of this maxim, and finds, that the quantity of rain that commonly falls in winter renders ploughing improper, then, by casting drains in all proper places, and by ploughing in autumn, in such a manner as to allow water the easiest passage from his fields, as best to secure the soil from being carried off, and best to expose it to the sun and wind, he will probably find his lands in a fit situation for being ploughed, when the lands under a different management are too wet; and hence may have it in his power to introduce a different scheme of management, and perhaps, too, with a few variations, the husbandry of a very different climate.

## C H A P. VI.

*Of schemes of Management, and the succession of Crops.*

**B**Y schemes of management, we mean the crops that are cultivated, the culture given them, and the order in which they succeed each other. In Britain, we have a variety of schemes of management; we have successions of different crops, and we have the same crops succeeding each other, in different orders. It was so likewise among the Romans; and their different schemes were adapted to their different soils.

When the soil was very good, what they called *terra tenera*, or *pulla*, or *putre solum*, they raised several different sorts of crops in succession. Pliny mentions two schemes in this rich soil: 'That kind of soil,' says he, called *tenera*, may be cropped in this manner; barley, millet, radish, and then barley again, or *triticum* as in  
 ' Cam-

‘Campania\*.’ For one of these crops, the land was always dunged, probably the millet; for  
 Pliny

\* Si fuerit illa terra, quam appellavimus teneram, poterit sublato hordeo milium feri; eo condito, rapa; his sublatis, hordeum vel triticum, sicut in Campania; Plin. Nat. Hist. lib. xviii. cap. xxiii.

Whether this succession of crops, and taking sometimes barley and sometimes wheat, was the practice in Campania, or whether it was the practice in that country to have always wheat in the place of barley, is not certain from Pliny’s words; probably the last is intended. Neither is it absolutely certain, that Pliny does not propose that the three crops first mentioned shall be reaped all within the year. In some passages in the preceding chapter, he mentions lands in Africa that carried several crops within the year; and, whether it is his design to show, in the passage under consideration, that something like this might be produced in Italy, is uncertain. From the nature of the crops mentioned, it appears possible. The early barley was sometimes reaped in May; in this month the millet was sometimes sown, and on the field too from which barley had been reaped. Pliny, in his kalender for May, says: ‘In the end of this month, is the time of sowing panic and millet: These are sown when the barley is ripe, and even on the same field.’ *Extremo autem hoc tempore panici miliique fatio est. Iustum est hoc feri maturato hordeo, atque etiam in eodem arvo;* Nat. Hist. lib. xviii. cap. xxvi. The millet  
 was

Pliny mentions this among the crops to which dung was always applied \*. In this succession of crops, there was no fallow intervening; and Pliny observes, that it was sufficient to plough the land immediately before, or when it was sown †.

A crop of *far* and of spring beans alternately, was another scheme of cropping upon the same kind of soil: 'Another order of cropping,' says Pliny, 'after a crop of *far*, let the land rest ' during the four winter months, and then be ' sown with the spring bean, that so it may ' not rest till next winter, but carry a crop eve-  
' ry

was ready in July, and in this month raddishes were sown, which might afford a good crop to be pulled in November, the time of the barley seed. However, though it was possible to reap these three crops from the same field within the year; yet it is probable, that it is our author's meaning, that these three crops succeeded each other in the order mentioned, not in the same year, but in three different years; and the rather, as he mentions another scheme upon the same rich land, in which it is evident, that the two crops were reaped, not in the same, but in two different years.

\* *Milium, panicum, rapa, napus, nisi in sterco rato non ferantur*; Nat. Hist. lib. xviii. cap. xxiii.

† *Satisque talis terra aratur, cum feritur*; id.

‘ry year\*.’ In this scheme, Pliny certainly supposes that dung is applied either to the one crop or to the other. Columella says, that, when beans are sown upon land that has carried a crop the year immediately preceding, dung must be applied †. And Pliny himself says, a little after the passage cited, that, even when beans are sown upon land that has not carried a crop, it must have been lately dunged ‡.

Land

\* Alius ordo, ut ubi odoreum fuerit, cesset quatuor mensibus hibernis, et vernam fabam recipiat, ita ut ante hiemalem ne cesset: id. The grain called *far* was also called *adoreum*, and sometimes *far adoreum*; see chap. xxix. of the culture of *far* and *triticum*.

† Sin autem proximae messis occupandam erit restibile, defectis stramentis, quatuor et viginti vehes stercoris in iugerum disponemus; Col. lib. ii. cap. x.

‡ Item in novalibus, tametsi in illis fabam feri volunt, eandem ubicunque quam recentissime stercorato solo; Plin. Nat. Hist. lib. xviii. cap. xxiii. The kind of land upon which Pliny here supposes the beans to be sown, he calls *novalis* or *novale*: I shall have occasion afterwards to inquire into the meaning of this word, and show what kind of land was commonly called by this name; all that is necessary at present, is to give Pliny’s own explication of it: ‘*Novale*,’ says he, ‘is that which is sown every other year; *Novale est, quod alternis annis feritur*?’ lib.



Land that was treated in this manner, and carried a crop every year, was not very common; it was found chiefly in Campania, the country which was reckoned the most fertile of any in Italy. Pliny mentions a very extraordinary field in it, which, as it carried a crop every year, and more valuable crops too than those that have been mentioned, falls naturally to be taken notice of in this place. Treating of the *alica*, he says; ‘ This most excellent of fields, ‘ is peculiar to Italy. It is indeed raised in E- ‘ gypt, but of a contemptible kind. In Italy, ‘ it is raised in many places, particularly on the ‘ lands about Verona and Pifa, but in Campania ‘ it is most excellent. There is a field lying ‘ under a ridge of stormy mountains, in a plain ‘ of forty thousand paces each way. To describe ‘ immediately

xviii. cap. xix. The land which carried a crop every year, such as that land upon which the scheme is mentioned, in the above cited passages were prosecuted, was called *restibilis*: ‘ That,’ says Varro, ‘ which may be ‘ sown every year, which is called *restibilis*; *quae quotan- ‘ nis obfita fit, quae vocatur restibilis;*’ Var. lib. i. cap. XLIV. And, wherever this word is used, it always signifies land that either carried a crop every year, or, from its richness, was considered as capable of doing this.

' immediately the nature of the soil; the earth  
 ' on the surface is dusty, below it is spongy and  
 ' porous like a pumice stone; it receives bene-  
 ' fit from the storms on the mountains, for they  
 ' strain and transmit to it the rain that falls up-  
 ' on them in frequent showers; yet its being  
 ' thus washed and moistened does not render  
 ' it more easily cultivated; for, having received  
 ' this moisture, it sends it to no fountains, but  
 ' preparing and ripening it into juice, retains it  
 ' within itself. It is sown every year, one year  
 ' with panic, and two with *far*; and likewise  
 ' such of the fields as are allowed to rest betwixt  
 ' crops, produce roses more fragrant than those  
 ' that are planted\*; so that this land never  
 ' ceases to bring forth a valuable crop: Whence  
 ' the common proverb, that there is more per-  
 ' fume in the fields of Campania, than oil in  
 ' the other fields of Italy. It is reckoned, that  
 ' so far as all other fields are excelled by those  
 ' of Campania, so far the other fields of Cam-  
 ' pania are excelled by this field, which is call-  
 ' ed *Laboriae*, and by the Greeks *Phlegraeum*.

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\* As panic is a summer grain, the land may be said to rest betwixt the reaping of the *far* in July, and the sowing of it in May.

‘ It is bounded on two sides by consular ways,  
 ‘ the one leading from *Puteoli*, and the other  
 ‘ from *Cannae* to *Capua* \*.’

This

\* *Quae palma frugum indubitata Italiam contingit. Fit sine dubio et in Ægypto, sed admodum spernenda: In Italia vero pluribus locis, sicut Veronensi Pisanoque agro; in Campania tamen laudatissima. Campus est subjacens montibus nimbofis, totis quidem xl. M. pass. planitie. Terra ejus (ut protinus soli natura dicatur) pulvereæ summa, inferior bibula, et pumicis vice fistulosa: Montium quoque culpa in bonum cedit. Crebros enim imbres percolat atque transmittit: Nec dilui aut madere voluit propter facilitatem culturae. Eadem acceptum humorem nullis fontibus reddit, sed temperat, et concoquens intra se vice succi continet. Seritur toto anno, panico semel, bis farre. Et tamen vere segetes, quae interquievere, fundunt rosam odoratiorem fativa: Adeo terra non cessat parere. Unde vulgo dictum, plus apud Campanos unguenti, quam apud caeteros olei fieri. Quantum autem univcrsas terras campus campanus antecedit, tantum ipsum pars ejus, quae Laboriae vocantur, quem Phlegraeum Graeci appellant. Finiuntur Laboriae via ab utroque latere consulari, quae a Puteolis, et quae a Cumis Capuam ducit; Plin. Nat. Hist. lib. xviii. cap. xi. *Nec dilui aut madere voluit propter facilitatem culturae; I have rendered; Yet its being thus washed and moistened, does not render it more easily cultivated.* This is different from the explication given by the commentators: ‘ There is no need of water,’ say they,*

This soil indeed must have been very good, to carry two crops of *far*, and a crop of *panic*, in a constant

they, 'to render it more easily cultivated; for a soil that 'is dusty, spongy, and porous, yields to the ploughman 'and plow.' But the explication which I have given of this passage, is necessary to make Pliny consistent with himself; for, in another place, speaking of this field of Campania, he represents it as very ill to plough, and very hard upon the ploughman: 'Among the evidences,' says he, 'of good land, is the grossness of the straw, 'which in the Laboriae, that noble field of Campania, is 'used in place of wood: But the same soil every where 'is severe in working, and difficult to cultivate, and being in a manner more severe by its good qualities, than 'it can be by its vices, vexes the farmer.' Inter argumenta stipulae crassitudo est, tanto alioqui in Laborino Campaniae nobili campo, ut ligni vice utantur. Sed idem solum ubicunque arduum opere, difficile cultu, bonis suis acrius paene quam vitis posset, affligit agricolam; Plin. Nat. Hist. lib. xvii. cap. iv. The last sentence of this passage shows, that the difficulty of cultivating this land, did not arise from the stiffness of the soil, but from some of its good qualities. Pliny says, that it received benefit from the water that came from the hills; this water easily passed through the upper part of the soil, which is represented as dusty, and would lodge in the spongy part, which is intimated by calling the under part *bibula*. Now, as this water did not make its way to any  
fountains,

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constant rotation. Those crops are much severer than barley or wheat, and millet, and radish, the crops sown upon the *tenera*, in the first scheme of management mentioned by Pliny; and indeed must have required very good soil to produce them.

When the land was not quite so good as that kind called *tenera*, they had a crop of corn, a crop of beans, and a crop of pulse: 'A less rich soil,' says Pliny, 'may have a succession of crops in this manner; after a crop of corn, pulse may be sown in the third year\*.' As he has mentioned *far* and spring beans sown alternately immediately before, it is probable, that he means here, that *far* and beans shall likewise be sown upon this kind of soil, with the addition of pulse for a third crop in the third year: This scheme is much easier for the land than the other, as the crop of *far*, which is the severest, does not so frequently return, and as

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fountains, but lodged in the lower part of the soil, the cattle would sink down in ploughing, which would make the work very severe.

\* Nec non nimis pinguis alternari potest ita, si frumento sublato legumen tertio feratur; Plin. Nat. Hist. lib. xviii. cap. xxiii.

a crop of pulse, especially if cut for forrage, is not so severe as a crop of beans. In this scheme, for the reasons already mentioned, it is natural to suppose, that dung was either applied to the crop of *far*, or the crop of beans.

In soil not quite so good as the kind mentioned last, they had two crops with a fallow, a crop of *far* probably, and a crop of beans or pulse; a poorer soil, says Pliny, rests on the third year \*. His meaning seems to be, that the fallow is introduced in the place of the crop of pulse on the better soil, so that the two crops were *far* and beans.

Varro mentions, as a practice in Olynthia, the having crops every year without fallow; an inquiry is made, whether the best crop may be expected from newly broken up land, or from land so good as to carry a crop every year, or from land that sometimes carries a crop, and is sometimes fallowed †: In this inquiry, it is first observed,

\* Gracilior, et in annum tertium cesset; Plin. id.

† The land that carried a crop every year, is called *resibilis*, and the word is explained in this passage (see the following note.) It is made the alternative to *vervullum*; but it is the *novale* that is properly the opposite to *resibilis*.

However,

observed, that, in Olynthia, the land carries a crop every year, but is so managed, that in the third year it carries a more valuable crop; so that, it seems, they had two crops of pulse, or something

However, it must be observed, that Varro does not say that the land that sometimes rests is called *vervacum*, as the generality of the commentators seem to think; he only mentions a crop sown upon the *vervacum*, of that kind of land that sometimes rests. Pliny informs us what kind of land is called by this name: 'Land,' says he, 'when once ploughed in the spring, is called *vervacum*, 'from the season in which it is ploughed.' Quod vere femel aratum est, a temporis argumento vervacum vocatur; Nat. Hist. lib. xviii. cap. xix. Hence, fallow after it has got the first ploughing, always receives this name. The passage then in Varro, under consideration, may be thus translated: 'It is a matter of some importance, to know upon what kind of land the best crop may be expected, whether upon land that is newly broke up, or upon that kind of land which carries crops every year, and is prepared for a crop of corn; or upon land that sometimes rests when it is fallowed. To which Agrius replies, it is said that, in Olynthia, there are fields that carry crops every year, but are so managed, that they carry the more valuable crops only once in three years. Licinius subjoins; It is necessary that land be allowed to rest every other year, or that it be sown in the year in which it should rest with less severe crops, that is, such as draw least nourishment from the earth.'

thing of the same kind, and one crop of corn in constant succession. The second thing observed in this inquiry is, that it is proper to let land lie fallow every other year, or, if sown every year, that it be with crops that are very easy, and draw little nourishment from the soil\*.

But, although there were some lands in Italy that were constantly cropped, or at least, that carried two or more crops in succession without a fallow; yet the ordinary scheme of management seems to have been, to fallow and crop alternately. This Varro mentions in the passage above cited; and this also Columella takes notice of: ‘*Far* and *siligo*,’ says he, ‘require land that is fallowed, and carries a crop alternately †.’ It is a general direction given by Virgil,

\* Illud quoque multum interest in rudi terra, an in ea feras, quae quotannis obrita sit, quae vocatur *restibilis*; an in vervaeto, quae interdum requierit. Cui Agrius, In Olynthia quotannis *restibilia* esse dicunt, sed ita ut tertio quoque anno uberiores ferant fructus. Licinius, Agrum alternis annis relinqui oportet, aut paullo levioribus fatiōnibus ferere, id est, quae minus sugunt terram; Var. lib. i. cap. XLIV.

† Atque illa (*siligo et far adonum*) vicibus annorum requietum, agitatumque alternis, et quam laetissimum volunt arvum; Col. lib. ii. cap. ix.



gil, to allow the corn fields to lie fallow after every crop : He says ; ‘ allow the *novalis*, after reaping, to lie idle every other year ; and, if the land is bad, let it harden by resting\*.’ This direction given by Virgil, is cited and recommended by Pliny, when the extent of the farm allows : ‘ Virgil,’ says he, ‘ directs that the fields lie idle every other year ; and this, if the extent of the farm allows, is without doubt the most advantageous †.’

On every farm, a great quantity of pulse was sown ; some of this pulse was cut green for the labouring cattle in May, and the beginning of June. These crops, particularly when cut green, do very little hurt to the soil ; and therefore, after

\* *Alternis idem tonfas cessare novalis ;*

*Et segnem patiere situ durefcere campum ;*

*Vir. Geo. I. v. 71.*

The *novalis* properly, were the fields that had carried a crop, before they were ploughed for another : ‘ It is called *novalis*,’ says Varro, ‘ which has been sown before it is brought again into tillage.’ *Novalis, nbi factum fuit antequam secunda aratione renovetur ;* Var. lib. 1. cap. xxix.

\* *Virgilius alternis cessare arva suadet ; et hoc si patiantur ruris spatia, utilissimum procul dubio est ;* Plin. Nat. Hist. lib. xviii. cap. xxi.

ter them, good crops of corn were expected; agreeable to this, we find that it was a practice to sow corn after such crops: Virgil gives a direction to this purpose; ‘Or, says he, *far* may be sown, changing the ordinary seed time, upon land that has carried a crop of beans, vetches, or lupines\*.’ To the same purpose, Pliny, after observing that it was Virgil’s opinion that land should rest every other year, adds: ‘If the situation of the farm does not allow this, *far* may be sown after a crop of lupines, vetches, beans, or any of the crops that better the soil †.’

There were some other crops besides corn raised by the Romans, that were reckoned very hurtful to the soil; when these were raised, they did not sow corn after them, except the land

was

\* Aut ibi flava feres, murato sidere, farræ,  
Unde prius lætū siliquæ quassante legūmē,  
Aut tenuis foetus viciæ; tristisque lupini  
Sustuleris fragiles calamos, silvamque sonantem.

Vir. Geo. I. L. 73.

† Quod si neget conditio, far ferendum, unde et lupinum, aut vicia, aut faba sublata sunt, et quæ terram faciunt lætiorē; Plin. Nat. Hist. lib. xviii. cap. xxi.

was both fallowed and dunged: 'A crop of  
 ' lint,' says Virgil, ' or oats or poppy, impove-  
 ' rishes the soil; however, these crops are less  
 ' severe, when the land is fallowed before and  
 ' after them, and when the farmer is not asha-  
 ' med to lay plenty of rich dung upon the land,  
 ' if naturally poor, and nasty ashes upon the land,  
 ' if worn out by cropping \*.'

The forming proper schemes of management, and adapting them to the different soils, is one of the most important things in agriculture. The crops we raise are very different in their culture, some are sown at one season, and some at another; some are very easy, and some very hurtful, to the land in which they are raised; the produce of some is of great value, and the produce of others, though the crop is good, turns out but to a small account: And this difference in the value does not always bear a proportion to the hurt done by them to the soil.

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\* Urit enim lini campum feges, urit avenae;  
 Urunt Lethaeo perfusa papavera somno.  
 Sed tamen alternis facilis labor; arida tantum  
 Ne faturare fimo pingui pudeat sola; neve  
 Effoetos cinerem immundum jactare per agros.

Vir. Geo. I. L. 77.

This makes it necessary to attend to the natures of the different crops, that so we may not only adapt them to the different soils, but also may know how to make them succeed each other in the manner most proper for saving the land, and raising the value of the produce. It is necessary likewise, that as great a variety of crops be introduced as is possible, that so, when we are disappointed in the one intended, or some accidents render it impossible for us to give the proper culture, we may have recourse to another to supply the deficiency, which it is in our power to cultivate properly. In a particular manner, we should be at the greatest pains to introduce crops that are easy to the land, and which at the same time have a valuable produce; and this should be done, though these crops require a very nice culture; for, though this may occasion some disappointments at first, yet the difficulties will be overcome, and the other crops will be benefited by the care and exactness which the crops of difficult culture introduce. In Italy, they had a great variety of crops, arranged in a variety of different ways in their schemes of management. In the south part of Britain, there is likewise variety of crops cultivated.

cultivated. In Scotland, there were very few till of late: These lately introduced are of the kind I have mentioned, and have fully discovered their usefulness: In many places of the country, the great benefit of the several roots, greens, and sown grass, cultivated among us is well known. These crops, at least some of them, require a more attentive culture than those that were cultivated formerly; but they are crops easy to the land, and at the same time very valuable. The more then that the culture of these crops is extended, the more frequently that they enter into our schemes of management, it may be expected that agriculture will be the more improved.

But, although our schemes of agriculture need still to be improved, yet we ought to be cautious in receiving any particular scheme, however plausible it may at first sight appear. In books of agriculture, we may observe that nothing is more common, than to insist upon, and recommend schemes of management, without any regard to situations and circumstances. We find calculations made, and accounts of profits and loss stated; and from these, the great advantages of the scheme proposed, above all others, render;

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ed in appearance most conspicuous: Things of this kind are not more common than deceitful; instead of improving agriculture, they are most hurtful to the practice of it: For the persons misled by them, become either wholly disgusted with agriculture, or reject every thing that has the appearance of novelty. Instead, therefore, of recommending any scheme as the best, I would rather call the attention of the farmer to situations and circumstances, as things the most proper for directing his judgement.

A farmer, when he enters to a farm, or proposes to alter his scheme of management, should first consider whether his fields are in good or bad order: If in bad order, he must inquire into the cause of this, whether they are foul from bad ploughing, or poor from good ploughing and severe cropping. According to the difference of circumstances in these respects, the scheme of management should be different: If the fields are foul, whatever are the crops proposed, frequent complete fallowings must be introduced, as the only effectual method of destroying weeds; but, if the fields are poor, plenty of rich manure must be provided, or they must be allowed to lie in grass till they recover.

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These things are necessary to bring the fields into proper order; and, when this is effected, other circumstances must be attended to. The farmer should next consider what is the nature of his soil, whether it is rich or poor, wet or dry, stiff or free, deep or shallow: For the knowledge of this should determine, not only the kind of crops that ought to be introduced into his scheme, but also the manner in which these crops should be arranged. To give a few instances, let us suppose, that the soil is rich, free, dry, and deep: This is indeed the best of all soils, is the least of all affected by accidents, and allows the greatest variety in the management: The farmer, therefore, who has the good fortune to cultivate soil of this kind, may use great freedom with it. However, it is best adapted for crops of beans, barley, and grass; and these, in his scheme of management, he ought to have particularly in view. Let us suppose next, that the soil is rich, stiff, wet, and deep; this is likewise a good soil for corn; but it requires more attention in the management, and the times of ploughing to be more carefully adjusted: On this soil, wheat should be considered as the principal crop in the rotation; beans likewise answer

swer very well, provided the land is in such good order, as to render one ploughing only necessary after wheat; but, if an autumn ploughing is necessary, the spring may be too far advanced for sowing, before the land is dry enough to admit its being properly ploughed. No kind of soil is more proper than this for oats and broad clover; but, although it carries likewise most excellent pasture grass, yet this cannot be so properly brought into a scheme of management in this kind, as in free and dry soils; because too many years are required to bring the grass to perfection. Let us farther suppose, that the soil is poor, dry, free, and deep: These are commonly the qualities of sandy soils, in the management of which great freedom may be used. Attention, however, ought to be given to the kinds of crops introduced; and the farmer, in forming his plan, ought to have particularly in view barley and roots with winter spring pasturage. Once more, let us suppose, that the soil is poor, stiff, wet, and shallow: This is the most ungracious of all soils, and is commonly called a thin weeping clay: It is too wet for being properly ploughed in winter, it too suddenly dries in spring, and too strongly



strongly resists the showers of summer. The returns from this soil are so small, that, in the management, great care must be taken to save expence in every thing, except in the purchase of manure; when this can be obtained, crops of wheat, or winter barley, may be raised upon fallow. Although this soil is not fit either for hay or pasture, yet a considerable part of the farm must be in grass, that so the quantity in tillage may be kept in tolerable order. Frequent fallowings are necessary, and oats ought to be the principal crop.

Situations and circumstances ought not only to determine the principal crops, to be cultivated in a scheme of management, but also the arrangement of the crops. Suppose, for instance, that a farmer proposes to break up a rich field, that has been for several years in grass, and to take four crops with a fallow, that is, a crop of wheat, a crop of barley, a crop of oats, and a crop of beans: Now, these crops ought to be arranged according to the nature and situation of the soil. If the soil is wet, the arrangement should be made so as not to require ploughing in the middle of winter, so as to make the spring ploughings upon firm land, which is sooner dry  
than

than that which is loose, and to place the fallow immediately before the last crop, that so the land may be laid off clean and in good heart. The natural arrangement, therefore, is first a crop of oats, for which the land, if stiff, should be ploughed before winter, and with a shallow furrow. After the crop of oats, beans ought to be sown; in ploughing for which, in spring, the cattle tread upon firm land; after the beans, a crop of wheat, the ploughing for which is in autumn; after the wheat fallow, which ought to be ploughed in autumn, so as best to prevent the field from being hurt by the rains of winter, and best to expose the soil to be mellowed by the frost. Upon the fallow, spring barley with grass seeds. If the soil is dry and free, the arrangement should be made in a different manner. Land naturally stiff cannot be too much reduced to receive grass seeds; but land naturally free cannot, when much reduced, prevent barley from lodging, and this effectually destroys grass seeds when sown with it. The proper arrangement, therefore, of these crops in this kind of soil, is oats, fallow, wheat, beans, and barley. Some crops intervening betwixt the barley and fallow, prevent it from be-

ing lodged, and the ploughings commonly given for this kind of crop, naturally clear the soil of the weeds encouraged by the intervening crops. A variety of instances of this kind may be produced ; but those mentioned may suffice to show, that the farmer ought to regulate himself according to situations and circumstances ; and indeed the person who does so, who considers the nature of his soil, and the situation of his lands, and who carefully endeavours to adapt the whole of his operations to these, will be successful ; while the one who gives no attention to these will as certainly be disappointed, though he should prosecute the best scheme of management that genius can devise.

Before this article is concluded, it may not be amiss to observe, that one of the schemes, upon good land, mentioned by Pliny, has been tried upon some of our rich soils in Scotland, viz. the sowing wheat and beans alternately, in a continued succession. But, though this scheme answered very well for ten or twelve years, yet it was at length found, that the couch or quickening grass was so much encouraged, and the land had become so foul, as to render a summer fallowing absolutely necessary. This  
arises

arises from the nature of our climate; at the same time, it is probable, that it did not happen in ancient Italy: In it, both wheat and beans were reaped and removed from the field in the month of June; this put it in the farmer's power to give his land some ploughings in dry weather, for each crop; and by these, root-weeds, in that climate, may be effectually prevented from becoming hurtful. In this country, things are in a different situation; neither wheat nor beans are carried from our fields till September; so that one ploughing only can be given for wheat; and, though more than one may be given for beans, yet none of them in such a season as to be of any use to destroy couch grass. It is impossible, therefore, to prosecute a scheme of this kind to great advantage in this climate: But, if the farmers that try this scheme would introduce a complete fallowing every fifth year, it is probable, that, in the present situation of affairs, it will turn out one of the most beneficial schemes that has been attempted.

## C H A P. VII.

*Of the Care of the Romans in Manuring,  
and the Particulars used for this Purpose.*

**T**HE use and good effects of manure are confirmed by the experience of all ages, and all nations acquainted with agriculture. The practice of manuring is very ancient: ‘There are,’ says Pliny, ‘many different kinds of dung; the thing itself is very ancient.’ In Homer, an old king is found manuring his fields with his own hands. King Augeas is said to be the first who found out the use of manure in Greece; but Hercules that published it in Italy, where immortality is given to Stercutius, the son of Faunus, for the invention\*.

The

\* Fimi plures differentiae: Ipsa res antiqua. Jam apud Homerum regius senex agrum ita suis manibus leatificans reperitur. Augeas rex in Graecia excogitasse traditur; divulgasse vero Hercules in Italia, quae regi suo Stercutio

Fauni

The effects that the dung of cattle has upon the places where they pasture, would soon be observed, and would naturally lead men to try this as a manure upon their corn fields. As soon as it became a practice to litter cattle, or to feed them in any confined place with straw or hay, the use of these articles as manures would soon be introduced; and a little reflection would soon point out to men, that all animal substances, being only richer kinds of vegetables, would, by corruption, be reduced to powerful manures. The ancients were very attentive to this article: They considered the application of manure as one of the principal operations of agriculture, and place it next to plowing\*. They were so sensible of the advantage

Fauni filio ob hoc inventum immortalitatem tribuit; Plin. Nat. Hist. lib. xvii. cap. ix.

† Theophrastus, after observing that ploughing is the first and most important operation in agriculture, adds: ‘Then it is necessary to dung well.’ Jam stercoresse bene, et alium atque alium cultum adhibuisse; de caus. plant. lib. iii. cap. xxv.

Cato, in like manner, represents the importance of manuring: Quid est agrum bene colere? bene arare. Quid secundum? arare. Tertio stercoresse; Cat. cap. lxi. Pli-  
ny

tage arising from manuring their fields, that they were very careful in finding out and collecting such things as were found proper for the purpose: They carefully gathered the dung of their cattle; they carefully littered their cattle with straw or stubble, which was carried with the dung to the dung-hill: They collected all kinds of ashes, they used different kinds of earth, they burned trees, shrubs, and stubble, in their fields; and they frequently sowed pulse to be ploughed in while green. There are some passages in Cato and Columella, that show with what care all kinds of dung, and all other things fit for manure, were collected: ‘ You may make ‘ manure,’ says Cato, ‘ of these things, stubble, ‘ lupines, straw, bean stalks, chaff, holm, and ‘ oak leaves. From the corn fields pull out ‘ dwarf elder, hemlock, and all the tall grass ‘ and reeds in the willow plantations, and lay ‘ them below the sheep and cows \*’ ‘ I am ‘ not

ny cites this passage with a little variation: *Quid tertium? stercorare; lib. xviii. cap. xix.*

\* *Stercus unde facias; stramenta, lupinum, paleas, fabalia, acus, frondem iligneam, quernam. Ex segete vel lito ebulum, cicutam, et circum salicta herbam altam, ulvamque;*

‘ not ignorant,’ says Columella, ‘ that there are  
 ‘ some farms in the country, in which neither  
 ‘ the dung of cattle nor of birds is to be got ;  
 ‘ however, even in such places, he is a slothful  
 ‘ husbandman that has no manure : He may  
 ‘ collect any kinds of leaves, the cuttings of  
 ‘ briars, and rakings of high-ways : He may  
 ‘ cut ferns, which, though on the fields of his  
 ‘ neighbour, will be rather an advantage as an  
 ‘ injury to him, and mix with the cleanings of  
 ‘ the court yard : He may dig a hollow place,  
 ‘ such as we directed to be done in the first  
 ‘ book for the dung-hill, and throw into it ashes,  
 ‘ the dirt of the kennels and jakes, all kinds of  
 ‘ straw, and every thing that is swept from  
 ‘ the house \*.’ A little after, he says, ‘ I think  
 ‘ those

vamque ; eam substernito ovibus bubusque ; Cat. cap.  
 xxxvii. There are a great many various readings of this  
 passage ; but it is cited by Pliny, agreeable to whose ci-  
 tation it is above explained.

Cato: Stercus unde fiat, stramenta, lupinum, paleas, fa-  
 balia, ac frondes iligneas, quernasque. E segete evellito  
 ebulum, cicutam, et circum salicta herbam auctam ulvam-  
 que : Eam substernito ovibus ; Plin. Nat. Hist. lib. xvii.  
 cap. ix.

\* Nec ignoro quoddam esse ruris genus, in quo neque  
 pecora,



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‘ those husbandmen are not diligent, who, from  
‘ each of their lesser cattle, in thirty days have  
‘ not a load of dung; and from each of the  
‘ larger cattle, ten loads; and as many from  
‘ each of the men, who may collect not only  
‘ what they make themselves, but also that which  
‘ is daily produced by the court-yard and house\*.’

But the ancients not only used various kinds of vegetable and animal substances for manure; they also mixed earths of different qualities: ‘ Some advise,’ says Theophrastus, ‘ to mix together earths of different qualities; for example;

*pecora, neque avis haberi possint; attamen inertis est rustici eo quoque loco defici stercore. Licet enim quamlibet frondem, licet e vepribus compitisque congesta colligeré. Licet filicem sine injuria vicini etiam cum officio decidere, et permiscere cum purgamentis cortis. Licet depressa fossa, qualem stercorei reponendo primo volumine fieri praecipimus, cinerem, coenumque cloacarum, et culmos, caeteraque quae everruntur, in unum congerere; Col. lib. II. cap. xv.*

\* Parum autem diligentes existimo esse agricolas, apud quos minores singulae pecudes tricenis diebus minus quam singulas, itemque majores denas vehes stercoreis efficiunt, totidemque singuli homines, qui non solum ea purgamenta quae ipsi corporibus edunt, sed et quae colluvies cortis et aedificii quotidie gignit, contrahere et congerere possunt; Col. id.

‘ example, light with heavy, and heavy with  
 ‘ light; fat with lean, and lean with fat: In  
 ‘ like manner, red and white, and whatever has  
 ‘ contrary qualities. Because this mixture not  
 ‘ only supplies what is wanting, but also ren-  
 ‘ ders the soil, with which another is mixed,  
 ‘ more powerful; so that what is wore out, be-  
 ‘ ing mixed with a fertile kind of earth, begins  
 ‘ again to carry crops as if renewed, and what  
 ‘ is naturally barren as clay, if mixed, is ren-  
 ‘ dered fruitful. For one kind mixed with a-  
 ‘ nother, in some measure serves in the place of  
 ‘ dung\*.’ In some countries, from this prin-  
 ciple, they regularly trenched their fields. The-  
 ophrastus, immediately after the passage above  
 cited,

\* *Terrenum quoque adversi habitus intermisceri prae-  
 cipiunt; exempli gratia, ponderoso leve, levi ponderosum;  
 macro pingue, et contra. Pari modo, et rubrum et can-  
 didum, et si qua contrarietas alia sit; quippe non modo  
 quod deest replere admistio potest; sed etiam solum om-  
 nino reddet validius, ut, si quod defatigatum, atque effoe-  
 tum jam est, fertili cuiquam terrae permisceatur, ferre  
 iterum incipit, quasi novum effectum sit; et quae sua  
 natura sterilis sit, ceu argilla, si misceatur feracem effecit.  
 Altera enim alteri stercoris vice quodammodo fungitur;  
 Th. de caus. plant. lib. III. cap. xxv.*

cited, adds: 'Wherefore, the Megarenfes have  
 ' been in ufe to mix in this manner, and every  
 ' fifth or fixth year, digging as deep as the rain  
 ' penetrates, they turn the bottom of the mould  
 ' into the top, by which the corn fields are re-  
 ' newed. For the particles of earth proper for  
 ' nourifhing plants is always carried downward  
 ' along with the rain water \*.'

Columella likewise mentions the practice of mixing earths of different qualities, as performed with great fuccefs by his uncle, a moft learned and attentive husbandman, who had thereby enriched not only his corn fields, but alfo his vineyards †.

This

\* *Quamobrem Megarenfes mifcere ita confueverunt, et quinquennio, aut ſexennio poſt alte defodientes, in quantum imber valeat pervenire, ima terreni ad ſumma regerunt, quo fegetes renovelletur. Pars enim ad alendum idonea labitur deorſum ſemper cum aqua; id.*

† *Si tamen nullum genus ſtercoris ſuppetet, ei multum proderit feciſſe, quod M. Columellam patruum meum doctiſſimum et diligentiſſimum agricolam ſaepenumero uſurpaſſe memoria repeto, ut fabuloſis locis cretam ingereret; cretoſis ac nimium denſis, fabulum. Atque ita non ſolum fegetes laetas excitaret, verum etiam pulcherrimas vineas efficeret; Col. lib. ii. cap. xvi.*

This care of the Roman farmers in collecting manure, is most worthy of our imitation. The farmer should allow nothing of this kind to be lost: His dung-hill should be the receptacle of all vegetable and animal substances; for all these, when putrified, make good manure. Many things, which, when exposed, are disagreeable and noxious, may be covered in the dung-hill, and rendered useful. Perhaps we may receive some instruction in this important article, by considering more particularly the different things which the Roman farmers used for manure, and the manner in which they prepared them.

## C H A P. VIII.

*Of Dung properly so called.*

**T**O prevent the necessity of citing passages frequently, I shall here bring into one view all that the different writers have said upon this subject.

Cato expresses himself in these words: ‘ Pigeons dung ought to be strowed on a meadow, or a garden, or a corn field; preserve carefully the dung of goats, sheep, and cows, likewise all other kinds of dung\*.’

Varro expresses himself in this manner: ‘ Cassius writes, that the dung of fowls, except that of the fenny and water-fowls is the best; that of these pigeon dung is the most excellent,

\* Stercus columbinum spargere oportet in pratum, vel in hortum, vel in segetem. Caprinum, ovillum, bubulum, item caeterum stercus omne sedulo conservato; Cat. cap. xxxvi.

' lent, because it is warmest, and ferments the  
 ' earth; that all of this kind should be strowed  
 ' upon the field, and not laid in heaps like the  
 ' dung of cattle. It is my opinion, that the  
 ' dung from the aviaries of thrushes and black-  
 ' birds, is the most excellent; because it is not  
 ' only an useful manure for land, but is also a  
 ' very fattening food for cows and swine; for  
 ' this reason, those who rent aviaries, pay less  
 ' when the master retains the dung, than when  
 ' he gives it. Cassius writes, that, next to pi-  
 ' geons dung, is that of men. In the third rank,  
 ' he places the dung of goats, sheep, and asses.  
 ' Horse dung is the worst kind; but it is so on-  
 ' ly when applied to corn fields; for it is the  
 ' best for meadows, as is that of all work-cattle  
 ' that are fed with barley, because it produces  
 ' plenty of grass \*.'

Colu-

\* Stercus optimum scribit esse Cassius volucrium, prae-  
 ter palustrium, ac nantium. De hisce praestare columbinum,  
 quod sit calidissimum, ac fermentare possit terram. Id  
 ut semen aspergi oportere in agro: Non ut de pecore a-  
 cervatim poni. Ego arbitror praestare ex aviariis turdo-  
 rum ac merularum, quod non solum ad agrum utile,  
 sed etiam ad cibum ita bubus et suibus, ut fiant pingues.  
 Itaque qui aviaria conducunt, si caveat dominus, stercus

ut

Columella expresses himself much to the same purpose, in these words: ‘ There are three principal kinds of dung, that which is produced by birds, by men, and by cattle. Pigeon dung is reckoned the best of the first kind; next to it the dung of hens and other fowls, except the fenny and water-fowls, such as ducks and geese, for this is hurtful. For my part, I approve most of pigeon dung; because I find, that, when but thin spread, it ferments the earth. Next to this, I approve of human ordure, if it is mixed with the other cleanings of the villa; for it is by itself of so fervent a nature, that it burns the soil: Urine is rendered fitter for trees, if it is kept six months; if it is applied either to vines or apple trees, it renders them fruitful above every other thing; nor does it only increase the crop, it also adds to the flavour of the wine and apples. Old lees of oil that have not been salted, when  
‘ mixed

ut in fundo maneat, minoris conducunt, quam ii quibus id accedit. Cassius secundum post columbinum scribit esse hominis. Tertio caprinum, et ovillum, et asinum. Minime bonum equinum, sed in segetes: In prata enim vel optimum ut caeterarum veterinarum, quae ordeo pascuntur, quod multum facit herbam; Var. lib. i. cap. xxxviii.

‘ mixed with this, is very advantageously sprin-  
 ‘ kled upon the roots of other fruit trees, and  
 ‘ particularly the olive. This kind of lees is  
 ‘ very profitably applied by itself; both of these  
 ‘ must be used in winter or in spring, before  
 ‘ the summer heat, and immediately before the  
 ‘ earth is put back to the roots of the trees. In  
 ‘ the third rank, is placed the dung of cattle,  
 ‘ and this is not all equally good; for the dung  
 ‘ of asses is reckoned the best, because this ani-  
 ‘ mal chews very slowly; therefore his food the  
 ‘ more easily dissolves, and his dung is well pu-  
 ‘ trified, and is immediately fit for being laid  
 ‘ upon the field. After these which I have men-  
 ‘ tioned, is to be ranked the dung of sheep,  
 ‘ next to this the dung of goats, and then the  
 ‘ dung of cows and work cattle. The worst of  
 ‘ all is that of swine. Besides these, ashes are  
 ‘ very proper for the corn fields, after the seed  
 ‘ is sown \*.’

Palladius

\* Tria igitur stercoreis genera sunt praecipua, quod  
 ex avibus, quod ex hominibus, quod ex pecudibus confit.  
 Avium primum habetur, quod ex columbariis egeritur.  
 Deinde quod gallinae caeterique volucres edunt; excep-  
 tis tamen palustribus, aut nantibus, ut anatis et anseris:

Nam



Palladius expresses himself much in the same manner, but not so fully : ‘ The dung of asses,’  
says

Nam id noxium quoque est. Maxime tamen columbinum probamus, quod modice sparsum terram fermentare comperimus. Secundum deinde quod homines faciunt, si et aliis villae purgamentis immisceatur, quoniam per se naturae est ferventioris, et idcirco terram perurit. Aptior est tamen furculis hominis urina, quam sex mensibus passus fueris veterascere; si vitibus aut pomorum arboribus adhibeas, nullo alio magis fructus exuberat: Nec solum ea res majorem facit proventum, sed etiam saporem et odorem vini pomorumque reddit meliorem. Potest et vetus amurca, quae salem non habet, permixta huic commode, frugiferas arbores, et praecipue oleas rigare. Nam per se quoque adhibita multum juvat. Sed usus utriusque maxime per hiemem est, et adhuc vere, ante aestivos vapores, dum etiam vites et arbores oblaqueatae sunt. Tertium locum obtinet pecudum stercus, atque in eo quoque discrimen est; nam optimum existimatur, quod asinus facit, quoniam id animal lentissime mandit, ideoque facilius concoquit, et bene confectum, atque idoneum protinus arvo simum reddit. Post haec quae diximus, ovillum, et ab hoc caprinum est, mox caeterorum jumentorum armentarumque. Deterrimum ex omnibus suillum habetur. Quinetiam satis profuit cineris usus et favillae; Col. lib. ii. cap. xv.

These words of Columella, *dum etiam vites et arbores oblaqueatae sunt*, I have rendered, ‘ immediately before  
‘ the

says he, ' is the best, particularly for gardens ;  
' then the dung of sheep, of goats, and cows :

' That

' the earth is put back to the roots of the trees.' Some of the commentators are of opinion, that *oblaqueare*, the word here used, is the opposite of *ablaqueare*, and that Columella means, that this operation of sprinkling the roots of the trees is to be performed after the earth taken away is restored again : But it is probable, that there has been an error in transcribing, or that *oblaqueare* and *ablaqueare*, signify the same thing. The operation of oblaqueating is described by Columella : ' Now,' says he, ' after the Ides of October, before the colds come on, the vines should be ablaqueated, which work exposes to view the small roots that have come forth in the summer ; these roots the skilful husbandman cuts off.' Nam post Idus Octobris, priusquam frigora invadunt, vitis ablaqueanda est ; quod opus adopertas ostendit aestivas radículas, easque prudens agricola ferro decidit ; Col. lib. iv. cap. viii. Before this earth was thrown back, by the taking out of which the roots were discovered, the manure intended for the trees was applied. This is evident from the following passage : ' This work being finished, if the winter in that country is mild, the vine ought to be left open ; but, if a colder climate renders this dangerous, the small pits that have been mentioned must be filled up before the Ides of December. Besides, if it is suspected that the cold of the climate may increase, so as to freeze, then some dung from the dung-hill, or, if more

‘ That of swine is the worst. Ashes are very  
 ‘ good. Pigeon dung is very hot; this, with  
 ‘ the dung of other fowls, except those of the  
 ‘ water kind, is very proper for sown fields \*.’

Pliny likewise gives a particular account of  
 the different kinds of dung, and the different  
 opinions of the farmers, with respect to their  
 goodness: ‘ M. Varro,’ says he, ‘ gives the pre-  
 ‘ ference to the dung of thrushes from the avi-  
 ‘ aries; which too he extols as food for oxen  
 ‘ and swine, and asserts, that there is no food  
 ‘ that

‘ convenient, some pigeon dung, or six sextaries of old  
 ‘ urine, prepared on purpose, should be thrown upon the  
 ‘ roots of each vine, before they are covered with earth.’  
 Hoc opere consummato, si est hiems in ea regione placida,  
 patens vitis relinquenda est: Sin violentior, id facere pro-  
 hibet, ante Idus Decembris praedicti lacusculi aequan-  
 di sunt. Si vero etiam praegelida frigora regionis ejus-  
 suspecta erunt, aliquid fimi, vel, si est commodius, colum-  
 bini stercoreis, aut in hunc usum praeparatae veteris urinae  
 fenos sextarios, antequam vitem adobruas, radicibus su-  
 perfundes; Col. id.

\* Stercus asinorum primum est, maxime hortis, dein  
 ovillum, et caprinum, et jumentorum; porcinum vero pes-  
 simum; cineres optimi; sed columbinum fervidissimum,  
 caeterarumque avium satis utile est, excepto palustrium;  
 Pal. lib. I. tit. XXXIII.

‘ that fattens them more quickly. We may have  
 ‘ a good opinion of the manners of our times,  
 ‘ if our ancestors had such large aviaries, as to  
 ‘ procure from them dung to their fields. Next  
 ‘ to this, Columella prefers pigeon dung, and  
 ‘ after it, the dung of hens, at the same time,  
 ‘ condemning that of water-fowls: Other au-  
 ‘ thors agree in approving of human ordure next  
 ‘ to this. Some reckon, that the best of this  
 ‘ kind, is the urine which has been used by cur-  
 ‘ riers for moistening the hair of the hides which  
 ‘ they dress; others think it best without this  
 ‘ mixture, having added to it twice as much  
 ‘ water, or even more than is mixed with wine  
 ‘ when it is drunk; because it requires more to  
 ‘ subdue its bad qualities in that state, when  
 ‘ man has added to the putrefaction of the wine.  
 ‘ These are the different opinions of men, about  
 ‘ the things which are all used for rendering the  
 ‘ earth fertile. Next to these already mentioned,  
 ‘ the dung of swine is commended; Columella  
 ‘ alone condemns it. Some think that the best  
 ‘ dung is that of the cattle that feed on *cytissus*;  
 ‘ others again prefer pigeon dung even to this,  
 ‘ and that, next to pigeon dung, is that of goats,  
 ‘ then sheep dung, after it the dung of oxen,  
 ‘ and,

‘ and, lastly, that of the other working cattle.  
 ‘ These were the differences of opinion among  
 ‘ the ancients. There were likewise precepts  
 ‘ (as I find) about the way of using dung.  
 ‘ When it is old, it is the more useful. Now,  
 ‘ it is observed, that, in some of the provinces,  
 ‘ they breed such numbers of cattle, that they  
 ‘ sift the dung like flour, the bad smell and  
 ‘ appearance, by the power of time, being chan-  
 ‘ ged into something that is agreeable. It has  
 ‘ been found out lately, that ashes from lime-  
 ‘ kilns are a good manure for olive trees. Var-  
 ‘ ro adds to the precepts; horse dung, and that  
 ‘ which is lightest, is best for corn fields; and  
 ‘ that which is heavier, and what is produced  
 ‘ by barley food, and produces much grass, is  
 ‘ best for meadows. Some likewise prefer the  
 ‘ dung of the work cattle to that of cows, and  
 ‘ the sheep dung to the goat. Others prefer  
 ‘ the dung of asses to all others, because he chews  
 ‘ very slowly: Whereas, on the contrary, prac-  
 ‘ tice is against both \*.’

From

\* M. Varro principatum dat turdorum fimo ex aviariis.  
 Quod etiam pabulo boum suumque magnificat: Neque  
 alio cibo celerius pinguescere asseverat. De nostris mori-  
 bus

From these passages, we may observe, that the Roman farmers divided dung into three kinds,

bus bene sperare est, si tanta apud majores fuere aviaria, ut ex his agri stercorearentur. Proximum Columella columbariis, mox gallinariis facit, natantium alitum damnato; caeteri auctores consensu humanas dapes ad hoc imprimis advocant. Alii ex his praeferunt hominum potus in coriariorum officinis pilo madefacto. Alii per sese, aqua iterum, largiusque etiam, quam cum bibitur, admista. Quippe plus jam ibi mali domandum est, cum ad virus illud vini homo accesserit. Haec sunt certamina, quibus invicem ad tellurem quoque alendam utuntur homines. Proxime spurcitas suam laudant. Columella solus damnat. Alii cujuscunque quadrupedis ex cytiso. Aliqui columbaria praeferunt. Proximum deinde caprarum est, ab hoc ovium, deinde boum, novissimum jumentorum. Hae fuere apud priscos differentiae, simulque praecepta (ut invenio) re tali utendi, quando et hic vetustas utilior; visumque jam est apud quosdam provincialium, in tantum abundante geniali copia pecudum, farinae vice cribris super injici, foetore aspectuque, temporis viribus, in quandam etiam gratiam mutato. Nuper repertum, oleas gaudere maxime cinere e calcariis fornacibus. Varro praeceptis adjicit, *equino*, quod sit levissimum, segetes alendas; prata vero graviore, et quod ex hordeo fiat, multasque gignat herbas. Quidam etiam bubulo jumentorum praeferunt, ovillumque caprino: Omnibus vero asininum, quoniam lentissime mandunt.

kinds, the dung of fowls, of men, and of cattle. This is the order in which both Varro and Columella treat of the different kinds of dung; and they arranged them in order, according to their opinions of their utility. Pliny, indeed, mentions different opinions with respect to the goodness of these kinds of dung; some, as he says, being of opinion that one kind, and others that another kind, is best. This difference of opinion would naturally arise from the different kinds of soils the farmers might have in view in giving their opinion, the different situations of the different soils, and the different crops, for which the different kinds of dung were intended as manures.

Of

mandant. E contrario usus adversus utrumque pronunciat; Plin. Nat. Hist. lib. xvii. cap. ix.

In the last passage, in which Pliny mentions the authority of Varro, either the transcribers have committed a mistake, or Pliny has not attended to the words which Varro wrote: Varro says, that the worst dung is that of horses, but so only for the corn fields, for it is good for meadows. Whereas Pliny, upon his authority, asserts that it is good for corn fields. If, in Pliny, instead of *equino*, we read *omnino*, the sense is better, and perfectly consistent with Varro.

Of the dung of fowls, that of pigeons seems to have been generally approved of as the best : When Varro prefers that of thrushes and black-birds, he does not understand it as a manure, but as food for some kinds of cattle. Of the dung of cattle, that of sheep and goats was reckoned best : For meadows, that of cattle fed upon barley, not because the most powerful manure, but because it produced grass : And that of asses is preferred, when soon used ; because most completely dissolved.

It seems to have been a custom with them, as with us, to keep some of the kinds of dung separate from others. Varro mentions the sowing of pigeons dung like seed, and not laying it in heaps : And, though Columella says, that, when the farm is wholly in corn, there is no necessity for keeping the different kinds of dung separate ; yet he mentions the sowing the dung of fowls, when that is wanting, the dung of goats, upon the corn fields, after the seed is sown : ‘ If there  
 ‘ is any cause,’ says he, ‘ to prevent the early  
 ‘ dunging, the next method is, before sowing,  
 ‘ to sow the dust of dung from the aviaries up-  
 ‘ on the corn fields ; or, if none of this can be  
 ‘ got, to throw goats dung out of the hand, and  
 ‘ by



‘ by farcles mix it with the earth : This is very  
 ‘ beneficial to the corn fields \*.’ Palladius men-  
 tions the same things : ‘ But,’ says he, ‘ if any  
 ‘ thing prevents the laying on of dung in its  
 ‘ season, before sowing, the dust of dung may  
 ‘ be cast like feed upon the fields, or goats dung  
 ‘ spread with the hand, and mixed with the earth  
 ‘ by farcling †.’ From these passages it appears,  
 that it was the custom to keep the dung of fowls,  
 and sometimes likewise the dung of goats, se-  
 parate from the rest, even for the corn fields.  
 When there were trees and meadows in the  
 farm, as well as corn fields, these kinds of dung  
 were always separated from others : ‘ If the farm,’  
 says Columella, ‘ is only a corn farm, it is of  
 ‘ no great importance to keep the different kinds  
 ‘ of dung separate ; but, if it is laid out in plan-  
 ‘ tations

\* Si tamen aliqua causa tempestivam stercorationem  
 facere prohibuerit, secunda ratio est, antequam farrias,  
 more seminantis ex aviariis pulverem stercoreis per segetem  
 spargere : Si et is non erit, caprinum manu jacere, atque  
 ita terram farculis permiscere, ea res laetas segetes reddit  
 Col. lib. ii. cap. xvi.

† Sed si tempore suo ejici aliqua ratione non poterunt,  
 ante quam feras, more feminis per agros pulverem ster-  
 coreis sparge, vel caprinum manu projice, et terram far-  
 culis misce ; Pal. lib. x. tit. i.

‘ tations of trees and corn fields, and also mea-  
 ‘ dows, the dung should be laid up according  
 ‘ to its kinds, particularly that of goats and  
 ‘ fowls\*.’ In every case, all the other kinds of  
 dung were mixed together in the dung-hill;  
 their management of which is very worthy of  
 our attention and imitation.

CHAP.

\* At si tantum frumentarius ager est, nihil refert ge-  
 nera stercoreis separari; sin autem furculo, et segetibus,  
 atque etiam pratis fundus est dispositus, generatim quoque  
 reponendum est, sicut caprarum et avium; Col. lib. ii.  
 cap. xv.

## C H A P. IX.

*Of the Management of Dung-hills.*

**T**O treat this subject with the greater exactness, it will not be amiss to bring into one view, as was done in the last chapter, all that the different writers have said upon it.

Cato says very little: In his directions to the bailiff, he desires him to be careful to have a large place for dung\*.

Varro is much more particular: ‘Near the villa,’ says he, ‘there ought to be two places for dung, or one divided into two parts. Into the one, the new made dung ought to be carried from the villa; and from the other, the old dung ought to be carried into the field. For that which is but lately brought from the villa is not so good as the other; when it is  
‘ old

\* Sterquilinium magnum stude ut habeas; Cap. cap. v.

‘ old and rotten, it is better; likewise the dung-  
 ‘ hill is the better, when its sides and top are  
 ‘ defended from the sun by twigs and leaves:  
 ‘ For it is not proper that the sun should be al-  
 ‘ lowed to exhale the juice which the earth re-  
 ‘ quires; therefore skilful husbandmen, on this  
 ‘ account, let water into the dung-hill when it  
 ‘ is in their power: So likewise, that the sap  
 ‘ may be the better preserved, some empty the  
 ‘ close-stools into it\*.’ In another place, he  
 says: ‘ The dung-hill should be made near to  
 ‘ the villa, that so the dung may be carried out  
 ‘ with the least labour. If, in the middle of it,  
 ‘ are put some oak-cuttings, serpents will be  
 ‘ prevented from breeding †.’

Colu-

\* *Secundum villam duo habere oportet sterquilinia, aut unum bifariam divisum: Alteram enim in partem ferri oportet e villa novum fimum, ex altera veterem tolli in agrum: Quod enim infertur recens, minus bonum: Id cum flaccuit, melius: Nec non sterquilinium melius illud, cujus latera et summum virgis et fronde vindicatum ab sole. Non enim succum quem quaerit terra, et solem ante exugere oportet. Itaque periti, qui possunt, ut eo aqua influat, eo nomine faciunt: Sic enim maxime retinetur succus, in eoque quidam fellas familiaricas ponunt; Var. lib. 1. cap. XIII.*

† *Sterquilinium secundum villam facere oportet, ut  
 quam*

Columella expresses himself still more fully: 'Likewise,' says he, 'there ought to be two places for dung; one for receiving the new dung from the offices, which is preserved in it for a year; and another for keeping the old dung, which from it is carried to the fields. Both of them, like fish-ponds, should be hollowed with a gentle declivity, and paved in the bottom to prevent the moisture from getting away; for it is of great importance to preserve the sap, that so the dung may preserve its strength, and may be putrified by continual moisture; so that, if any seeds of briars or grass are thrown into the dung-hill along with the straw, they may be destroyed: Therefore skilful husbandmen quickly carry off whatever dung is turned out of the sheep-cots and stables, cover it with grates made of twigs, and neither allow it to dry in the winds, nor be withered by the rays of the sun\*.'

Pliny's

quam paucissimis operis egeratur. In eo si in medio robusta aliqua materia sit depacta, negant serpentem nasci; Var. lib. 1. cap. xxxviii.

\* Sterquilinia quoque duo sint; unum, quod nov purgamenta recipiat, et in annum conservet: Alterum,

Pliny's directions on this subject are very short: 'Dung-hills should be made in the open air, in a hollow place, and which collects moisture, covered with straw, that the dung may not be dried in the sun; and having an oak pole put into it, that so serpents may be prevented from breeding \*.' The directions of Palladius on this subject are likewise very short, and seem to have been chiefly collected from Columella. 'There should be a place,' says he, 'for gathering together the dung, which should abound with moisture; and, on account of the disagreeable appearance and smell, should be

re-

*ex quo vetera vehantur. Sed utrumque more piscinarum devexum leni clivo, et extractum pavitumque solum habeat, ne humorem transmittant. Plurimum enim refert, non ad ficcato succo fimum vires continere, et assiduo macerari liquore, ut si qua interjecta sint stramentis aut paleis, spinarum vel graminum semina, intereant, nec in agrum exportata segetes herbidas reddant. Ideoque periti rustici, quidquid ovilibus stabulisque conversum progresserunt, superpositis virgeis cratibus tegunt, nec arefcere ventis sinunt, aut solis incurfu patiuntur exuri; Col. lib. i. cap. vi.*

\* Fimeta sub dio concavo loco, et qui humorem colligat, stramento intecta, ne in sole arefcant, palo e robore de pacto fieri jubent. Ita fore ne innascantur his serpentes; Plin. Nat. Hist. lib. xvii. cap. ix.

‘ removed from the view of the mansion-house.  
 ‘ The abundant moisture is of that advantage to  
 ‘ the dung, that, if there are any seeds of briars  
 ‘ amongst it, they putrify \*.’

From these passages, it appears, that amongst the Romans, there were two dung-hills belonging to every farm, the one for receiving the dung from the offices, the other for preparing the dung to be carried to the corn fields and vineyards: For they were of opinion, that dung should lie a year in the dung-hill before using it either for corn or vines: They did not think this necessary indeed when applied to meadows; on the contrary, they laid it on as fresh as possible, from the opinion, that the more fresh it is, it produces the greater quantity of herbs. These things are mentioned both by Columella and Palladius. Columella says: ‘ It is likewise  
 ‘ my opinion, that all dung placed in the dung-  
 ‘ hill in proper time, and that has remained  
 ‘ there for a year, is the best for corn fields;  
 ‘ for,

\* Stercorum congestio locum suum tenere debet, qui abundet humore, et propter foetoris horrenda, a praetorii convertatur aspectu. Humor abundans hoc praestabit stercore, ut siqua insunt spinarum semina putrescant; Pal. lib. I. tit. XXXIII.

‘ for, in this situation, it has its full strength,  
 ‘ and does not produce weeds ; but, in propor-  
 ‘ tion as it is older, it is less powerful, and con-  
 ‘ sequently of less benefit. But, for meadows,  
 ‘ it should be as fresh as possible, because, the  
 ‘ fresher it is, it produces the more grass\*.’  
 Palladius to the same purpose: ‘ Dung which  
 ‘ has remained a year in the dung-hill, is pro-  
 ‘ per for corn fields, nor does it produce weeds.  
 ‘ If it is older, it is of less benefit. But fresh  
 ‘ dung does most good to meadows, in produ-  
 ‘ cing rich grass †.’

We may observe likewise, that these places  
 for the dung were hollowed in the middle, and  
 paved in the bottom. This to preserve the mois-  
 ture, a thing very necessary in that climate, to  
 make

\* Illud quoque praecipendum habeo, stercus omne  
 quod tempestive repositum anno requieverit, segetibus  
 esse maxime utile ; nam et vires adhuc solidas habet, et  
 herbas non creat. Quanto autem vetustius sit, minus pro-  
 desse ; quoniam minus valeat. Itaque pratis quam recen-  
 tissimum debere injici, quod plus herbarum progeneret ;  
 Col. lib. ii. cap. xv.

† Stercus, quod anno requieverit, segetibus utile est,  
 nec herbas creat ; si vetustius sit, minus proderit. Pratis  
 vero recentia stercola proficient ad uber herbarum ; Pal.  
 lib. i. tit. xxxiii.



make the dung putrify, and to destroy the seeds of weeds.

We may observe likewise, that these places were built at the sides, and covered above with branches of trees, or twigs, wrought in the form of a grate. These things in that climate were necessary to prevent the sun and wind from drying the dung too much; and the more so, as it was their custom in the summer season to turn over the dung in the dung-hill. This is a thing mentioned by Columella: ‘In the summer  
 ‘ months, the dung in the dung-hill ought to be  
 ‘ mixed with rakes, in the same manner as if  
 ‘ *repaftinated*, by which means it the more easily  
 ‘ putrifies, and becomes fit for the fields \*.’ In-  
 to the dung-hill, as appears from a passage in Columella cited in the last chapter, was thrown all vegetable and animal substances; and, to the great variety of things mentioned by Columella, Palladius adds sea-weed and mud: ‘And,’ says he, ‘the things thrown out by the sea, if they  
 ‘ are washed with sweet water, and the slime  
 ‘ which a gushing water, or a river in flood,  
 ‘ throws

\* *Æstivis deinde mensibus non aliter, ac si repaftines, totum sterquilinum rastris permiscere oportet, quo facilius putrefcat, et fit arvis idoneum; Col. lib. II. cap. xv.*

‘ throws out, when mixed with other things in  
‘ the dung-hill, serves in the place of dung \*.’

These things show how careful the Romans were in the management of their dung-hills. Their care is certainly very worthy of our imitation. In Britain, at least in the greatest part of it, we are very deficient in this matter. There is commonly but one dung-hill belonging to each farm; or, if there are more than one, this is owing to the situation of the different offices, which renders it inconvenient to carry the dung from all of them to the same dung-hill, and not with a view to prepare the dung for the fields. By having only one dung-hill, we may observe, that dung, in a variety of different situations, is carried to the fields at the same time, and applied to the same purposes; and, if any is left in the dung-hill, it is of the kind that should have been carried out; it is the oldest in the dung-hill. This old dung, if there is no demand for it for some time, unless the farmer is more attentive than ordinary, is covered with

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the

\* Et maris purgamenta, si aquis dulcibus eluantur, mista reliquis vicem stercoreis exhibebunt, et limus, quem scaturiens aqua vel fluvii incrementa respuerint; Pal. lib. 1. tit. xxxiii.

the fresh dung, and becomes the last of being carried out when the next demand comes. Every farmer must be convinced, that this is a very absurd practice, nor is it easy to prevent it, while farms have only one place for dung, unless the dung at a proper season is removed from the common dung-hills to the fields, and there formed into another dung-hill, as is the practice of some farmers, and indeed a very proper one. But, if we would follow the example of the Roman farmers, make two places for this purpose, and, whenever the intended quantity is put into any of the places, turn over the dung that it may putrify as equally as possible, cover it up, and let it lie for some time in that situation; we would then have it in our power to carry the dung to our fields putrified to any degree that we should judge most proper. The advantage of this every farmer must observe; and, as the doing it is attended with very little trouble or expence, all farmers should be encouraged to practise it.

## C H A P. X.

*Of the Times and Manner of Laying on Dung.*

**I**N Britain, we have no particular seasons for laying on dung. There is no season in which this operation is not performed: It is done in spring, in summer, in autumn, and in winter. The land intended for barley is commonly dunged in spring, the fallow for wheat in summer; the land for wheat, after a crop in autumn, and the land for pease in winter.

There are two seasons for this operation, mentioned by the Roman authors, the autumn and winter, answering to the two different seed times, the autumnal and spring, or trimestrian. ‘In the mean time,’ says Columella, ‘he who would prepare his fields for corn, ought to lay upon them moderate heaps, while the moon is decreasing in the month of September, if he is to sow in autumn; and any time in winter,

‘ter,

‘ter, if he is to sow in spring; proportioning  
 ‘it in such a manner, that there may be eigh-  
 ‘teen loads of dung upon the *jugerum* of land  
 ‘on a plain, and twenty-four on the *jugerum*  
 ‘of land on a declivity\*.’ Palladius, in Sep-  
 ‘tember, says: ‘New land ought to be dung-  
 ‘ed:’ A little below: ‘Some carry out dung  
 ‘any time in winter.’ And, in October, he says:  
 ‘Now likewise dung is carried out and spread †.’  
 Pliny, to the same purpose with Columella, says:  
 ‘Whoever proposes to sow in autumn, should  
 ‘plough in dung in September after a shower;  
 ‘but, if he is to sow in spring, he ought to lay  
 ‘on dung during the winter ‡.’

## The

\* Interim qui frumentis arva praeparare volet, si au-  
 tumno sementem facturus est, mense Septembri; si vere,  
 qualibet parte hiemis modicos acervos luna decrefcente  
 disponat, ita ut plani loci jugerum duodeviginti, clivosi  
 quatuor et viginti vehes stercore teneant; Col. lib. II. cap.  
 XVI.

† Agri nunc stercoreandi sunt.—Ejiciuntur quidem lac-  
 tamina, et qualibet hiemis parte; Pal. lib. X. tit. I. Nunc  
 etiam laetamen effertur ac spargitur; Pal. lib. XI. tit. I.

‡ Autumno aliquid sature, Septembri mense fimum  
 inaret post imbrem. Utique si verno erat sature, per  
 hiemem fimum disponat; Plin. Nat. Hist. lib. XVIII. cap.  
 XXIII.

The land of the kind that required chiefly to be dunged, was not ploughed till the end of August or beginning of September, as shall afterwards be shown. Now, it was improper to lay dung upon this land in the summer season, as it would have been dried so much by the sun, as to have rendered it almost useless. Their spring seed time was finished in March, which rendered it impossible to dung land in the spring, at least so late as is sometimes done by the farmers in Britain.

If, by any accident, land that required manure was not dunged before the seed was sown, then the dung of fowls, or goats, or sheeps dung powdered, was sown upon it out of the hand, and covered with farcles or hoes. This appears from a passage in Columella, and one in Palladius, already cited as an evidence, that the Roman farmers were in use to keep some kinds of dung separate from others. Pliny has a passage to the same purpose: ‘If this dunging,’ says he, ‘is omitted, another follows after the seed is sown, the dust of dung may be sown before the corn is farcled\*.’

The

\* *Aut jacto semine, si haec omissa sit sterco ratio, frequens est, priusquam farriat, aviarii pulvere; id.*

It

The quantity of dung laid on was from eighteen to twenty-four loads upon the *jugerum*, each load containing eighty *modii*; so that, in the proportion of eighteen load upon the *jugerum*, there were about five *modii* upon a space of ten feet square: ‘A *jugerum*,’ says Columella, ‘that is to be dunged thick, requires twenty-four loads; one that is to be dunged thin, requires eighteen\*.’ In another passage, when treating of beans, he says, ‘It is sufficient to lay eighteen load of dung upon each *jugerum*. A load of dung contains eighty *modii*, from which it may be observed, that five *modii* of dung should be spread upon ten square feet; from which it follows, that fourteen hundred and forty *modii* are enough for a whole *jugerum* †.’ Palladius mentions the same quantity upon

It is obvious, that this passage has been wretchedly mangled in transcribing. Possibly it may have been in words to this purpose; Aut, jactato femine, si haec omitta sterco ratio, sequens est altera priusquam farriet, serat pulverem.

\* *Jugerum autem desiderat, quod spiffius sterco ratu r, vehes quatuor et viginti; quod rarius, duodeviginti; Col. lib. II. cap. v.*

† Satis erit in fingula jugera vehes sterco ris comporta-

upon the authority of Columella; he says, Columella asserts, 'That twenty-four cart-load are enough for a *jugerum*; if it is upon a plain, eighteen are sufficient \*.' Pliny only mentions the smallest quantity: 'It is just,' says he, 'that eighteen loads be allowed to a *jugerum* †.' But of every load sixteen heaps were made, so that each heap contained five *modii*, and these heaps were laid at the distance of ten feet from each other every way, when eighteen loads were laid upon the *jugerum*; and at the distance of ten feet the one way, and near eight the other, when it was proposed to lay twenty-four loads on the *jugerum*: 'The heaps of dung,' says Columella, 'about five *modii* each, should be laid thinner upon the plain, and thicker upon the hill; upon the plain, at the distance of  
' eight

re numero decem et octo: Vehes autem stercoreis habet modios octoginta. Ex quo colligitur, oportere in denos quoquo versus pedes, modios quinos stercoreis spargere. Quae ratio docet universo jugero satisfacere modios MCCCXL.; Col. lib. xi. cap. ii.

\* Uni jugero asserit Columella xxiv stercoreis carpentibus sufficere; in plano vero xviii.; Pal. lib. x. tit. i.

† Justum est vehes octodecim jugero tribui; Plin. Nat. Hist. lib. xviii. cap. xxiii.



‘ eight feet every way; upon the hill, two feet  
‘ less \*.’

The

\* In campo rarius, in colle spiffius, acervi stercoꝝ, instar quinque modiorum disponentur; atque in plano pedes intervalli quoquoversus octo; in clivo duobus minus relinqui sat erit; Col. lib. 11. cap. v. In this passage, if Columella meant 8 feet from the center of the one heap to the center of the other, he has committed a mistake, or the passage has been altered in transcribing. For, if heaps of 5 *modii* of dung are laid down at the distance of 8 feet from each other every way, no less than 28 load will be laid upon the *jugerum*, instead of 18; and, if heaps of 5 *modii* are laid down at only 6 feet distance, a *jugerum* will take no less than 50 load; which is inconsistent with what he says in the very next sentence, where he mentions the quantity that a *jugerum* requires; but still it is possible, that there may be no mistake, and that Columella, in the passage under consideration, intended to give a direction to the carter or carman, to lay the heaps at the distance mentioned, not measured from the center of each heap, but from the outer sides; and, if we suppose the heaps to have been two feet broad at the bottom, then, placing them at 8 feet distance, measured from the outer sides, is the same thing with placing each heap upon a space of 10 feet square, which Columella says was done when 18 load was laid upon the *jugerum*. But there is another difficulty that still remains; supposing that the heaps are placed at two feet less distance, as Columella directs,

The quantity of 18 loads to the *jugerum*, is nearly in the proportion of 600 Winchester bushels to the English acre, and of 737.6 firlots Linlithgow wheat measure to the Scots acre. And 24 loads to the *jugerum* is nearly in the proportion of 800 bushels to the English acre, and of 983.5 firlots to the Scots acre\*. These quantities

directs, then the *jugerum* will receive 28 loads in place of 24; so that it should be only one foot less, or it is Columella's meaning that the heaps shall be indeed at two feet less distance in the rows; but the rows at the same distance from each other, as in the other case: When this is done, there are nearly 24 loads on the *jugerum*. It is not to be supposed, that the carman or carter measured the heaps as he laid them down; but, as the dung was well putrified before it was carried to the fields, it would not be difficult for him to judge, and, after a little practice, he would be able to divide the load with sufficient exactness.

\* It has already been observed, that the Roman *modius* is equal to 1.029 parts of a Winchester peck, and as there were 80 *modii* in the Roman load, this load must contain 82.32 Winchester pecks. It has likewise been observed, that the Roman *modius* is equal to 1.006 parts of a Linlithgow wheat peck. In this proportion, the Roman load contains 80.48 Scots pecks. The smallest quantity of dung laid upon a *jugerum* was 18 loads; this

quantities of well putrified dung, may be considered as sufficient for light soils, the kind that is most common in Italy.

There are many maxims in the Roman authors about dunging land; these fall naturally to be mentioned here; and indeed they seem to be very just, and at the same time very important.

One of these maxims is, *Dung must be ploughed in as soon as it is spread.* ‘Whenever dung ‘is spread,’ says Columella, ‘it is proper to ‘plough it in, lest it should lose its strength ‘by the exhalations of the sun; and that the ‘soil, being mixed with it, may be enriched.  
‘Therefore,

is equal to 1481.76 Winchester pecks, or 370.44 bushels; and to 1448.64 Linlithgow pecks, or 362.16 firlots. The largest quantity laid upon the *jugerum* was 24 loads; this is equal to 1975.68 Winchester pecks, or 493.92 bushels; and to 1931.52 Linlithgow pecks, or 482.88 firlots. It has likewise been observed, that a *jugerum* is equal to .618 parts of an English acre, and to .491 parts of a Scots acre; so that, in the proportion of 18 loads to the *jugerum*, there are nearly 600 Winchester bushels to the English, and 737.6 firlots to the Scots acre: And, in the proportion of 24 loads to the *jugerum*, there are nearly 800 bushels to the English, and 983.5 firlots to the Scots acre.

‘ Therefore, when heaps of dung are laid upon  
 ‘ a field, a greater number ought not to be  
 ‘ spread, than the ploughman can plough in on  
 ‘ the same day \*.’ He repeats this direction in  
 another place, as a matter of consequence to  
 be attended to: ‘ And, as I mentioned,’ says  
 he, ‘ a little before, the husbandman ought not  
 ‘ to spread the heaps, till he is ready to sow †.’  
 This is also mentioned by Palladius, and the  
 same reason given: ‘ But,’ says he, ‘ no great-  
 ‘ er number of heaps must be spread, than can  
 ‘ be ploughed in on the same day, lest the dung,  
 ‘ being too much dried, should become uselefs ‡.’

Some of our British farmers alledge, that af-  
 ter dung is spread upon a field, and before it is  
 ploughed in, it is in more danger from rain  
 than from the heat of the sun. This may be  
 true

\* *Disiectum deinde protinus fimum inarari et obrui  
 convenit, ne folis halitu vires amittat, et ut permista  
 humus praedicto alimento pinguescat. Itaque cum in  
 agro disponentur acervi stercoreis, non debet major modus  
 eorum dissipari, quam quem bubulci eodem die possint  
 obruere; Col. lib. ii. cap. v.*

† *Et, ut paullo prius dixi, non antea dissipet cumulos,  
 quam erit faturus; Col. lib. ii. cap. xvi.*

‡ *Sed iidem cumuli tot dissipandi sunt, quot ea die po-  
 terunt exarari, ne stercorea exsiccata nihil profint; Pal. lib.  
 x. tit. i.*

true in such a climate as Britain, while it may be as certainly true, that dung, in the situation mentioned, is in greater danger from the sun, in such a climate as Italy.

It has already been observed, that the time of laying on dung was in autumn or winter, according to the seed-time for which it was intended. The particular time was determined by the moon; for this work was performed when the moon was decreasing. This Columella applies to both the seasons mentioned\*. In another place he assigns this reason; ‘Because thereby the corn is freed from weeds †.’ Palladius mentions this, and gives the same reason: ‘While,’ says he, ‘the moon is decreasing, which thing, if observed, destroys weeds †.’ Pliny adds to this; ‘That the wind be West, and the weather dry. At whatsoever time,’ says he, ‘this is done, care must be taken that  
‘ it

\* Si autumnno fementem facturus est, mense Septembri; si vere, qualibet parte hiemis, modicos acervos luna decrescente disponat; Col. lib. II. cap. XVI.

† Sed id nobis *decrecente luna* fieri placet: Nam ea res herbis liberat fegetes; Col. lib. II. cap. V.

‡ Cum luna minuitur: Quae res si fervetur, herbis oficiet; Pal. lib. X. tit. I.

' it be done while the wind blows from the West,  
 ' the moon decreasing, and the weather dry.  
 ' The fruitfulness and effects of the dung are re-  
 ' markably increased by observing these things\*.'

It would be going too far to assert, that it was merely superstition in the Romans, to lay the dung upon their lands when the moon was decreasing; and that this must be considered in no other light, than as a ridiculous charm to prevent the growth of weeds. That the ancients attributed too much to the influence of the moon, will perhaps be easily allowed: But to assert, that, in things of this kind, the moon can have no influence, is to assert that a thing is false, because no proper reason appears to us for its truth. It is not impossible that the time of the moon may give encouragement to the animals that destroy the seeds and roots of weeds, and, therefore, that the laying on dung and ploughing, may have a greater effect at one time of the month than another. But, whatever some persons may think of this maxim, regarding the  
time

\* Quocunque tempore facere libeat, curandum, ut ab occasu aequinoctiali flante vento fiat, lunaque decrescente ac sicca; mirum in modum augetur ubertas effectusque ejus observatione tali; Plin. Nat. Hist. lib. xvii. cap. ix.

time of the moon, yet all farmers must approve of what Pliny, as has been already observed, adds to this, (viz.) that the weather be dry: For it is well known, that driving carriages upon land, or ploughing it in wet weather, is very destructive.

All farmers must likewise approve of the maxims that follow: The dung must be well broken and made small in spreading: 'Preserve the dung carefully,' says Cato, in his directions to the *villicus*, 'when you carry it out, spread and break it into small pieces\*.' None of the other writers give this direction, not because they did not approve of it, but probably because they thought it unnecessary, as every husbandman would observe, that, without breaking the dung well, that was laid upon a field, it would be impossible to spread it equally, or mix it thoroughly with the earth: And, without this, all the good effects of dung cannot be obtained, nor its bad effects prevented. This seems to have been considered by the Romans as of so great importance, that Pliny calls dunging land, in one of his maxims, mixing it with  
the

\* Stercus fedulo conserva, cum exportabitur spargito, et comminuito; Cat. cap. v.

the earth; 'It is,' says he, 'of great advantage  
'to mix the dung with the earth, while the wind  
'is West, and the weather dry\*.'

It was another maxim, rather to dung often  
than lay on much at a time: 'Nor should far-  
'mers be ignorant,' says Columella, 'that land  
'becomes cold which is not manured, and, like-  
'wise, that it becomes parched, when too much  
'manured; and that it is much more for the  
'benefit of the husbandman to do this often,  
'than to lay on much manure at a time †.' Pli-  
ny to the same purpose: 'If a field is not manu-  
'red, it becomes chill; if too much, it is parched:  
'It is better therefore to do this often, than im-  
'moderately ‡.' 'It is not advantageous,' says  
Palladius, 'to lay on too much dung at a time,  
'but frequently and moderately ||.'

It

\* *Fimum miscere terrae, plurimum refert, Favonio flante, ac luna sitiente; Plin. Nat. Hist. lib. xvii. cap. ix.*

† *Nec ignorare colonos oportet, sicuti refrigerare agrum, qui non stercoretur; ita peruri, si nimium stercoretur; magisque conducere agricolae frequenter id, potius quam immodice, facere; Col. lib. ii. cap. xvi.*

‡ *Ager, si non stercoretur, alget; si nimium stercoretus est, aduritur. Satiusque est id saepe, quam supra modum facere; Plin. Nat. Hist. lib. xviii. cap. xxiii.*

|| *Nec prodest nimium stercore uno tempore, sed frequenter et modice; Pal. lib. x. tit. i.*



It was a general opinion, that wet and cold land should have more dung than dry and warm. ‘Nor is there any doubt,’ says Columella, ‘but wet land requires a larger quantity of dung, and dry land a lesser quantity. The one being chill with continual moisture, is thawed by the application of the manure; the other being in itself warm by its dryness, is the more scorched by receiving this in too great abundance. For which reason, this kind of soil must neither want altogether, nor have too much\*.’ To the same purpose, Palladius, amongst the maxims of the ancients, mentions this one: ‘Wet land requires more dung, dry land requires less †.’ So Pliny likewise: ‘The warmer that soil is, it is the custom to give it the less dung ‡.’

It

\* *Nec dubium, quin aquosus ager majorem ejus copiam, ficcus minorem desideret. Alter, quod assiduis humoribus rigens, hoc abhibito, regelatur. Alter, quod per se tepens ficitatibus, hoc assumpto largiore, torretur; propter quod nec deesse ei talem materiam, nec superesse oportet; Col. lib. II. cap. XVI.*

† *Ager aquosus plus stercoreis quaerit, ficcus minus; Pal. lib. I. tit. VI.*

‡ *Quo calidius solum est, eo minus addi stercoreis, ratio est; Plin. Nat. Hist. lib. XVIII. cap. XXIII.*

It was likewise a maxim, that land upon a declivity should get more manure than land upon a plain. ‘The heaps of dung,’ says Columella, ‘about five *modii* each, should be laid thinner upon the plain, and thicker on the hill; upon the plain, at the distance of eight feet every way, upon the hill two feet less\*.’ Now, says Palladius, ‘fields ought to be manured, but the dung should be laid thicker on the hill, thinner on the plain †.’ The reason for this practice, though not mentioned, is obvious: The rain that falls upon a declivity, carries along with it, in running off, some of the virtues of the dung that is laid on; and, therefore, to produce the same effect, a greater quantity of dung is necessary to land in this situation, than to land on a plain.

The propriety of these maxims must be acknowledged by every intelligent farmer; though perhaps they do not appear so important to the moderns, as they seem to have appeared to the ancients. It would not be amiss however, if our

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farmers

\* In campo rarius, in colle spissius, acervi stercoreis instar quinque modiorum disponentur; Col. lib. ii. cap. v.

† Agri nunc stercoreandi sunt, sed in colle spissius, in campo rarius laetamina disponentur; Pal. lib. x. tit. i.

farmers would give particular attention to them; be careful to break the dung applied in small pieces, and spread it equally; to dung moderately at a time, and the more frequently on this account, if necessary; to lay more upon wet land, and less upon dry; more upon high ground, and less on a plain. Every farmer knows, that land, according to its situation, requires more or less dung: Every farmer must know likewise, that, when more dung is applied than the situation of the land requires, the overplus is not only lost, but also proves hurtful, at least to the immediately succeeding crop. It is certainly, therefore, important to consider attentively the situation of the land we propose to dung, and to adjust the quantity to be applied with all possible exactness.

Before this article is concluded, it may not be amiss to observe, that the practice of folding sheep upon land intended for corn, was known to the Romans. Very great benefit, in the present schemes, it is said, arises from this practice. But the moderns have no reason to boast of the invention, as it is probable, that we learned the practice from the ancients. Cato, the most ancient rustic writer among the Romans, expresses  
himself

himself in this manner: ‘ Where you intend to  
 ‘ sow, there allure the sheep, and feed them with  
 ‘ leaves till the green forage is ready \*.’ That  
 the sheep were allured upon the fields where  
 corn was to be sown, for the purpose of manu-  
 ring, is evident from the manner in which Pli-  
 ny cites this passage. Treating of the different  
 things proper for manuring land, he cites some  
 passages from Cato, in which he mentions some  
 things proper for this purpose, and, among others,  
 this passage with a very little variation: ‘ Like-  
 ‘ wise,’ says he, upon the authority of Cato,  
 ‘ where you intend to sow corn, there allure the  
 ‘ sheep †.’ Whether this implies, that they were  
 folded, is uncertain: That they had hurdles and  
 toils

\* Ubi sementem facturus eris, ibi oves delectato; et frondem usque ad pabula matura; Cat. cap. xxx.

† Itemque ubi satureus eris frumentum, oves ibi delectato; Plin. Nat. Hist. lib. xvii. cap. ix. This verb *delecto*, we find used by Varro: When treating of goats, he says, Quod potius silvestribus saltibus delectantur quam pratis; Var. de re rust. lib. ii. cap. iii. The meaning of which is, that goats delight more, or feed better, in forests than in meadows. Agreeable to this, it appears to be Cato’s meaning, in the direction which he gives, that sheep should have meat laid down for them, on the fields intended for corn.

toils for confining their sheep in the night-time, when they pastured at a distance from the villa, is certain: This appears from a passage in Varro: ‘ On the other hand,’ says he, ‘ for those flocks that  
 ‘ pasture in the forests, and are at a great distance  
 ‘ from houses, the shepherds carry along with  
 ‘ them hurdles or toils, and other utensils, with  
 ‘ which they make folds in the desert. For the  
 ‘ flocks in pasturing, are in use to range far and  
 ‘ wide in different places, so that their winter  
 ‘ pastures are often many miles distant from their  
 ‘ summer ones \*.’ Now, it is natural to suppose, that they would use these kinds of folds, for confining their sheep when feeding them up-  
 on

\* *Contra illa in saltibus quae pascuntur, et a tectis absunt longe portant secum crates, aut retia, quibus cohortes in solitudine faciant, caeteraque utensilia. Longe enim et late in diversis locis pasci solent, ut multa millia absint saepe hibernae pastiones ab aestivis; Var. lib. 11. cap. 11.* The meaning of this passage is very obvious; however, the commentators are very much diffculted about the construction, and seem to think there has been a mistake committed in transcribing. Some imagine the word should be *contra illi in saltibus qui pascunt*; others, that they should be *contra illis*, or *ad illas*. But there is no necessity to change any of the words, if we can suppose, that Varro, by the word *greges*, might understand both the flocks and their attendants.

on the fields intended for corn. That these folds were sometimes used for confining sheep, for the sake of their dung, is evident from another passage in Pliny: 'There are some,' says he, 'who think lands are dunged in the very best manner, by having folds made for the cattle, with toils in the open air\*.' This, it is probable, was done upon the fields intended for corn.

## C H A P.

\* Sunt qui optime stercoreari putent, sub dio retibus inclusa pecorum mansione ; Plin. Nat. Hist. lib. xviii. cap. xxiii.

That *agros* is here understood, as I have explained the passage, cannot be doubted. Pliny is here treating of the times and manner of applying dung. He mentions the time of applying it, both before and after sowing, and the quantity that should be applied. Then, after a digression respecting the quantity of dung that cattle should produce, he returns to his subject, and tells us, that some were of opinion, that lands were manured in the best manner without the trouble of carrying the dung to the dung-hill, and then to the fields, by folding the cattle upon the fields intended to be dunged and sown.

## C H A P. XI.

*Of Vegetables sown for Manure.*

**I**N Britain, buck wheat, clover, pease, and other pulse, are sometimes sown, to be ploughed in for manure. This custom we have received from the ancients, among whom it was very frequent. Beans were commonly used for this purpose by the Greeks; and Theophrastus informs us, that the farmers in Macedonia and Thessalia ploughed them in when in the flower\*. Instead of beans, the Romans commonly used lupines. ‘Some things,’ says Varro, ‘are sown, not so much for the present crop, as for their  
‘ being

\* Faba (ut dictum est) cum alias molesta minime est, tum etiam tellurem raritates suae, ac putredinis causa stercoreare putatur. Ob id, qui circa Macedoniam, atque Thessaliam colunt, cum fabae florent, arva invertere consueverunt; Theoph. de Hist. Plant. lib. viii. cap. ix.

‘ being beneficial to the crop that follows ; be-  
 ‘ cause, being cut down and left upon the field  
 ‘ where they were sown, they make the soil bet-  
 ‘ ter. Thus, when a field is poor, it is a custom,  
 ‘ instead of dunging it, to plough in a crop of  
 ‘ lupines before the pods appear, sometimes a  
 ‘ crop of beans before the pods are so far ad-  
 ‘ vanced as to render the fruit fit for being ga-  
 ‘ thered \*.’ ‘ It is universally allowed,’ says  
 Pliny, ‘ that there is no better manure than a  
 ‘ crop of lupines before they come to the pods,  
 ‘ by the plough or *bidens*, or handfuls of them  
 ‘ cut and buried around the roots of trees and  
 ‘ vines †.’ And, in another place, ‘ I have said  
 ‘ that fields and vineyards are rendered fertile  
 ‘ by the sowing of this ; therefore no person  
 ‘ need

\* Quaedam etiam serenda non tam propter praesentem fructum, quam in annum prospicientem, quod ibi subjecta atque relicta terram faciunt meliorem. Itaque lupinum, cum nec dum filiculam cepit, et nonnunquam fabalia, si ad filiquas non ita pervenit, ut fabam legere expediat : si ager macrior est, pro stercore inarare solent ; Var. lib. 1. cap. xxiii.

† Inter omnes autem constat, nihil esse utilius lupini segete, priusquam filiquetur, aratro vel bidentibus versa, manipulisve defectae, circa radices arborum ac vitium ob-  
 rutis ; Plin. Nat. Hist. lib. xvii. cap. ix.



‘ need want manure, as it will serve in place of  
 ‘ the best \*.’ Particular directions are given  
 how this operation should be performed. In  
 September, the seed was sown, and in May the  
 crop was ploughed in. Where the soil was  
 light, the lupines were ploughed in, while in the  
 third flower; where the soil was stiff, not till  
 they were in the fourth. ‘ Likewise,’ says Co-  
 lumella, in his kalendar for the last half of May,  
 ‘ whoever has sown lupines, for manuring his  
 ‘ land, must now turn them in with the plough †.’  
 So Palladius, to the same purpose: ‘ In May, if  
 ‘ any one shall sow lupines for manuring his  
 ‘ land, must now turn them in with the plough ‡.’  
 And in September: ‘ In this month, that bar-  
 ‘ ren lands may be rendered fertile, lupines are  
 ‘ sown about the 13th day; and, when they  
 ‘ shall have grown up, are turned in with the  
 ‘ plough, that so their roots being thus torn up,  
 ‘ they

\* *Pinguescere hoc fatu arva vineasque diximus. Ita-  
 que adeo non eget fimo, ut optimi vicem repraesentet;*  
*Plin. Nat. Hist. lib. xviii. cap. xiv.*

† *Item qui lupinum stercorendi agri causa serit, nunc  
 demum aratro subvertit;* *Col. lib. xi. cap. ii.*

‡ *At si quis lupinum stercorendi agri causa, seminabit  
 aratro illum nunc debet evertere;* *Pal. lib. vii. tit. iv.*

‘ they may putrify \*.’ ‘ And I am of opinion,’  
 says Columella, ‘ that, when the husbandman is  
 ‘ destitute of all kinds of dung, the ready assist-  
 ‘ ance of lupines need not be wanting; for, if  
 ‘ they are sown upon a barren field, and cover-  
 ‘ ed about the 18th day of September, and in a  
 ‘ proper time turned in with the plough or  
 ‘ spade, they will discover the qualities of the  
 ‘ very best manure. In sandy soils, they ought  
 ‘ to be turned in when in the second flower; in  
 ‘ stiff soils, when in the third. In the first of  
 ‘ these, they are turned in while tender and soft,  
 ‘ that they may the more quickly putrify, and  
 ‘ be mixed with the free soil. In the other,  
 ‘ they are allowed to become hard and stiff, the  
 ‘ longer to support and keep suspended the more  
 ‘ solid clods, that so these, being moistened and  
 ‘ warmed by the steam exhaled from the putri-  
 ‘ fying plants by the summer heats, may be dis-  
 ‘ solved †.’ Pliny, when treating of the cul-  
 ture

\* Hoc mense, ut loca foecundentur exilia, lupinus circa Idus feritur, et ubi creverit, vertitur vomere, ut putrefiat excisus; Pal. lib. x. tit. ix.

† Et ego reor, si deficiatur omnibus rebus agricolæ, lupini certe expeditissimum praesidium non deesse; quod

ture of the lupine, says, 'Of the stiff kind of soil, it loves the red best; to enrich which, it ought to be turned in after the third flower is come out; in a sandy soil, after the second\*.'

Thus we see, that the Romans were very attentive to this operation, the ploughing in vegetables sown for manure: And, perhaps, it is from the want of this attention in us, that this practice has succeeded very well with some persons, and in some places, while, with other persons, and in other places, it has succeeded very ill. The light soils in Italy are hurt by being too much exposed to the sun in the hot season; when lupines, therefore, were sown for manuring such soils, they were ploughed in while tender,

*cum exili loco circa Idus Septembris sparserit et inaraverit, idque tempestive vomere vel ligone succiderit, vim optimaе stercorationis exhibebit. Succidi autem lupinum sabulosis locis oportet, cum secundum florem; rubricosis, cum tertium egerit. Illic dum tenerum est convertitur, ut celeriter ipsum putrescat, permisceaturque gracili solo: Hic jam robustius, quod solidiores glebas diutius sustineat, et suspendat, ut eae solibus aestivis vaporatae resolvantur; Col. lib. II. cap. XVI.*

\* Ex densiore terra rubricam maxime amat; ad hanc alendam post tertium florem verti debet, in sabulo post secundum; Plin. Nat. Hist. lib. XVIII. cap. X.

ender, that so they might soon mix with the soil, and prevent the sun from exhaling the juices. The stiff soils are in a different situation; they need to be pulverised, and this operation is difficult: When lupines, therefore, were sown for manuring them, they were not ploughed in till they had acquired a degree of firmness, so as to suspend the clods raised in ploughing, and keep the soil open. Hence the rays of the sun were the more easily admitted, to raise a steam from the putrifying plants to moisten and dissolve the clods. Would we give the same attention to circumstances, to the nature and qualities of the soils upon which vegetables are sown for manure, to the seasons of sowing them, the seasons of ploughing them in, their situation when this operation is performed, the time when the seed is to be sown for the crop following, the situation of the land when it receives this seed furrow, and the kind of weather naturally to be expected from the season that follows, I am persuaded, that this method of manuring our lands would become much more common, and a much greater improvement, than it is at present.

Before

Before we leave this part of the subject, it may not be improper to observe, that, though the sowing vegetables for manure is still a practice in Italy, yet it is different from the practice of the Romans. The moderns differ from the ancients, both in the seasons of sowing and ploughing in. Crescenzi, after mentioning the practice of the ancients in this matter, adds :  
 ‘ But, in some parts of Tuscany, the expert farmers sow lupines in the season of sowing turnip, about the end of July or beginning of August, on land that has been fallowed, or on land that has carried a crop, and been twice ploughed after, in the proportion of three baskets to the *jugerum*, and cover the seed with a harrow. Afterwards, in the month of October, they cut them down with spades, and lay them in the furrows. There they sow the grain, and cover the seed with the plough. The fields cultivated in this manner produce a plentiful crop next summer. But the Milanese sow radishes thick, and, when they have grown up, turn them under ground; and others sow lentiles, and turn them under ground when they have arrived at their full growth \*.’

To

\* In partibus autem Tusciae cultores experti lupinos ferunt,

To understand the description given by Crescenzo of this operation, it is proper to observe, that, in Italy, they sometimes plough in very small ridges, which they call *quaderni*, formed by the plough going once about, like what is called stiches in England. It appears, that the lupine seed is sown on broad lands, and that it is ploughed in, and those narrow ridges formed, in the furrows of which the lupine stalks, turned up with the spade, are laid; then the seed is sown upon them, and the whole covered with the plough. By going once round each furrow, the field is laid out into narrow ridges, as before; only the furrows are turned into crowns, and the crowns into furrows.

Vincenzo Janara, when treating of the culture of beans, says, ‘ We sow them in the first  
 ‘ of August, either in stiches or broad lands,  
 ‘ on

ferunt, tempore quo feminant rapae in terris cultis, vel stipulis bis aratis, videlicet circa tres corbes in jugero, et terra operiunt; deinde Octobris ligonibus incidunt, et in fulcis ponunt, et ibidem feminantes frumentum aratur, semenque operiunt, et deinde bonum frumentum colligunt aestate sequenti. Mediolanenses vero feminant raphanos spissos, et cum creverint eas evertunt. Alii autem ferunt galegam et evertunt, cum ad substantiae venerit complementum; Cres. lib. II. cap. XIII.

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‘ on the fields designed for hemp, (such are call-  
‘ ed *cafali* or *canapari*); these, when mixed with  
‘ the wild rocket that is produced after the  
‘ beans are sown, and being grown up, we turn  
‘ under the ground with a spade, to manure it  
‘ for the benefit of the hemp: And, in truth,  
‘ this is the easiest and best way of manuring  
‘ land that has been found out\*.’

Besides the crops ploughed in for manure, there were others, which the Roman authors were of opinion improved their lands, though they were cut and carried off. These are the several kinds of pulse, when cut green, for forage: But that the land might be bettered by these crops, it is observed, that it is necessary to plough in the stubble as soon as the crop is cut. ‘ But of these crops that I have mentioned,’ says Columella, ‘ the same Saferna is of opinion, ‘ that the fields are manured and improved by  
‘ some

\* Noi prima d’agosto seminiamo à quaderni, ò vane-  
girole ne’ campi destinati a canepa (quali *cafali*, o *canapari*  
feno chiamati) quella che milticata conrucchetta salvati-  
cha, nata da poi, e cresciuta vangando il Novembre la  
poniamo sotto la terra, per ingrassarla ad uso dicanepa,  
et in vero quest’ é il piu gentil modo d’ingrassar terreni  
che si ritrovi; Vin. Jan. lib. vi.

' some of them, and exhausted and rendered  
 ' leaner by others; that they are manured by  
 ' lupines, beans, vetches, tares, lentiles, cicer-  
 ' cula, and pease. I have no doubt as to the  
 ' lupine, and likewise the vetch, when used for  
 ' green forage, provided the field is ploughed  
 ' immediately after they are cut, and what ~~is~~  
 ' left by the scythe before it wither, is cut up  
 ' and buried by the plough; for this serves in  
 ' place of dung. But if, after the forage is cut,  
 ' their roots are left to wither, they exhaust the  
 ' soil of every juice and virtue. The same thing  
 ' may be said of the bean, that, unless the field  
 ' is ploughed immediately after it is cut, it is of  
 ' no advantage to the crop that follows \*.' Pal-  
 ladius,

\* Sed ex iis quae retuli, feminibus, idem Salserna putat  
 aliis stercoreari et juvari agros, aliis rursus peruri, et emaciari.  
 Stercoreari lupino, faba, vicia, ervo, lente, cicer-  
 cula, piso. De lupino nihil dubito, atque etiam depabulari  
 vitia, si tamen eam viridem defectam confestim aratrum  
 subsequatur, et quod falx reliquerit priusquam inarescat,  
 vomis rescindat, atque obruat; id enim cedit pro stercore;  
 nam si radices ejus defecto pabulo relictæ inaruerint,  
 succum omnem solo auferent, vimque terrae absument;  
 quod etiam in faba, caeterisque leguminibus, quibus terra  
 gliscere videtur, verisimile est accidere; ut nisi  
 protinus



ladius, to the same purpose, among the maxims of the ancients, has this one: ‘Lupines and vetches for forage, if cut green, and the earth ploughed above their roots, fertilize the lands like dung; but, if these are allowed to dry before the land is ploughed, the juice of the soil is carried off through them\*.’

Pliny, without assigning any particular reason, directs, that, if a crop of lupines is pastured in the leaf, the land be immediately ploughed †. This is a particular to which the ancients seem to have given much more attention than the moderns. At the same time, it seems a matter of no small importance. When a plant is cut green, in the manner of forage, particularly when the seed is beginning to form, there is certainly a great deal of juice in the part of the stalk that is left, and in the root. Now, if the  
plant

protinus sublata messe eorum proscindatur, nihil iis segetibus, quae deinceps in eo loco seminari debent, profuturum sit; Col. lib. ii. cap. xiv.

\* Lupinus et vitia pabularis, si virides succidantur, et statim supra festas eorum radices aretur, stercoris similitudine agros foecundant; quae si exaruerint antequam proscindas, in his terrae succus aufertur; Pal. lib. i. tit. vi.

† Si depastum sit in fronde, inarari protinus solum opus est; Plin. Nat. Hist. lib. xviii. cap. xiv.

plant in this situation is left exposed to the heat of the sun, it is probable that all the juice in the roots will be exhaled, and that, as long as the roots continue to have the power of suction, they will draw nourishment from the earth, which will be regularly exhaled by the heat of the sun. But, if these roots, while full of juice, are ploughed up and covered with earth, they will putrify, will restore their juices to the earth, and raise a fermentation in the soil. In this country, tares and other pulse are sometimes cut for green forage. In this case, the direction given by the ancients should be followed, and the rather, because, whether or no the roots of the tares, when allowed to wither, exhaust the soil, yet it is certain, that the sooner a field is ploughed after the crop is taken off, it receives the greater benefit.

Some of these crops that have been mentioned, though allowed to come to perfection, were thought, by some of the Roman farmers, to better the soil. Pliny, amongst others, cites this passage from Cato. ‘ He says likewise, that the earth is nourished by some things sown in it. ‘ These crops manure the soil, lupines, beans, ‘ vetches; on the other hand, there are some

‘ that hurt it, such as *cicer*, because it is pulled  
 ‘ up, and is of a salt nature. Barley, fenugreek,  
 ‘ ervile, all these, and all other things that are  
 ‘ pulled up, exhaust the land. Do not plant  
 ‘ kernels in the corn-fields \*.’

It

\* Nec non et fatis quibusdam ipsis pasci terram dicit. Segetem stercoreant fruges; lupinum, faba, vicia. Sicut e contrario *cicer*, quia vellitur, et quia salsum est; hordeum, foenum Graecum, ervum: Haec omnia segetem exurunt, et omnia quae velluntur; nucleos in segetem ne indideris; Plin. Nat. Hist. lib. xvii. cap. ix. The passage in Cato runs thus: ‘ Si cariosam terram tractes, *cicer* quod  
 ‘ velletur, et quod salsum est, eo malum est; hordeum,  
 ‘ foenum Graecum, ervum, haec omnia segetem exsugunt,  
 ‘ et omnia quae velluntur. Nucleos in segetem ne indideris; lupinum, faba, vicia, sterco unde facias, stramenta, lupinum, paleas, fabalia,’ &c. This passage seems to have been mangled in transcribing, and has greatly diffculted the commentators, some of whom have proposed most ridiculous amendments. From the manner in which it is cited by Pliny, it is evident, that the meaning is, that *cicer*, barley, fenugreek, and ervile, exhaust land, and that lupines, beans, and vetches, better it. The whole passage, therefore, may be thus translated: ‘ It is a bad  
 ‘ thing to touch carous land, (see chap. xxi. of Plowing).  
 ‘ A crop of *cicer* is hurtful, for this reason, because it is  
 ‘ pulled up when reaped, and because it is of a salt nature.’

It is important to know the effects that the different crops have upon land. Upon the knowledge

ture. Barley, fenugreek, and ervile, are likewise hurtful. All these things hurt land, as do all crops that are pulled up in reaping. It is hurtful, also, to have kernels planted in the corn fields: But, on the other hand, a crop of lupines, beans, and vetches, better land. Dung is made of stubble, lupines, short straw, bean stalks, &c. There is a difficulty, however, that arises from this explication of the passage. Cato is made to say, that all things that are pulled up in reaping are hurtful to land, and that lupines, beans, and vetches, are beneficial; and yet it is certain, that beans were pulled up, and probably lupines likewise. To remove this, let it be observed, that these crops were sometimes pastured, or cut for green forage, and at other times allowed to perfect the feed. Now, it is probable that Cato makes a distinction betwixt the crops so differently treated; and that his meaning is, when they are pastured or cut green, they better the land; but, when they perfect the feed and are pulled, are then hurtful. The passage in some copies begins very differently; *cariosam terram faciet, si jacies cicer, &c.* But the other seems to be the true reading. According to the description given of carous land, the sowing of *cicer* cannot be supposed to have the effect here ascribed to it. In the chapter immediately before, Cato treats of dung, and the other things that better land; and it is natural to think, that, in this chapter, he mentions the things that hurt

knowledge of this depend many of the operations of the farmer; by it he is particularly directed,

hurt land; and it is not surprising, that he should begin with mentioning the touching of carous land, which, in another place, he says is most destructive. A crop of *cicer* he mentions next, a plant of a different nature from the *cicercula*, which Columella, upon the authority of Safferna, in the passage already cited, ranks among the crops that better land. Columella, when treating of the culture of this plant, says of it, that there is no *legum* that hurts land less. *Nec ullum legumen minus agro nocet.* But of the *cicer* he says, that it hurts land, and is therefore condemned by the more prudent husbandmen. *Nam etiam id terram laedit; atque ideo improbatur a callidioribus agricolis;* Col. lib. 11. cap. x. After mentioning some other crops that hurt land, Cato returns to the subject of his former chapter, and mentions things that better it; and, first, he begins with the particular crops that have this effect. That this is his meaning, is evident from the manner in which Pliny cites the first part of the passage; for he mentions them as things sown, and calls them *fruges*. But he likewise, a little before, cites the latter part of the passage, beginning with *stercus unde fiat*, which shows, that this is not to be applied to what goes before. Cato then mentions the things of which dung is made. Among these are *stramentum* and *palea*. *Stramentum* signifies the straw that was left on the ground after the corn was cut down: In some of the ways of reaping, a great  
part

rected, in his scheme of management, how to make the crops succeed each other in such a manner as to exhaust the soil in the smallest degree, in proportion to the value of the produce. This the Roman farmers seem to have given very great attention to, and it is the foundation of our principal improvements in Britain. It is now found, that valuable crops of grass may be raised from the seed, and that our lands are not hurt, but bettered by them. Hence farmers are encouraged to sow grass-seeds, and to allow their lands to continue in grass for many years, which is the most essential improvement that has been introduced into the country. By a proper attention to the principles upon which this improvement is founded, the effects which the different crops have upon our land, we will be able to improve our schemes of management still farther, and render our crops still less hurtful to our lands, and more valuable in the market.

## C H A P.

part of the straw was left on the ground ; this was afterwards cut for litter to the cattle, and was called *stramentum*. *Palea* signifies the short straw that was cut with the ear, and was used when there was a scarcity of hay for forage to the cattle ; when there was plenty of hay, it was thrown into the dunghill.

## C H A P. XII.

*Of Burning Trees, Twigs, Stubble, &c.  
for Manure.*

**T**HE virtues of ashes, as a manure, would soon be found out by the farmer, as in every house, where there is a family, they are produced. The luxuriancy of some of the plants growing near to the places upon which they were thrown, would soon be noticed by the attentive husbandman, and encourage him to try them as a manure on his corn fields: The success of such trials would naturally lead him to produce ashes in his fields, by burning upon them all useless vegetables. This, we know, was practised by the Romans with great success. ‘If you cannot,’ says Cato, ‘fell wood and  
‘twigs, and have no stone that will burn into  
‘lime, make charcoal of the wood, and burn  
‘in the corn fields the twigs and small branches  
‘that

‘ that remain ; where you have burned these,  
 ‘ there sow poppy \*’. This passage is cited by  
 Pliny : ‘ Thus,’ says he, ‘ Cato treats of poppy :  
 ‘ Burn upon the corn fields the twigs and small  
 ‘ branches that remain, after making charcoal ;  
 ‘ when you have burned these, there sow the  
 ‘ wild poppy †.’ In another place, this author,  
 when treating of the manner of destroying  
 the different kinds of weeds, by which land is  
 infested, says : ‘ Shrubs are best destroyed by  
 ‘ fire †.’ But there is a passage in Palladius,  
 that plainly discovers, that it was a practice to  
 burn not only branches and shrubs, but also  
 trees, for manuring land, and that this land was  
 afterwards treated in the same manner as other  
 corn

\* Si ligna et virgas non poteris vendere, neque lapidem  
 habebis unde calcem coquas, de lignis carbones coquito,  
 virgas et farmenta, quae tibi *ustioni* supererunt, in segetem  
 comburito ; ubi eas combufferis, ibi papaver serito ; Cat.  
 cap. xxxviii.

† Cato de papavere ita tradit: Virgas et farmenta, quae  
 tibi *ustioni* supererunt, in segete comburito. Ubi eas com-  
 bufferis, ibi papaver serito silvestre ; Plin. Nat. Hist. lib.  
 xviii. cap. xxv. Instead of *ustioni*, it should certainly be  
*ustioni*, as in Cato.

‡ Fruteta igne optime tolluntur ; Plin. Nat. Hist. lib.  
 xviii. cap. vi.



corn fields. When showing how the different kinds of land are to be treated, he says: ‘ If you  
 ‘ have a field covered with uselefs trees, divide  
 ‘ it according to the foil, that part that is of a  
 ‘ rich foil, clear of the trees, and bring it im-  
 ‘ mediately into tillage, but allow them to re-  
 ‘ main upon the barren part. The reason of  
 ‘ this is, that the one part answers very well by  
 ‘ its natural fruitfulness, the other is improved  
 ‘ by burning the trees upon it. But you must  
 ‘ still continue to distinguish betwixt the burned  
 ‘ and unburned part of the field, so as to ma-  
 ‘ nure again the burned part after five years:  
 ‘ Thus you may manage in such a manner, as  
 ‘ to make the barren part of the field carry e-  
 ‘ qual crops with the fruitful part \*.’ Perhaps  
 it

\* Si tibi ager est filvis inutilibus tectus, ita eum divide, ut loca pinguia puras reddas novales, loca sterilia filvis tecta esse patiaris, quia illa naturali ubertate respondent; haec beneficio laetantur incendii. Sed sic urenda distingues, ut ad incensum agrum post quinquennium revertaris; ita efficies, ut aequaliter vel sterilis gleba cum foecunda contendat; Pal. lib. 1. tit. vi. I have used a little freedom in rendering this passage of Palladius. His meaning in it, particularly in the last part of it, is not very obvious. However, when he mentions the return-  
 ing

it may be necessary to observe, that Palladius does not suppose that the barren land is to carry five crops before it is dunged; were it so, it would be very improper to follow his directions; for five crops are too many for land improved in the manner he describes. His direction is, that the land be dunged on, or after, the fifth year.

ing to the burned part of the field after the fifth year, and treating it so as to make it contend with the other, it is natural to suppose, that he means laying dung upon it, as was done upon other barren soils: Allowing this, the direction given is very proper. It is proposed, that the soil of the fields covered with trees, from which little or no benefit arises, shall be carefully examined; and, that those places where the soil is naturally good, shall be cleared of the trees, and immediately brought into tillage; and that, upon the places where the soil is poor, the trees shall be burned, before they are ploughed. By this means, our author declares that all parts of the fields will be rendered equally fertile. But, sensible that they would not continue so, as the effects of ashes are over in a few years, he says, that it is necessary to make a distinction afterwards betwixt the different parts of the fields, in the way of treating them, and to dung that part on which the trees were burned, after the fifth year, and to do so every fifth year, that so both parts of the field might be equally fruitful.

year. He proposes that the rich part of the field shall be made *novalis*, that is, carry a crop and be fallowed alternately. He proposes likewise, that the burned land shall be made as it were to contend with the richer land, which supposes that it is to be cropped in the same manner. In this case, there would be only two crops before the land would be dunged. The land would be fallowed on the first, third, and fifth year, and cropped on the second and fourth. On the fifth year, the year of the fallow, our author proposes that the land shall be again manured.

This manner of improving barren land, on which there are useless trees and shrubs, by burning these upon it, is certainly very proper; whenever any field, where there are trees or shrubs, is to be brought into tillage, the burning upon it all the useless stuff that cannot be otherwise disposed of to any advantage, will certainly contribute to its improvement. The method of managing the land after being brought into tillage, here mentioned, is certainly as proper as the manner of improving it. When it is inconvenient to turn burned land into grass, which is undoubtedly the best method, the fallowing and cropping alternately, and dunging to  
the

the third crop, every farmer will allow to be a proper way to prevent the land from being exhausted by the ashes.

There are some other passages relating to the burning of things in the fields to manure them, which I shall likewise take notice of. Pliny mentions the burning of the twigs of a vineyard, to improve it when it becomes poor: ‘If a vineyard,’ says he, ‘becomes poor, burn its twigs, and plough them in\*.’

It was a custom likewise, in some places, to burn the stubble in the corn fields. Virgil says, ‘Often it has been useful to set fire to barren lands, and burn the light stubble in crackling flames.’

\* *Vinea si macra erit, farmenta sua comburito, et ibidem inarato: Plin. Nat. Hist. lib. xvii. cap. ix.* This is a citation from Cato. The sentence in Cato, is as follows: *Vitis si macra erit, farmenta sua concedito minute, et ibidem inarato, aut infodito; Cat. cap. xxxviii.* ‘If a vine shall become lean, cut its twigs small, and there plough or dig them in.’ Whether an error has been committed in transcribing Cato, or transcribing Pliny, or whether Pliny has committed a mistake in his citation, is uncertain. Cutting green twigs and ploughing them in, no doubt, may do some service; but, if they can be safely burned in the vineyard, the operation is easier, and the effects more immediate, though not so lasting.

‘ flames.’ He mentions the effect which this operation has upon land, according to its nature and situation: • For to these barren soils, it either communicates rich juices, or corrects bad ones, opens their pores to allow the nourishing juices access to the young plants; or renders them more solid, so as to prevent them from being hurt by small showers, the excessive heat of the sun in summer, and the severe cold in winter\*.’ It would be absurd to suppose, that Virgil here asserts, that burning produces these different and opposite effects upon lands of the same nature, and in the same situation. He asserts no more than that some barren lands have been found to be improved by burning; and this he endeavours to account for, at the same time

\* Saepe etiam steriles incendere profuit agros,  
 Atque levem stipulam crepitantibus urere flammis :  
 Sive inde occultas vires, et pabula terrae  
 Pingua concipiunt; sive illis omne per ignem  
 Excoquitur vitium, atque exfudat inutilis humor :  
 Seu plaris calor ille vias et caeca relaxat  
 Spiramenta, novas veniat qua fucus in herbas ;  
 Seu durat magis, et venas astringit hiantes :  
 Ne tenuous pluviae, rapidive potentia folis  
 Acrior, aut Boreae penetrabile frigus adurat.

Vir. Geo. I. l. 84. &c.

time expressing himself with great diffidence. He intimates, that there are four things that render land barren: The want of juices necessary for the nourishment of plants; the having bad juices that tend to hurt and destroy plants; the being so solid, as to hinder the tender roots from extending themselves in search of their food; and the being so porous and spongy, as to be easily hurt by rain, heat, or cold. All these are well known to be causes of barrenness; and it is well known likewise, that, in every country, there are lands in each of the situations mentioned. There are lands, where there is little food for vegetables; there are lands, that have noxious qualities that hurt corn; there are lands so solid, that plants cannot find their food in them, though it may be there; and there are lands so spongy and porous, that they suck in all the rain that falls upon them, and expose the roots of the plants that grow in them to be destroyed by excess of heat or frost. Now, Virgil does not assert, that burning supplies all these defects, or is proper for land in all these situations; but that it supplies one or more of them: Probably it is not proper for land that is barren, by reason of its containing little food  
for

for plants; but, it is natural to suppose, that it may correct bad juices; and, it is certain, that it tends to open the pores of too solid land, and renders more solid the land that is too porous and spongy.

Our author here mentions both the burning lands, and burning stubble; whether by these, he intends two different operations, is uncertain. Supposing that he does, yet it is probable, that he had nothing further in view, than the burning trees and shrubs, which has already been taken notice of: This operation may very properly be called burning the field, as not only all its productions are burned, but the surface likewise. Pliny mentions the practice of burning stubble: 'There are some,' says he, 'that burn the stubble on the field, chiefly upon the authority of Virgil; the principal reason for this, that they may burn the seeds of weeds \*.' By some of the ways of reaping, as shall afterwards be shown, a great part of the straw was left upon the field: When this was at a great distance from the villa, and there was more  
straw

\* Sunt qui accendant in arvo et stipulas, magno Virgillii proeconio. Summa autem ejus ratio, ut herbarum semen exurant; Plin. Nat. Hist. lib. xviii. cap. xxx.

straw than was sufficient for litter, it might be found too expensive to cut the stubble and carry it to the dung-hill: In this case, it would not be improper to burn it, as thereby, besides other advantages, the weeds in the land would be destroyed. The early season of harvest, and the warmth of the climate, would render this operation very easy.

I do not find a passage in any of the ancient rustic writers, to justify the opinion of those who assert, that Virgil recommends, in the passage that has been cited, to pare off the surface of land, and burn the turff upon it for manure, as is practised in Britain. This practice, though it may tend to the present advantage of the farmer, yet proves very destructive to the land, unless it is treated with great care and tenderness afterwards. In breaking up land in the southern climates, I presume there is no necessity for burning it, except in the case mentioned by Palladius. The plough, assisted by the drought and heat of such climates, easily dissolves and reduces the turff. The paring turff, and burning it for manure, if an improvement, is however not a modern one, though it does not seem to have been practised by the ancient Romans,

yet



yet it was practised five hundred ago by the inhabitants of the Alps. Crescentius, who wrote in the thirteenth century, informs us of this : ‘ In the groves,’ says he, ‘ of the Alps, the trees ‘ are cleared of all their small branches in the ‘ month of May and June ; afterwards, when ‘ dry, are burned in the month of August, and, ‘ when in ashes, are ploughed in. Siligo is sown ‘ upon them, which produces that year a very ‘ great crop ; then the land rests for seven years, ‘ and is again sown in the same manner. But, ‘ when there are no groves, the grafs with its ‘ roots and some earth is pared off, and, being ‘ dried, is burned ; afterwards, upon the ashes ‘ and dust of this, filigo is sown at the season already mentioned. The land is allowed to rest ‘ eight years, and then the same work is renewed \*.’

Whether

\* In nemoribus enim Alpium mundantur mense Junio et Maio omnes ramusculi arborum, deinde cum siccati fuerint, incidantur mense Augusto, et vertantur in cinerem, et in eis feminatur filigo, quae optime provenit anno illo ; deinde usque ad septem quiescit annos, et eadem ratio denuo iteratur. Sed ubi non sunt nemora, herba cum suis radicibus et modico terrae inciditur, et exsiccata comburitur ; in cujus cinere et pulvere filigo postea praefato

Whether the inhabitants of the Alps did well, in thus paring and burning the turff of their lands, and whether the letting them rest eight years betwixt each paring and burning, was a proper management of them, it is not my business at present to determine; I shall only observe, that, taking only one crop after burning, is better management than taking three or four, as is sometimes done in modern times.

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fato tempore feminatur, et circa octo annos quiescit, et idem opus postea iteratur; Cref. lib. III. cap. de filigine, p. 90.

## C H A P. XIII.

*Of Lime.*

**L** I M E was well known to the Romans, though it does not seem to have been used as a manure, till the time of Pliny. Palladius mentions the different kinds of stones that were burned into lime: ‘ We make lime,’ says he, ‘ of a hard white stone, or Tiburtine, or ‘ dove-coloured river stone, or a red or porous ‘ stone, or lastly, of marble.’ It may not be amiss to cite what follows, though it relates to building and not to agriculture: ‘ That which ‘ is made of solid hard stone, is best for build- ‘ ing; but that which is made of the soft and ‘ porous, is best for plaister. One part of lime ‘ is mixed with two of sand: If to the river sand ‘ is added a third part of shell sand, the work ‘ is made remarkably firm\*.’

Cato

\* Calcem quoque ex albo saxo duro, vel Tiburtino aut colum.

Cato directs how a kiln shall be made, and in what manner lime shall be burned: ‘ Make  
 ‘ a lime-kiln,’ says he, ‘ ten feet diameter at  
 ‘ the bottom, twenty feet high, and reduced to  
 ‘ three feet diameter at the top. If there is on-  
 ‘ ly one entry to the furnace of the kiln, then  
 ‘ make a large pit within, sufficient to retain  
 ‘ the ashes, to prevent the necessity of carrying  
 ‘ them out. Let the kiln be well built, and  
 ‘ make the grate to fit the whole bottom. If  
 ‘ there are two entries to the furnace, there is  
 ‘ no need of a pit: When it is necessary to take  
 ‘ out the ashes, take them out at the one entry,  
 ‘ while the fire is in the other. Take care that  
 ‘ the fire never go out, but that it always burn  
 ‘ both in the night and at all other times. Put  
 ‘ good stone into the kiln, as white and as little  
 ‘ speckled as possible. When you make a kiln,  
 ‘ let the jaws fall perpendicular downwards.  
 ‘ When you have digged far enough, place the  
 ‘ kiln

columbino fluviali coquemus, aut rubro, aut spongia, aut marmore postremo quae erit et spisso et duro faxo, stric- turis convenit ex fistuloso vero aut molliori lapide tecto- riis adhibetur utilius. In duabus arenae partibus calcis una miscenda est. In fluviali vero arena si tertiam partem testae cretae addideris, operum soliditas mira praestabitur; Pal. lib. 1. tit. x.

## 332 OF THE HUSBANDRY

' kiln in such a manner, that it may be as  
 ' deep, and as little exposed to the wind, as  
 ' possible. If you have a kiln not deep e-  
 ' nough, where you can get bricks, build with  
 ' them what is raised above ground, or bedawb  
 ' the outside, where it is thus raised, with ce-  
 ' ment made of mud. When you kindle the  
 ' fire, if any flame comes out, except at the top,  
 ' fill up the place with mud. Take care that  
 ' no wind blow upon the furnace, particularly  
 ' the south wind. This shall be the mark when  
 ' the lime is sufficiently burned, the stones in  
 ' the top shall be found burned, the burned  
 ' stones at the bottom shall fall down, and a  
 ' flame with less smoke come from the kiln \*.

The

\* Fornacem calcariam pedes latam decem facito, altam  
 pedes xx. usque ad pedes lll. summam latam redigito.  
 Si uno praefurnio coques, lacunam intus magnam facito,  
 uti satis fiet, ubi cinerem concipiat, ne foras sit educendus.  
 Fornacemque bene struito, facito fortax totam fornacem  
 infimam complectatur. Si duobus praefurniis coques, la-  
 cuna nihil opus erit. Cum cinere eruto opus erit, altero  
 praefurnio eruito, in altero ignis erit. Ignem caveto ne  
 intermittas, quin semper fiet, neve noctu, neve ullo tem-  
 pore intermittatur, caveto. Lapidem bonum, quam du-  
 rissimum, quam minime varium in fornacem indito. Cum  
 fornacem facies, fauces praecipites deorsum facito. Ubi  
 satis foderis, tum fornaci locum facito, ut quam altissima,  
 et

The way of burning lime in Britain is very different from the way described by Cato, in this

et quam minime ventosa fiet. Si parum altam fornacem habebis, ubi facias lateres summam struito, aut cementis summam cum luto extrinsecus oblinito. Cum ignem subdideris, siqua flamma exhibit, luto oblinito, ne nisi per orbem exeat fumum. Ventus ad praefurnium caveto ne accedat. Inibi austrum caveto maxime. Hoc signi erit, ubi calx cocta erit, fumos lapides coctos esse oportebit; item infimi lapides cocti cadent, et flamma minus fumosa exhibit; Cat. cap. xxxviii.

Though Cato does not expressly direct that the kiln shall be made round; yet that it was made so, appears from an expression which he uses, when representing the flame coming out at the top; he says, *nisi per summam orbem*; which plainly implies, that the kiln was round at the top. The word that I have translated *grate*, is *fortax*. It cannot signify the bottom of the kiln, nor the meaning of the passage be, that the kiln must have a firm bottom, answering to its wideness; for, in this case, there would be no place for the pit to hold the ashes, which our author says expressly was within the kiln, and was intended to prevent the necessity of taking out the ashes. This pit was certainly in the bottom, and there would be a grate to support the fuel, and allow the ashes to fall into the pit. It appears, that the fire was altogether below, and that, when there was only one entry to the furnace, or place for the fire, there were two grates; one below, to prevent the fire-wood from falling into the pit intended

this passage. In Britain, we mix the lime-stone with the fewel. In Italy, these were kept separate ;

to receive the ashes ; and one above, to support the lime-stone, and prevent it from falling into the furnace. When there were two entries to the furnace, there was no need of a pit for the ashes ; for, while the fire was burning near the one, the ashes might be raked out of the other. When the ashes were taken out, fewel might be put in their place, and then the ashes taken out, and fewel put in at the other entry ; which could not be done when there was but one entry. These grates, at least the one that supported the lime-stone, would extend over the whole wideness of the kiln, and was the one that was called *fortax*. The direction given by Cato, never to allow the fire to go out, is not intelligible, without supposing that there was a furnace, into which the fewel for the fire was put. It is upon this supposition too, that it is of any importance to give marks, by which it may be known when the whole stones in the kiln were sufficiently burned : For, in this way of burning lime, the fire may be continued as long as it is found necessary ; but, in the ordinary way now used, no alteration can be made. It is probable, that the grate was made so as to let down, that the lime-stone falling into the furnace might be carried out at the entry ; or, if fixed, that there would be a place made in the kiln, just above it, for this purpose of taking out the lime ; or, perhaps, their way of conveying water to the burned stones next to the grate, which would make them break

in

rate; the fuel was below and the lime-stone above. It is natural to suppose, that the first attempt

in pieces, and fall through the grate into the furnace. It is probable, that this way of burning lime continued to be practised in the time of Pliny; for he mentions the ashes of lime-kilns as a good manure for olive trees: 'It has been lately found out,' says he, 'that olive trees receive great benefit from the ashes of lime-kilns.' *Nuper repertum, oleas gaudere maxime cinere e calcariis fornacibus; Plin. Nat. Hist. lib. xvii. cap. ix.* Had lime-stone, in the time of Pliny, been burned in the same manner as is done now, it would not have been possible to keep the ashes separate from the lime. Whether or no the heat of a fire below will communicate itself to lime-stones above, lying near twenty feet thick, so as to burn into lime even those on the top, I cannot assert, as I have no certain information that lime-stone was ever burned in this way: If it will not, I have certainly mistaken Cato's meaning; for it cannot be doubted, that he has described a method of burning lime-stone, that was practised with success. But, as his meaning appears to be very obvious, it is probable, that this will be found, upon trial, the most proper way of burning lime-stone, when wood is used for fuel. Perhaps, it may be proper to observe further, with respect to Cato's description of the lime-kiln, that what he calls the jaws, *fauces*, is the upper part. This appears from another passage of this author, compared with a passage in Pliny. Cato says: 'If the field  
' is



tempt to burn lime would be made, by putting the stone into a fire, or mixing the stone and fewel together. If so, the keeping these separate, as in the Roman method, was certainly an improvement. In this operation, however, it is probable, that there is a great difference betwixt using wood and using coal as fewel. To burn lime-stone properly, it is necessary that the heat be raised to a certain degree, and that this heat continue for a certain time: When the heat is raised to a very great height, the stone, if there is any fusible earth mixed with it, as  
 sometimes

‘ is wet, drains must be made, shelving three feet wide at  
 ‘ the top.’ Sulcos, si locus aquosus erit, alveatos esse oportet latos summis pedes tres; Cat. cap. XLIII. Pliny cites this passage in this manner: ‘ Cato says, if the place  
 ‘ is wet, make drains three feet wide in the jaws.’ Cato, si locus aquosus sit, inquit, latos pedes ternos in faucibus; Plin. Nat. Hist. lib. xvii. cap. xi. So that what Cato calls the top or upper part, Pliny calls the jaws. Cato, therefore, in the directions which he gives with respect to the jaws of the kiln, seems to require, that the kiln shall be taken in, till it is no more than three feet wide, before the walls are raised to the top, that then they shall be raised a little higher, but not taken in; and this part carried up perpendicular at three feet diameter, appears to be what was called *fauces*, the jaws of the kiln.

sometimes happens, is melted and run together into one mass, and, if the heat does not continue the full time, the particles of the stone are not thoroughly separated. Wood, as a fuel, is very quickly consumed; hence, it becomes almost impossible to mix it with stone, in such a manner, as to preserve sufficient heat in the kiln as long as is necessary: And this defect cannot be supplied by an increase of heat, lest the stone, by this, should be melted. Coal, in this respect, is different from wood; it is not so soon consumed, and, mixed with lime-stone, preserves the proper degree of heat as long as is required. Therefore, mixing the fuel with the stone, may be the most proper method of burning lime-stone, when coal is used; while keeping these separate, may be the most proper, when wood is used. It may be of importance to attend to this difference, as it is probable, that there are many parts of the kingdom where lime-stone and wood, or peat, may be found in plenty, and where coal cannot be procured, at such a price, as to render the burning of lime-stone with it of any advantage. In such places, it is probable, if the Roman method of burning

lime-stone is known and followed, that a very great improvement would be introduced\*.

In Britain, two kinds of lime-kilns are used; One of them is very simple: It is built of a rectangular form, and raised a few feet above ground, with openings at the ends near the bottom, for admitting air. After strawing the bottom with some dry easily kindled fuel, the coals and stone are put in alternately, and, when raised above the walls, are tapered to a narrow top, and covered with earth. When the kiln becomes cool after burning, one of the end-walls or both are taken down, and the shells, as the burned stones are commonly called, are taken out. When more lime is required, the same process is repeated. The other kind of kiln is of a different construction, and the process

\* In some parts of Scotland, it is a common practice, to burn lime-stone with peat. This does very well when the lime is intended for manure; but the quantity of peat necessary is so great, in proportion to the quantity of stone, that the ashes mixed with the lime render it improper for mortar. To prevent the heat from being raised to too great a height, the kilns are built narrow and high; and, to prevent the fire from communicating itself too quickly from the lower to the higher parts of the kiln, the stone is broken very small,

cess of burning the lime-stone very different likewise: It is of a circular form, narrow below, and wide above, with open places near the bottom for taking out the shells. When once set a-going, it continues to burn; for, as the burned lime-stone is taken out, unburned lime-stone and fuel are put in above. The great advantage of this kind of lime-kiln above the other, is, that the continued heat serves in part for fuel: For it is well known, that a furnace, when heated to a certain degree, requires much less fuel to support this degree of heat, than to raise it. This kind of kiln is called a draw-kiln, no doubt, from the manner in which the shells are drawn out. Was the Roman method of burning lime-stone with wood once properly understood and practised, possibly some improvement of this kind may be found out, to lessen the expence.

As Cato describes the manner of burning lime, so likewise he informs us, upon what terms the proprietor of a lime-stone quarry agreed with the burner of the lime, when the lime was divided between them. He says: ‘ He who gives  
 ‘ lime-stone to a partner to be burned, gives up-  
 ‘ on these terms: The lime-burner makes ready  
 ‘ the

‘ the stones, and burns them, puts in the wood,  
 ‘ and takes out the lime. The proprietor fur-  
 ‘ nishes the stone, and as much wood as the  
 ‘ kiln requires \*.’

In the time of Pliny, the Gauls, in some parts of the country, used lime with success as a manure for their corn fields : And, it was found in Italy to be very beneficial to vines and olives †. He likewise mentions it as proper to be applied to the roots of cherry trees, to hasten the ripening of the fruit ‡. From this passage, it appears, that the use of lime, as a manure, was known to the Romans. Cherries were not known in Italy, till brought by L. Lucullus from Pontus, after his victory over Mithridates, which was in the year of the city 680, about 200 years before Pliny §. As lime was found beneficial,  
 when

\* Calcem partiario coquendam qui dant, ita dant; calcarius perficit et coquit, et ex fornace calcem eximit, et ligna conficit ad fornacem. Dominus lapidem, ligna ad fornacem, quod opus fiet, praebet; Cat. cap. xvi.

† Hedui et Pictones calce uberrimos fecere agros; quae sane et oleis et vitibus utilissima reperitur; Plin. Nat. Hist. lib. xvii. cap. viii.

‡ Cerasos praecoces facit, cogitque maturefcere calx admota radicibus; Plin. Nat. Hist. lib. xvii. cap. xxvii.

§ Cerasi ante victoriam Mithridaticam L. Luculli non fuere

when applied to the roots of cherry trees, in Pliny's time, we may well suppose, that many experiments had been tried with it as a manure; and, it is probable, that, at that time, it would have been as commonly used in Italy, as it is at present in Britain, had it agreed as well with their soils and climates, as with ours.

The most proper method of applying lime as a manure, and the most proper method of managing the land to which it has been applied, are not yet well known.. There are many fields, the history of which discovers, past all doubt, that lime acts as a most powerful *stimulus*: After lime was applied, they carried good crops, and now are reduced to a state of barrenness. On some of these fields, lime has been tried a second time, without producing any sensible effect. This shows, that, when a large quantity of lime is applied, great care should be taken in the management of the land, and great tenderness used in the manner of cropping. But, whether there is a particular method of applying lime, to prevent its bad effects, or, whether there

fuere in Italia: Ad urbis annum DCLXXX. is primum vexit e Ponto; annisque cxx trans oceanum in Britanniam usque pervenere; Plin. Nat. Hist. lib. xv, cap. xxv.

there is any way of managing land wore out with lime, so as to restore it to its original state, and prepare it for another liming, is uncertain: These things can be found out only by experiments; but, to finish these experiments, too many years are necessary. However, this is a matter of such importance in agriculture, that farmers should be very careful in making observations: They should endeavour to learn, as exactly as possible, the history of every limed field in their neighbourhood, the manner in which it was limed, the quantity applied, the crops that followed, and the order of these crops. By comparing these with the present situation of the fields, it is probable, that something may be found out, of great advantage in the management of limed lands. Some attempts should likewise be made, to restore the fertility of limed land, that is wore out with cropping. There is one thing, that has so much the appearance of succeeding, as to render it worthy of a trial, and this is trenching the field: Six or seven inches of new soil, thrown up from the bottom to the top, make a complete alteration in the situation of a field, and, probably, may dispose it to be as much fertilized by lime as formerly. Many fields

fields are of so deep a foil, as to render trenching of itself a real improvement; but, even where the foil is shallow, and barren earth below, yet it is probable, that this barren earth, when mixed with lime, and exposed to the air, may acquire a degree of fertility sufficient to answer the expence. The probability appears so strong, as to render the experiment worthy of a trial; and, if it shall succeed, it will be no difficult matter to contrive ploughs of such a form, as to go to any depth that may be found necessary.



## C H A P. XIV.

*Of Marls.*

**T**H E R E are many different kinds of marls used in Britain as manures, and our lands are greatly improved by them ; some kinds of them were used by the Greeks. It does not appear, however, that the Romans found any of them in Italy ; but they were acquainted with them in the time of Pliny ; and, before he wrote his natural history, were used with success in this island. It is Pliny that mentions them ; and I shall give his description of their nature and use, as nearly in his own words as the difference of the languages will allow.

Some of the Roman writers, and among them Columella, upon the authority of his uncle, recommend, in the culture of vines, to put clay upon a light soil, and sand upon a clay soil.

This

This Pliny mentions, and asserts, that no good can be expected from it. ‘ But,’ says he, ‘ to improve earth by earth, (as some recommend) by laying fat earth upon lean or light soil, through which the water easily passes upon moist and fat soil, is the work of a madman; for what can he expect who cultivates his land in such a manner?’

Then he adds :

‘ There is another way of nourishing earth by earth, which has been found out in Britain and Gaul. It is thought, that there is a greater degree of fruitfulness in this kind than in any other. It is a certain richness of earth, like the kernels in animal bodies, that are increased by fatness.

‘ The Greeks have not omitted to mention this; for, is there any thing that has not been tried by them? They call the marl like white clay *leucargillon*, which they use in the lands near Megara, but only where they are moist and cold. These kinds that enrich the Gallic and British fields, it is proper that we describe with care. There are two general kinds; more have been tried of late by men of genius. There are the white, the dove-  
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' coloured, the clay, the stony, the sandy. They  
 ' are of two different natures, acrid and fat. I  
 ' have an account of experiments made on both  
 ' in my hands, and they serve two purposes.  
 ' Some of them are proper for nourishing corn,  
 ' and others proper both for corn and fodder.  
 ' The white stony kind is one of those that are  
 ' proper for corn, which, if found amongst  
 ' springs, renders the land exceedingly fertile;  
 ' but it is acrid when applied, and, if laid on in  
 ' too large quantities, burns up the soil. The  
 ' next in goodness to it is the red kind, which  
 ' is called *capnumargos*. It is a stone marl, and  
 ' the stones are mixed with a sandy dusty earth.  
 ' The stones are broken upon the field, and, for  
 ' some years, they make it difficult to cut down  
 ' the stubble. This kind, however, being light-  
 ' er by the half than the other, is carried to the  
 ' field at much less expence. It is spread very  
 ' thin; some think that it is mixed with salt.  
 ' The good effects of both these kinds, only  
 ' once laid on, remain for fifty years, and ren-  
 ' der the land fruitful both in corn and fodder.

' The principal of those, reckoned the fat  
 ' kinds, is the white; of this there are many.

' One

‘ One very acrid, that has already been men-  
 ‘ tioned. Another kind of the white is like a  
 ‘ soft clay. It is found at a great depth; the  
 ‘ pits very frequently dug an hundred feet down,  
 ‘ narrow at the mouth; but the vein, as in me-  
 ‘ tals, widening within. This is chiefly used in  
 ‘ Britain. It remains eighty years; nor is there  
 ‘ an instance of any man laying it twice on the  
 ‘ same field. A third kind of the white is call-  
 ‘ ed *glischromargon*. It is a fuller’s clay, mixed  
 ‘ with fat earth, better for producing fodder  
 ‘ than corn; for, when one crop of fodder is  
 ‘ reaped, another very good one may be cut be-  
 ‘ fore seed time; when the field on which it is  
 ‘ laid is in corn, it produces no other kind of  
 ‘ plant. It lasts thirty years. If laid on thick-  
 ‘ er than the Signinian plaster commonly is, it  
 ‘ destroys the soil, by giving it too much rich-  
 ‘ nefs.

‘ The Gauls call the dove-coloured, in their  
 ‘ language, *eglecopala*. This kind is raised in  
 ‘ the same manner as stones in a quarry. It is  
 ‘ dissolved by the sun and frost, so as to fall in-  
 ‘ to very small thin pieces. It renders the land  
 ‘ equally fertile with the last mentioned.

‘ The

### 348 OF THE HUSBANDRY

‘ The sandy kind is used where there is no  
‘ other, and even on wet lands, though there  
‘ are others.

‘ The Ubii are the only people I know, who,  
‘ cultivating very fertile lands, enrich them with  
‘ earth of any kind, taken three feet from be-  
‘ low the surface, and laid on one foot thick.  
‘ But this manure lasts only ten years.

‘ The Hedui and Pictones manure their fields  
‘ with lime, which is likewise found very good  
‘ for olives and vines.

‘ All marl ought to be laid upon ploughed  
‘ land, that its virtue may be the easier sucked  
‘ in by the foil. A little dung should be laid  
‘ on with it, particularly with that kind that at  
‘ first is too hard, and does not dissolve well e-  
‘ nough to nourish plants. Besides, of whatever  
‘ kind it is, it hurts the foil, by its being new,  
‘ and does not render it fertile till after the first  
‘ year. It may be asked, and it is of importance  
‘ to know, upon what foils the different marls  
‘ ought to be laid? The dry or hard kind is  
‘ best for moist land, and the fat kind for dry  
‘ land. Either of the two kinds, either the clay  
‘ kind which is fat, or the dove-coloured which

‘ is

‘ is hard and dry, does very well for soils that  
‘ are neither dry nor wet \*.’

We

\* Terram enim terra emendari (ut aliqui praecipunt) super tenuem pingui injecta, aut gracili bibulaque super humidam ac praepinguem, dementiae opera est. Quid potest sperare qui talem colit?

Alia est ratio, quam Britannia et Gallia invenere alendi eam ipsa; quod genus vocant margam. Spiffior ubertas in ea intelligitur. Est autem quidam terrae adeps, ac velut glandia in corporibus, ibi densante se pinguitudinis nucleo.

Non omifere et hoc Graeci. Quid enim intentatum illis? Leucargillon vocant candidam argillam, qua in Megarico agro utuntur, sed tantum in humida frigidaque terra.

Illam Gallias Britanniasque locupletantem cum cura dici convenit. Duo genera fuerant. Plura nuper exerceri coepta proficientibus ingeniis. Est enim alba, rufa, columbina, argillacea, tophacea, harenacea. Natura duplex aspera, aut pinguis. Experimenta utriusque in manus; ususque geminus, aut ut fruges tantum alant, aut edant et pabulum. Fruges alit tophacea alba, quae si sit inter fontes reperta, est ad infinitum fertilis, verum aspera tractatu, et si nimia injecta est, exurit solum. Proxima est rufa quae vocatur *capnumargos*, intermixto lapide terrae minutae, harenosae. Lapis contunditur in ipso campo; primisque annis stipula difficulter caeditur propter lapides. Impendio tamen minimo levitate, dimidio minoris quam

We may observe, that Pliny classes these marls in four different ways :

## 1. He

quam caeterae invehitur. Inspergitur rara ; sale eam misceri putant. Utrumque hoc genus semel injectum in L annos valet, et frugum et pabuli ubertate.

Quae pingues esse sentiuntur, ex his praecipua alba. Plura ejus genera. Mordacissimum, quod supra diximus. Alterum genus albae cretae argentaria est. Petitur ex alto, in centenos pedes actis plerumque puteis, ore angustatis ; intus, ut in metallis, spatiente vena. Hac maxime Britannia utitur : Durant annis LXXX. Neque est exemplum ullius qui bis in vita hanc eidem injecerit. Tertium genus candidae, glischromargon vocant. Est autem creta fullonia mixta pingui terra, pabuli quam frugum fertilior, ita ut messe sublata ante sementem alteram laetissimum secetur. Dum in fruge est, nullum aliud gramen emittit. Durat xxx annis ; densior justo Signini modo strangulat solum, Columbinam Galliae suo nomine Eglecopalam appellant. Glebis excitatur lapidum modo ; sole et gelatione ita solvitur, ut tenuissimas bracteas faciat. Haec ex aequo fertilis. Harenacea utuntur, si alia non sit ; in uliginosis vero, et si alia sit. Ubios gentium solos novimus, qui fertilissimum agrum colentes, quacunq;ue terra infra tres pedes effossa, et pedali crassitudine injecta laetificent. Sed ea non diutius annis x prodest. Hedui et Pictones calce uberrimos fecere agros ; quae sane et oleis, et vitibus utilissima reperitur. Omnis autem marga arato injicienda est, ut medicamentum rapiatur ; et fimi desiderat aliquantulum,

1. He classes them by their colours ; of these there are three, white, red, and dove-coloured.

2. He classes them by the things which they seem to resemble, or of which they seem to be compounded ; of those there are three likewise, clay, stone, and sand.

3. He classes them according to what seems to be their natures ; and of these there are two, the acrid and fat.

Lastly, He classes them according to their uses ; and of these there are two sorts likewise, and the same with those mentioned in the preceding class ; the one sort fit for corn, and the other fit for both corn and fodder.

Of the white he mentions three kinds ; one of them a stone marl, and of the acrid kind. The effects of it, as a manure, continued fifty years ; and it seems to have been easily dissolved by the air, as it is represented as one of the  
kinds

tulum, quae primo plus aspera, et quae in herbas non effunditur, alioquin novitate, quaecunque fuerit, solum laedet, ne sic quidem primo post anno fertilis. Interest et quali solo quaeratur. Sicca enim humido melior, arido pinguis. Temperat alterutra, creta vel columbina, convenit ; Plin. Nat. Hist. lib. xvii. cap. v. vi. vii. viii.



kinds proper for corn \*. The other two white kinds are represented as clay marls, and of the fat kind †. It is probable that it is one of these  
white

\* This kind of white marl Pliny calls *tophacea alba*. He describes its nature, by calling it *genus mordacissimum*.

† One of these Pliny calls *creta argillosa*. *Creta* is a kind of clay used by potters; so is *argilla*, as Columella informs us. ‘A clay soil,’ says he, ‘is reckoned good for vines; but *creta* by itself, which potters use, and which some call *argilla*, is very bad.’ *Cretosa humus utilis habetur viti; nam per se ipsa creta qua utuntur figuli, quamque nonnulli argillam vocant, inimicissima est.*— This kind of marl, it seems, had a resemblance to that kind of white clay which potters use at this day. But, in the common copies of Pliny, instead of *creta argillosa*, we read *creta argentaria*. It is said, that there is a kind of clay that was used for polishing silver, and that this is the kind here mentioned. But, if *creta argillosa* is a reading supported by any copy, I should think it the true one; because our author, in mentioning the different kinds of marl, calls one of them *argillacea*.

The other kind of white clay marl Pliny describes in these words: ‘*Est autem creta fullonia mista pingui terra.*’ This one appears, from the description, to be softer and more greasy than the other. It is evidently of the fat kind. It is mentioned as more proper for fodder than corn, and it is said likewise to destroy weeds. Pliny expresses this in these words: ‘*Dum in fruge est nullum aliud*

white marls that Varro mentions as used by the Gauls in his time. ‘When I marched an army,’  
says

‘aliud germen emittat.’ In some copies, in place of *germen*, we read *gramen*. But *germen* is certainly the true reading. *Germen* properly signifies a bud, twig, or young shoot; and Pliny, in applying this word here, certainly intended to declare, that when the land, upon which this kind of marl is newly laid, is in corn, it produces no bud or shoot but from the seed that is sown. This kind of marl, our author likewise says, must be laid on very thin. He expresses this in these words: ‘Densior justo Signini modo strangulat solum.’ In some copies we read *cymini*, in the place of *Signini*; but *Signini* is certainly the true reading; for the herb *cymen* has no relation to the destroying of land, or to the quantity of marl that should be applied to it. The commentators seem generally to be of opinion, that *justo modo Signini* signifies, ‘after the manner that the rubbish from a plaster work is laid upon land.’ But it seems to be more probable, that it is Pliny’s meaning, that this marl must be laid on no thicker than this kind of plaster. This was the kind of plaster that was used for pavement. Columella mentions it as proper for the bottom of a cistern for holding water: ‘Et si naturalis defuit aqua, vel inducitur fluens, vel in fossi lacus Signino consternuntur;’ Col. lib. ix. cap. 1.—He mentions it likewise as proper for the bottom of a fishpond: ‘Id autem stagnum vel exciditur in petra, cujus rarissima est occasio, vel in littore construitur opere Sig-

says he, ‘ to the Rhine in Transalpine Gaul, I  
 ‘ passed through some countries, which produce  
 ‘ neither vines, olives, nor fruit-trees, where  
 ‘ the fields were manured with a white fossil  
 ‘ clay\*.’

Of the red he mentions only one kind; it is a stone marl: For he says, that, for some years after it is laid on, it is difficult to cut the stubble by reason of the stones. He says further, that it is lighter by one-half than any others of the stony kind. He describes it likewise to be of the acrid kind, and, on this account, laid on very thin. To these he adds, that it was the opinion of some that it is mixed with salt.

Of the dove-coloured he mentions only one kind, which is likewise a stone marl; for he says, that it rises in pieces like stones, and that these are dissolved on the fields by the sun and frost.

The

‘ nino.’—It is probable that this plaster was laid on very thin; and, in the same manner, Pliny says, this kind of marl must be laid on land.

\* In Gallia Transalpina intus ad Rhenum, cum exercitum ducerem, aliquot regiones accessi, ubi nec vitis, nec olea, nec poma nascerentur; ubi agros stercorearent candida fossicia creta; Var. lib. 1. cap. vii.

The stony marls are the kinds which Pliny mentions as proper only for corn. They were not at first proper for fodder; for the stones not only prevented the fodder from being properly mowed, but also covered too much of the surface, and thereby made the crop thin. They had not the same effect upon corn; for corn branches out from the root, which is not the case with any of the kinds of pulse, and these were the crops commonly raised by the ancients for fodder. Our author, however, after asserting that the white and red, stony and acrid kinds, continue for fifty years, adds, ‘and  
 ‘ make the land carry rich crops both of corn  
 ‘ and fodder.’ This is designed to explain his meaning, when he says that the stony kinds are fit only for corn; which is, that this is to be confined to a few of the first years after the marl is laid on; for that, afterwards, when the stones are dissolved, the lands carry as good crops of fodder as of corn.

Pliny, in directing how the different marls are to be applied to the different soils, says, that the dry, that is, the stony and acrid, should be laid upon moist land; that the sandy should be laid upon wet land; and the fat upon dry land.

He

He proposes, likewise, that dung shall be laid on along with them, particularly the acrid kinds; because it is some time before they dissolve, so as to transmit their juices to the roots of plants. It is needless to insist upon these directions. The propriety of them must appear to every farmer acquainted with marls; and, perhaps, they are as good as are given by any modern improver.

All the kinds of marls here mentioned by Pliny are found in Britain, and some of them common in Scotland. In some places, we have the white and red stone marls, and they are of the same kind with those mentioned by Pliny; they are of the acrid kind, and must be laid on in small quantities. The white clay kind is likewise found in some places; it appears, as Pliny says, fat in its nature, and must also be laid on very thin. The dove-coloured stone marl is very common, and rises in the pit, and is dissolved upon the land in the same manner as is mentioned by Pliny. As none of these marls were found in Italy, and as there were no books to which our author could have recourse, we cannot but admire his diligence in getting information concerning them, and the exactness of the information which he received.

What

What he says concerning the Ubii is somewhat extraordinary. Though they cultivated a rich soil, yet they manured their lands by taking any kind of earth three feet from below the surface, and laying it one foot thick upon them. It is possible, that, in the country of the Ubii, the soil is very deep, and that they were in use to trench their lands. By this practice, they may be said to manure their fields in the manner that Pliny describes: He says, they used any kind of earth, because they trenched the whole field, and did not take the earth which was laid on the top from any particular place.

Thus I have endeavoured to collect the principal things which the Roman authors have mentioned about manuring their fields; and, from the passages that I have cited, it appears that they gave a very particular attention to this operation, were very exact, and adapted their practices as different situations and circumstances required. In these things they are certainly superior to the moderns, and are very worthy of our imitation.

## C H A P. XV.

*Of Draining.*

**T**HE care necessary in draining is well known. There are not many farms in Britain, particularly in the northern part of the island, in which it does not call for the particular attention of the farmers.

The Romans were at very great pains in draining their wet lands. Cato represents this as a matter of very great consequence: ‘ In the  
 ‘ winter,’ says he, ‘ it is necessary that the water  
 ‘ be let off from the fields. On a declivity, it is  
 ‘ necessary to have many drains. When the  
 ‘ first of the autumn is rainy, then is the greatest  
 ‘ danger from water; when it begins to rain,  
 ‘ the whole servants ought to go out with farcles,  
 ‘ and other iron tools, open the drains, turn the  
 ‘ water into its channels, and take care of the  
 ‘ corn

‘ corn fields, that it flow from them. When it  
 ‘ rains, it is necessary to go round all parts of the  
 ‘ villa, and to mark with charcoal the places  
 ‘ where the rain goes through, that so, when it  
 ‘ turns fair, the tiles may be changed. Where-  
 ‘ ever the water stagnates amongst the growing  
 ‘ corn, or in other parts of the corn fields, or in  
 ‘ the ditches, or when there is any thing that  
 ‘ obstructs its passage, that should be removed,  
 ‘ the ditches opened, and the water let away\*.’

Varro

\* Per hiemem aquam de agro depellere oportet. In monte fossas inciles plures habere oportet. Prima autumnitate cum pluvia est, tum maxime ab aqua periculum est. Cum pluere incipiet, familiam cum ferreis, farculisque exire oportet, incilia aperire, aquam deducere in vias, et segetem curare oportet, uti fluat. In villa cum pluet, circumire oportet, sicubi perpluat, et signare carbone, cum desierit pluere, uti tegula mutetur. Per segetem in frumentis, aut in segete, aut in fossis sicubi aqua constat, aut aliquid aquae obstat, id emittere, patefieri, removerique oportet; Cat. cap. clv. In some copies, instead of *In monte fossas inciles plures*, we read *fossas inciles puras*, ‘well-cleaned drains.’ But it is probable that *plures* is the true reading. There is not so great need of clean drains on a declivity as there is on a plain; but there is need for more of them, to prevent the rain water from carrying off the soil, which it is apt to do when too much of it is collected.



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Varro recommends draining as a work to be performed betwixt the winter solstice and the coming

collected together. Instead of *prima autumnitate cum pluvia est*, in some copies we read *cum pulvis est*. Many of the commentators are of opinion, that this is the true reading. One of them, with great appearance of triumph, says, 'What then? Would any man have been ignorant, though Cato had not told him, that, when it is rain, then is the time of danger from water? But the danger from water (by which we can understand nothing but rain) is chiefly when there is dust, and this is more common after the summer heats in the beginning of autumn, than at any other season; because the water, suddenly rushing from the declivities, easily forces away the dust, and by its flood sweeps away the soil.' *Quid enim? an ignorasset quisquam, nisi Cato monuisset, tum periculum esse ab aqua, cum pluvia est? Quin periculum est ab aqua (quae alia hic intelligi non potest, quam pluvia) tum maxime, cum pulvis est, quod post aestivos calores prima autumnitate magis, quam ullo tempore anni accidit; quia aqua subito ingruens locis declivibus pulverem ipsum facile amolitur, et eluvione nocet, agrosque supremo nudat corio; Scrip. Rei Rust. vet. Lip. 1735. p. 114.—But, with all due deference for the opinion of this learned gentleman, the great danger from the water, here mentioned, may be supposed to refer neither to the rain nor the dust, but to the season of the year: And then our author's meaning is, that the greatest danger from water stagnating,*

coming of the Zephirs, which was reckoned about the sixth day of February. ‘ In the eighth ‘ interval,’ says he, ‘ betwixt the winter solstice ‘ and the coming of Favonius, these things ought ‘ to be done. If there is any water on the corn ‘ fields, it ought to be let off\*.’

For

stagnating, or flowing on land, is in a rainy autumn, and not in the autumn after a dry summer, as this learned commentator supposes. The propriety and importance of this observation will be observed by every farmer, when he is informed that this was the seed-time. The seed was commonly ploughed in ; an operation that cannot be performed properly while land is wet. Cato therefore recommends, as a matter of the greatest importance, that the land that is to receive seed be laid in such a situation as to receive the least damage from water in the autumn, if that season should prove rainy. That the danger here mentioned by Cato is not the danger of having the dusty soil carried off by rain, is evident to every person who knows any thing of the nature of draining land, the operation that is here recommended. The way to drain land is to give the rain water an easy passage ; and the more easy that the passage is, and the more that the water is collected, it runs with the greater violence.

\* Octavo intervallo inter brumam et favonium, haec fieri oportet. De segetibus, si qua est aqua, deduci ; Var. lib. 1. cap. xxxvi.

For the purpose of draining, Columella recommends, that, immediately after the seed is sown, water-furrows be drawn, and this though the season is dry and the seed early sown. 'But,' says he, 'although the seed-time should be early finished, yet we ought to be careful in making the furrows clean and many water-furrows, which some call *elices*, and draw the whole water into drains, and thence out of the fields\*.' The same author, in his kalendar, recommends, that in that season the ditches be cleaned, and water-furrows made †. Pliny tells us, that it was the custom to make wide furrows where it was necessary, for conveying the water into ditches or drains ‡; and that this work must be performed, as Varro directs, betwixt the  
winter

\* Sed quamvis tempestive sementis confecta erit, cavebitur tamen, ut patentes liras, crebrosque sulcos aquarios, quos nonnulli *elices* vocant, faciamus, et omnem humorem in colliquias, atque inde extra segetes derivemus; Col. lib. ii. cap. viii.

† Eodem tempore fossas rivosque purgare, et *elices* sulcosque aquarios convenit facere; Col. lib. xi. cap. ii.

‡ In usu est et colliquias interponere, si ita locus poscat, an piores sulco, quae in fossas aquam deducant; Plin. Nat. Hist. lib. xviii. cap. xix.

winter solstice and the coming of the Zephirs \*. Virgil likewise recommends care in conveying away the water, especially in the rainy months, when rivers overflow their banks, and leave their waters in the hollows †. When the land was wet, they ploughed and sowed in such a manner that the seed was laid upon the top of small ridges, with water-furrows betwixt each of them, as shall be afterwards shown, when we come to describe their ploughs and manner of ploughing.

The representation which I have given, of the care of the Roman farmers, in draining and keeping their lands dry, in such soils and in such a climate as in Italy, may be considered as a severe reproof to many of the farmers in Britain, where the land is stiff and the climate wet. There is scarcely any thing of greater importance in  
farming,

\* In his kalendar for January, 'fossas purgare, aut novas facere;' Plin. Nat. Hist. lib xviii. cap. xxvi.

† ————— quique paludis

Collectum humorem bibula deducit arena?

Præsertim incertis si mensibus amnis abundans

Exit, et obducto late tenet omnia limo;

Unde cavæ tepido sudant humore lacunæ.

Virg. Georg. I. l. 113.

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farming, than the preventing land from being hurt by water. It is particularly of importance, to lay it up in such a manner before winter as to keep it dry, that so, if sown, the young plants may not be chilled, and, if not sown, may be in a proper condition for being ploughed in spring.

CHAP.

## C H A P. XVI.

*Of Drains.*

**A**S the importance, or rather the necessity, of draining, would soon be discovered by the attentive farmer, it is natural to think, that making trenches in proper places would also soon appear to him the proper way to prevent some of his fields from being overflowed, and to carry off the water that was in danger of stagnating upon others; and yet, in many parts of Britain, agriculture was long practised before almost any thing of this kind was attempted. The Romans were not so negligent; they not only observed the importance of draining, but they also carefully determined the places and positions of their drains, and adapted the kind of drain to the situation of the field.

There

There are two kinds of drains used in Britain ; the one kind is open, the other is covered. Open drains are easily made ; more care and attention are required in making covered ones. The way of making these, and the manner of applying them, we have from the Romans, who used both kinds. A particular description of them is given by almost all the rustic writers. Cato, the oldest writer, directs covered drains to be made in this manner. Treating of the culture of olives, he says, ‘ If the place is wet, it is ‘ necessary that the drains be made shelving, ‘ three feet broad at the top, four feet deep, ‘ and one foot and a quarter wide at the bot- ‘ tom. Lay them in the bottom with stones. ‘ If there are no stones to be got, lay them with ‘ green willow rods placed contrary ways ; if ‘ rods cannot be got, tie twigs together \*.’ Columella describes both the kinds of drains, in these words : ‘ If the land is wet, the too great ‘ abundance of moisture may be dried up by ‘ drains ;

\* Sulcos, si locus aquosus erit, alveatos esse oportet latos summos pedes tres, altos pedes quatuor, infimum latum pedem unum et palmum. Eos lapide confternito. Si lapis non erit, perticis salignis viridibus quoquoersus collatis confternito. Si pertica non erit, sarmentis colligatis ; Cat. cap. XLIII.

drains; of these we know two kinds, covered  
 and open. In stiff and clay soils, they are left  
 open; but, where the soil is of a looser nature,  
 there are some open, but likewise some are  
 covered, placed so that the mouths of the co-  
 vered drains may let the water pass into the  
 open ones. But it is proper to make both the  
 open and covered drains shelving, broad at the  
 top and narrow at the bottom, like roof tiles  
 turned upside down; for those whose sides are  
 perpendicular are soon damaged by the water,  
 and are filled with the falling of the earth from  
 the top. Again, the covered drains are to be  
 made three feet deep, half filled with small  
 stones or clean gravel, and the earth that was  
 dug out thrown over them. If there are no  
 stones nor gravel, let twigs be twisted like a  
 rope, and formed to the exact thickness that  
 the bottom of the narrow ditch requires, so as  
 to take it in fitted and pressed into it. When  
 this is stretched along the bottom, let cypress  
 or pine, or, if there are none of these, any  
 other leaves, be pressed upon it, and then co-  
 vered with earth; at both ends, however, af-  
 ter the manner of little bridges, two stones  
 should be placed, by way of pillars, and one  
 laid



‘ laid on the top of them to support the bank,  
 ‘ lest the earth should be carried away by the  
 ‘ falling down and issuing out of the water \*.’

Pliny

\* Si humidus erit, abundantia uliginis ante ficcetur fossis. Earum duo genera cognovimus, caecarum et patentium: Spissis atque cretosis regionibus apertae relinquuntur; at ubi solutior humus est, aliquae fiunt patentes, quaedam etiam obcaecantur, ita ut in patentes oriantia caecarum competant: Sed et patentes latius, et apertas summa parte declivesque; et ad solum coarctatas, imbricibus supinis similes facere conveniet: Nam quarum recta sunt latera, celeriter aquis vitiantur, et superioris soli lapsibus replentur. Operae rursus obcaecari debent, fulcis in altitudinem tripedaneam depresso; qui cum parte dimidia lapides minutos, vel nudam glaream receperint, aequentur superjecta terra, quae fuerat effossa. Vel si nec lapis erit, nec glareae, farmentis connexus velut funis informabitur in eam crassitudinem, quam solum fossae possit angustae, quasi accommodatam coarctatamque, capere. Tum per imum contendetur, ut super calcatis cupressinis, vel pineis, aut, si eae non erunt, aliis frondibus terra contegatur, in principio atque exitu fossae more ponticulorum binis saxis tantummodo pilarum vice constitutis, et singulis superpositis, ut ejusmodi constructio ripam sustineat, ne praeccludatur humoris illapsu atque exitu; Col. lib. II. cap. II.—I have used a little freedom in the translation of this passage from Columella. In the ordinary copies we read, *Sed et patentes latius et apertas summa parte declivesque.*

Pliny expresses himself on this subject in this manner: ' It is very advantageous to cut and  
 ' dry wet land, by drains. These ought to be  
 ' left open in clay soils. In looser soils, they  
 ' ought to be strengthened with hedges, or they  
 ' ought to shelve downward, to prevent them  
 ' from falling in. Some of them ought to be  
 ' covered, and drawn into others larger and  
 ' more open. If there is occasion, they may be  
 ' laid in the bottom with flint or gravel. Their  
 ' mouths

*declivesque.* The commentators are diffculted with these words, and cannot make either good sense or good language out of them, without striking away *et patentes et.* Instead of this, I have changed *apertas* into *opertas*, and supposed, that what Columella says of the shelving of the ditch applies both to the open and covered drains. This is the more probable, as Cato directs the covered drains to be made in this manner. Columella himself, in describing these, mentions the twisting twigs like a rope, and fitting them to the bottom of the narrow ditch three feet deep. A ditch so deep, and with a bottom so narrow, must necessarily be shelved in making. Pliny likewise says, that, in the looser soil, the ditches are made shelved, and that some of them are covered. From all these it appears, that Columella intended what he has said of the shelving of the ditch to apply both to the open and covered drains.

‘ mouths on each side ought to be supported by  
 ‘ two stones, with one laid over them \*.’ Palla-  
 dius says, ‘ If the land is wet, it may be dried  
 ‘ by drains drawn from every part. Open  
 ‘ drains are well known; covered drains are  
 ‘ made in this manner. Ditches are made a-  
 ‘ cross the field three feet deep; afterwards,  
 ‘ they are filled half way up with small stones or  
 ‘ gravel, and then filled to the surface with the  
 ‘ earth that was thrown out. These covered  
 ‘ drains are let to an open one to which they  
 ‘ descend, so that the water is carried off, and  
 ‘ destroys no part of the field. If stones cannot  
 ‘ be got, branches, or straw, or any kind of  
 ‘ twigs, may be used in their place †.’

I

\* *Humidiorem agrum fossis concidi atque ficcari, utilissimum est; fossas autem cretosis locis apertas relinqui; in solutiore terra sepibus firmari, ne procidant; aut supinis lateribus procumbere; quasdam occaecari, et in alias dirigi majoresque patentioresque. Si fit occasio, filice vel glarea sterni. Ora autem earum binis utrinque lapidibus statumipari, et alio super integri; Plin. Nat. Hist. lib. xviii. cap. vi.*

† *Si humidus erit, fossarum ductibus ex omni parte ficcetur. Sed apertae fossae notae sunt, caecae vero hoc genere sunt. Imprimuntur sulci per agrum transversim, altitudine*

I have cited all these passages, because there is something peculiar in each of them; and I have set them together, not only because they illustrate each other, but also that the reader may have in his view all that the several writers have said on the subject.

And, from what these authors have mentioned concerning drains, we may observe, that the Romans used always open drains in their stiff soils; and though, in the very loose soils, they had some covered drains, yet they had likewise open ones for receiving the water from these. In stiff soils, water cannot find its way into covered drains, except the water of springs, whose channels are intercepted by them; but, in free loose soils, that have a hard bottom that resists the water, covered drains, properly placed, may be very useful, provided there are open ones for carrying off the water. Palladius informs us, that those drains were placed across, and this  
would

*altitudine pedum ternum. Postea usque ad medietatem lapidibus minutis replentur, aut glarea, et super terra, quam egresseramus, aequatur. Sed fossarum capita unam patentem fossam petant, ad quam declives decurrant; ita et humor deducetur, et agri spatia non peribunt. Si defuerint lapides, sarmentis vel stramine subiecto cooperiantur, vel quibuscunque virgultis; Pal. lib. vi. tit. iii.*

would be very proper for intercepting the water in its way. All of them were made to shelve as our ditches do; and, when the soil was very loose, and the drains open, Pliny says they were sometimes firmed with hedges, the roots of which would prevent, in some measure, the earth from falling down from the sides into the bottom. The covered drains, when designed to convey the water from the pits made for olive-trees, were made, according to Cato, four feet deep. When in the corn field, they were made, according to Palladius, three feet deep. When made four feet deep, they were three feet wide at the top, and one foot and a quarter wide at the bottom. When made three feet deep, it is probable that they were wide at the top, and shelved in the same proportion. They were filled half way up with small stones and gravel: If none of these could be got, with willow poles; if none of these, with twigs twisted, or even with straw. Above these they were filled with earth, so that the earth was one and a half foot deep, far enough without reach of the plough. Both ends of these drains were fortified with little stone bridges, a stone on each side for pillars, and one laid over for the top. From these  
drains

drains having small bridges at both ends, and being placed so as to convey their water into open drains, it appears that they were designed for intercepting the water of springs, and conveying it from the field ; for Columella supposes, that the water runs into them, as well as runs out, with some degree of violence, which is the case only with springs. Experience teaches us, that it is only in this kind of wet land that these drains are useful.

From all these things, it is evident that the Romans were very careful in draining their lands, and very exact in making and placing their drains ; and, whoever compares their practices in these matters with ours in modern times, will be convinced that we have made no improvements, and that in very few places, if in any, we have arrived at their care and exactness,

## C H A P. XVII.

*Of the Instruments used in Agriculture.*

**I**N Britain there are a great many instruments used in tillage; but still a greater number seem to have been used by the ancients, particularly by the Romans, in Italy. Many of these are mentioned by the rustic writers, the particular forms and uses of which are not now distinctly known. These following are mentioned, *aratrum, irpex, crates, rastrum, bidens, capreolis, securis, ligo, pala, sarculum, marra*. All these were used for digging the ground, smoothing the surface, or hoeing the corn. Besides these, there were many others, for reaping, beating out, and cleaning the corn, which it is needless to mention here. It will not be amiss, that a description of those used in tillage be attempted, so far as it can be gathered from the particular passages where they are mentioned. The plough, on account of its importance, deserves the preference.

C H A P.

## C H A P. XVIII.

*Of the Plough (Aratrum).*

THE word *aratrum* is found so frequently in the Latin authors, that it is needless to cite any passages, to show that it signifies an instrument used by the Romans for the same purposes that we use the plough. It was commonly drawn by oxen, and the man that managed it was called *arator*, or *bubulcus*, the one from his ploughing the ground, and the other from his managing the oxen.

The plough is the principal instrument used in agriculture. It is by it that the earth in our fields is stirred and turned over; by which operation it is exposed to the air, sun, and frost, and prepared for the reception of the seed we intend to sow. There are a great variety of ploughs used in Britain, adapted to the different soils.



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soils. There were also several kinds used by the Romans.

Cato mentions two, which he calls *Romanicum* and *Campanicum*; the first proper for stiff soil, and the other for light soil\*. The *Romanicum*, it is probable, had an iron share, and the *Campanicum* a piece of timber like the Scots plough, with a *share* or *sock* driven upon it. There is a passage in Pliny that gives countenance to this opinion. When treating of the different kinds of shares, he says, ‘There is a third kind used in a free soil, that is not stretched over the whole dentile †.’ Varro mentions a particular kind used for ploughing in seed, and which, from the description he gives of it, seems to have had two mold boards. ‘At the third time,’ says he, ‘when they plough after the seed is sown, they are said to *ridge*; that is, with boards added to the share, they at once both cover on the ridges the seed sown, and draw furrows for conveying away the rain wa-  
‘ter.’

\* *Aratra in terram validam Romanica bona erunt, in terram pullam Campanica*; Cat. cap. cxxxv.

† *Tertium in solo facili, nec toto porrectum dentali*; Plin. Nat. Hist. lib. xviii. cap. xviii.

‘ter\*.’ Pliny mentions the adding one board for this purpose. Having spoke of sowing, and covering the seed, he adds, ‘This operation, ‘designed to cover the seed, is performed, according to the custom of the country, either ‘by a toothed *crates*, or by a plough having a ‘board fixed to it; when this is done by the ‘plough, the ploughmen are said to ridge †.’ Palladius likewise mentions two kinds of ploughs, the one simple and the other eared. ‘This last,’ he says, ‘was used when the plainness of the ‘country allowed it; by it the sown corn was ‘laid upon a higher furrow, and preserved from ‘being hurt, by water standing upon it in winter †.’ This plough, from the description, seems

\* Tertio cum arant jacto femine, boves lirare dicuntur; id est, cum tabellis additis ad vomerem simul, et satum frumentum operiunt in porcis, et fulcant fossas, quo pluvialis aqua delabatur; Var. lib. 1. cap. xxix.

† Haec quoque ubi consuetudo patitur, crate dentata, vel tabula aratro annexa, quod vocant lirare, operiente femina; Plin. Nat. Hist. lib. xviii. cap. xx.

‡ Aratra simplicia, vel si plana regio permittit, aurita, quibus possint contra stationes humoris hiberni, fata celsiore fulco attolli; Pal. lib. 1. tit. xliv.—Here we may observe, that, in the Latin language, *fulcus* is used in the

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seems to be of the same construction with the one mentioned by Varro, that had boards added to it. They are represented as employed in the same kind of work, different from the work of the common plough.

The common plough was used, in the ordinary operations of ploughing, to prepare the soil for the seed. The boarded plough was used to cover the seed when sown; and sometimes, immediately before sowing, to make little trenches for receiving the seed, that it might be easily covered by harrowing, and might rise in rows for hoeing \*.

It

same two different senses in which we use the word *furrow* in English; both for the trench made by the plough, and also for the earth that is thrown up. Here it is used for the earth, and is called *celsior fulcus*.

\* Some readers may be desirous to have a more particular description of the Roman ploughs, and to examine the authorities for the description that has already been given. In these it may not be improper to indulge them.

The different parts of the plough mentioned by the several authors are these following; *buris, terno, stiva, aures, dentale, vomer, culter, ralla*. All these, the two last excepted, are mentioned by Virgil, in the description which he gives of the plough. Having mentioned the *vomis*, or *vomer*, and in the general the heavy temper of the plough,  
and

It is probable, that I shall be considered as very partial to the ancients, if I do not allow that

and having named several of the other instruments, he adds: ‘ An elm bent with great strength in the woods, is \* forced into a *buris*, and receives the form of the crooked plough. To it are fitted the *temo*, stretched out eight feet from the lower end, the two *aures*, the *dentalia* with the double back, and the *stiva*, which bends the lower part of the plough behind. The light lime-tree is felled before hand for the yoke, and the lofty beech for the other parts, and the smoke seasons the timber hung up above the fires \*.’ I have used a little freedom in this translation, the reasons for which I shall give when I inquire into the manner in which these different parts of the plough were fitted to each other.

There seems to be no part of the modern ploughs, that answers exactly to the *buris* of the Roman plough. Virgil in the above cited passage, represents it as curved, and

\* Continuo in silvis magna vi flexa domatur  
 In burim, et curvi formam accipit ulmus aratri.  
 Huic a stirpe pedes temo protentus in octo,  
 Binae aures, duplici aptantur dentalia dorso.  
 Caeditur et tilia ante jugo levis, altaque fagus,  
 Stivaque, quae currus a tergo torqueat imos;  
 Et suspenſa focus explorat robora fumus.

Virg. Georg. I. v. 169.

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that the moderns excell them in the construction of their ploughs. We are not indeed so well acquainted

and also as the ground-work of the plough, to which all the other parts were fitted. Varro likewise represents it as curved; for he says, that it was called by some *curvum* from *curvo*: ‘Bura a bubus, alii hoc a curvo curvum appellant;’ Var. de L. L. lib. iv. From another passage in Varro, it appears, that the *buris* was the part of the plough that was broken when the plough was too much strained; and that, when it was broken, the share was left in the field: ‘Terram boves profcindere nisi magnis viribus non possunt, et saepe fracta bura relinquunt vomeres in arvo;’ Var. de re rust. lib. i. cap. xix.

*Temo*, signifies the pole to which the cattle in a carriage are joined; and therefore must be what we call the beam of the plough: Varro says, that it is derived from *tenendo*, because it holds the yoke: ‘Temo dictus a tenendo, is enim continet jugum;’ Var. de L. L. lib. vi.

*Siva* signifies the handle of the plough. Columella, treating of the ploughman, says, that a tall man does better to hold the plough, than perform any other kind of labour: ‘Because, standing almost upright in ploughing, he rests upon the *siva*: ‘Nam longissimum quemque aratorem, sicut dixi, faciemus, et propter id, quod paulo ante retuli, et quod in re rustica nullo minus opere fatigatur prolixior, quia in arando sivae pene rectus innititur;’ Col. lib. i. cap. ix. Valerius Maximus says of Attilius Seranus, that having laid down the very rod,  
he

acquainted with the construction of the ancient ploughs, as to make a just comparison. I shall only

he was not ashamed to grasp again the wooden *stiva* of the plough: ‘Nec fuit iis rubori eburneo scipione de-  
‘posito, agrestem stivam aratri repetere;’ Val. Max. lib. iv. cap. iv. A bar was put through the *stiva* near the end, which was called the *manicula*, the ploughman took hold of this, and by it managed the plough: Having mentioned the plough, Varro adds: ‘Supra id regula  
‘quae stat, stiva a stando, et in ea transversa regula, ma-  
‘nicula, quod manu bubulci tenetur, qui quasi est temo  
‘inter boves;’ Var. de L. L. lib. iv.

There were two *ures*, and both of them were fixed to the *buris*, as appears from the above cited passage in Virgil. The ploughs which Palladius calls *aurita*, were used for ploughing in seed; they were of the same kind with the ploughs with boards, mentioned by Varro. From this it appears, that the *ures* served in place of mold boards.

The *dentalia* were likewise fixed to the *buris*: This Virgil expressly declares in the above cited passage. Pliny mentions a *dentale*, and represents it as the part of the plough upon which the share is put: ‘Tertium (vomeris  
‘genus) in solo facili, nec toto porrectum dentali;’ Plin. Nat. Hist. lib. xviii. cap. xviii. In the ploughs with two mold boards, it is possible, that there were pieces of timber below the boards, like the rests of our ploughs, and that these were called *dentalia*; but, when there were no  
earth

only observe, that, from the few passages in the rustic authors concerning them, it appears, that the

earth boards, and when there was a piece of timber, like the head of the Scots plough, upon which the share was driven, that then this piece of timber was called *dentale*: Or rather, it is probable, that Virgil might make use of the plural number *dentalia*, in place of the singular number *dentale*, and that there was only one to the plough of the kind mentioned by Pliny. This is the more probable, as Columella, when giving an account of the kind of work performed by small ploughs, calls them small shares and *dentalia*. As in this passage, he asserts, that these small ploughs cannot plough deep enough, it is probable, that by the *dentalia*, as well as the shares, he means the parts of the plough that go deepest in the earth: ‘ Et  
 ‘ ideo minoribus aratris moliuntur, qui non valent alte  
 ‘ per fossam novaleum terram rescindere; Quod cum fit,  
 ‘ omnibus virentibus plurimum confert; nam penitus ar-  
 ‘ vis fulcatis majore incremento segetum arborumque  
 ‘ foetus grandescunt. Et in hoc igitur a Celso dissentio,  
 ‘ qui reformidans impensam, quae scilicet largior est in  
 ‘ amplioribus armentis, censet exiguis vomeribus et den-  
 ‘ talibus terram subigere, quo minoris formae bubus ad-  
 ‘ ministrari id possit;’ Col. lib. 11. cap. 11. The share and *dentale* joined together, are sometimes called *dens*; thus, in the following passage from Columella: ‘ Nam  
 ‘ vel respuitur duritia foli dens aratri;’ lib. 11. cap. 14. So Varro likewise, in giving an account of the derivation  
 of

the ancients had all the different kinds of ploughs that we have at present in Europe, tho' perhaps

of some parts of the plough, mentions the *dens* betwixt the *vomer* and *stiva*, in these words; 'Dens, quod eo mordetur terra;' de L. L. lib. iv. It is probable, that, in the first plough used by the Romans, there was no share, and that the piece of timber that tore up the earth was called *dens*; but that afterwards, when they covered this piece of timber with iron, they called the iron part *vomer*, and the timber part *dentale*; and the two put together *dens*, because they served the same purpose with the *dens* of the old plough.

The *vomer* or *vomis*, as is evident from many passages, signifies the share of the plough. Virgil says, that it shines when rubbed with the furrow in ploughing: 'Et fulco attritus splendescere vomer;' Geor. I. v. 46. Columella says, that the upper roots of vines and olives are cut by it; and that sometimes the hooves, pasterns, and legs of the oxen are hurt and wounded by it: 'Ut et summae radices vitium olearumque vomeribus rescindantur. Si talum aut unguam vomer laeserit.—Item si vomer crus fauciarit;' Col. lib. vi. cap. xv. Pliny gives a description of several kinds of shares. After describing a kind that shall afterwards be particularly taken notice of, he adds: 'Another kind is the common one, with a beak like a bar; a third used in free soil, not stretched over the whole dentile, but upon the forepart, forming it into a point. This point, in a fourth kind,



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perhaps not so exactly constructed. They had ploughs without mold boards, and ploughs with

‘ kind, is broader, but towards the point raised up to a  
 ‘ sharp edge in the top, cutting the ground with this  
 ‘ sharp sword on the top, and cutting the roots of weeds  
 ‘ with its sharp sides. This kind was invented not long  
 ‘ since in Rhoetia. The Gauls add to such a one two  
 ‘ wheels, which kind they call *planarati*. It is pointed  
 ‘ like the *pala*.—Alterum genus est vulgare, rostrati  
 ‘ vectis. Tertium in solo facili, nec toto porrectum den-  
 ‘ tali, sed exigua cuspide in rostro. Latior haec quar-  
 ‘ to generi, et acutior in mucronem fastigata, eodem-  
 ‘ que gladio scindens solum, et acie laterum radices her-  
 ‘ barum secans: Non pridem inventum in Rhoetia. Gal-  
 ‘ liae, duas addiderunt tali rotulas, quod genus vocant  
 ‘ *planarati*. Cuspis effigiem palae habet;’ Plin. Nat.  
 Hist. lib. xviii. cap. xviii. The *pala*, as shall be after-  
 wards shown, was a digging instrument, and, it is pro-  
 bable, from its resemblance to the share here mentioned,  
 that it was pointed like that kind of spade, which is used  
 for raising turf.

The *culter* is mentioned by Pliny only, and is placed  
 by him amongst the different kinds of shares. It was al-  
 ready mentioned, as particularly to be taken notice of.  
 ‘ There are many kinds of shares,’ says he; ‘ one kind is  
 ‘ called *culter*, it cuts the firm earth before it is taken off  
 ‘ by the plough, and makes a tract for the furrows, which  
 ‘ the share lying flat on its back cuts off in plowing.—

‘ Vomerum

with mold-boards; they had ploughs without  
coulters, and ploughs with coulters; they had  
ploughs

‘Vomerum plura genera: Culter vocatur, praedensam,  
‘priusquam profcindatur, terram secans, futurisque sulcis  
‘vestigia praescribens incifuris, quas resupinus in arando  
‘mordeat vomer;’ Plin. Nat. Hist. lib. xviii. cap. xviii.  
From the operation of the *culter*, here described by Pliny,  
it appears to have served the same purpose with our coul-  
ter, and to have been used in the plough along with a  
share. Though Pliny does not assert this, yet his words  
seem to imply it; for the share that makes the furrows af-  
ter it, he says, is *resupinus*, ‘lying flat on its back.’ This  
position of the share, is necessary when the plough has a  
coulters; for a plough of this kind, when inclined to a  
side, does not go straight forward, but has a tendency  
towards the land, or towards the furrow, according as  
the coulters is pointed: But, when a plough has no coulters,  
its inclination to either side makes very little difference in  
its manner of going forward. It is probable, therefore,  
that Pliny, in this passage, mentions the share as *resupinus*,  
to distinguish between the manner in which the plough  
with a coulters goes, and the manner in which the ploughs  
without coulters commonly went.

The *ralla* or *rulla*, served the same purpose with the  
plough staff of our ploughs. This appears from a passage  
in Pliny: ‘The goad,’ says he, ‘pointed with a *ralla*,  
‘cleans the share.—Purget vomerem subinde stimulus  
‘cuspidatus ralla;’ Plin. Nat. Hist. lib. xviii. cap. xix.

ploughs without wheels, and ploughs with wheels; they had broad pointed shares, and narrow

To understand the construction of the Roman ploughs, it is necessary to attend particularly to the passages, where the *buris* is mentioned, which seems to have been the ground-work of the plough, and the part to which all the other parts were fitted and adjusted. Some are of opinion, that it is nothing but the lower part of the *stiva*. Mr Martyn, to illustrate his notes upon Virgil's description of the plough, gives us a draught of a modern Italian plough: In it, there is no *stiva* different from the *buris*. He translates *buris*, the plough-tail, and *stiva*, the plough-staff; and he supposed, that, in Virgil's plough, there are two handles as in our ploughs, that the one was called *buris*, and the other *stiva*. But there is no foundation for this conjecture, in the description which Virgil gives of the plough; and it is inconsistent with what Varro says of the *manicula*, which was a bar put across the *stiva*, held by the hand of the ploughman. Besides this, Virgil mentions the *buris* and *stiva* as different. He begins with the *buris*, and ends with the *stiva*: He says, that an elm growing in the woods was with great force bended into a *buris*, and that a beech was cut down to make the *stiva* and other parts of the plough. It is impossible to suppose, that there are two handles, or that the one is only the upper or lower part of the other. Besides, if the *buris* is nothing more than the second handle, or the lower part of the *stiva*, Virgil has neglected

narrow pointed shares; they even had, what I have not as yet met with amongst the moderns,  
 shares

ted to mention a principal part of the plough, which, in the British ploughs, is called the sheath or fore-head; this is the part that joins the beam and the share, is the part that commonly gives way when the plough is strained, and is therefore made of the strongest timber, and is the part likewise to which the mold-board is fixed. It is scarcely to be supposed, that Virgil would have neglected to mention so important a part of the plough. The modern Italian plough, of which Mr Martyn has given us a draught, seems indeed to have no sheath, at least a very slender and improperly placed one; and if the coulter is not fixed into the share, which is done in some cases, a plough of this form could not bear the smallest strain. But what seems to put the matter past all dispute, is the passage from Varro that has already been cited; for, in it, he mentions the *buris* as the part that breaks when the plough is strained; and, when it is broken, he says that the oxen leave the share in the field. No part of the *siva* can be supposed to be broken by any strain, except where it is fixed to the share or the beam; and if any of these parts give way, the cattle must take the share along with them. Now, as it appears from these things, that the *buris* is different from the *siva*, it will not be improper to inquire, whether there are any circumstances in the passages mentioned, that give us ground to conjecture what part of the plough it was.

Virgil

shares not only with sharp sides and points, but also with high raised cutting tops. Were we well

Virgil tells us, that it was made of an elm tree, that this elm was bended in the woods; a probable evidence that this was done while it was growing; that this operation required great force, an evidence that the tree of which it was made was large and strong; and that, when the tree was thus bended, it had the form of the crooked plough. When he mentions the *stiva*, he says, that it makes the lower part of the plough bended, or turned behind. One, from his being thus particular with respect to the *stiva*, is apt to imagine, that he intends at the same time to inform us, that the *buris*, which he had before mentioned as bended with great force, gave this form to the plough in the fore and upper part. Let us suppose, then, that the *buris* of the Roman plough served the same purpose with the sheath of the modern ploughs, that it was fixed to the share or the dentile, when the share did not stretch the full length; and that it was not only fixed to the beam, but likewise came back in a curve and was fixed to the handle. And let us inquire, whether or not a plough, upon this supposition, may be constructed, that in some degree answers the description given of the Roman plough. Let A B represent the *buris*; to it, says Virgil, is fitted the *temo* or beam, stretched out to eight feet *a stirpe*. If *a stirpe* refers to the *buris*, then indeed it must be in the hind-part of the plough, and probably was the lower part of the *stiva*, or handle.

But,

well acquainted with the construction of all of these, perhaps it would be found, that the improvements

But, though all the commentators are of this opinion, yet it is improbable. The handle at the lower end is fixed to the dentile or share; to fix it at this end, or even near to it, likewise to the beam, is very improper, as this must weaken the handle, and make it easily broken, when the ploughman should press it to a side, which is often necessary in ploughing, and which was common in the Roman method particularly: It is, on this account, more natural to suppose, that *a stirpe* refers to the beam itself, and is designed to inform us, that the eight feet of the beam is not to be reckoned from the place where it is fixed to the *buris*, which, in a made plough, as the *buris* was the ground work, would be reckoned the length, but from the end where it was fixed to the *stiva*, which is very properly called *stirps*, as this is the big end of the beam. Agreeable then to Virgil's description, we may suppose, that when A B represents the *buris*, C D represents the beam. It is uncertain whether or not Virgil says, that the *stiva* was likewise fixed to the *buris*: In the ordinary way of constructing the passage where the *stiva* is mentioned, the meaning is far from being distinct: It is absurd to suppose, that *stiva* agrees with *caeditur*, and yet it is upon this supposition, that the passage is commonly translated: It is more natural to think, that *caeditur et tilia ante jugo levis, atque fagus*, should be put into a parenthesis, and that *stiva* is one of the nominatives

provements made by the moderns, in this article, are not so great as many persons are apt to imagine.

## C H A P.

to *aptantur huic*: If there is any ground to suppose that the lines have been misplaced, and that the line above cited should come after *si vaque quae currus a tergo torqueat imas*, the difficulty would be removed: And I can more easily suppose that this has been done, or that the line *caeditur, &c.* should be put into a parenthesis, than suppose that Virgil would join the handle of the plough with a lime tree and a beech, and say, that all of them are cut down. Mr Martyn is so sensible of the impropriety of this, that he supposes it should be *si vas*, in place of *si vaque*; and that it is Virgil's meaning, that the tall beech is cut down for the *si va*. But, had our poet intended this, I am persuaded that he would have made use of an epithet different from *alta*, for it does not require a tall tree to be a *si va*, especially a beech, which grows to a large size. It is probable, that all the parts of the Roman plough, except the *buris*, were made of beech, and that it is this which Virgil informs us of in the passage before us. As he mentions the heavy timber of the plough, and directs that it be prepared for use by hanging it up above the fires, as he is so particular as to name an elm for the *buris*, and a lime tree for the yoke, and as the *temo* and *dentalia* are parts of the plough as important as the *si va*, it is natural to suppose, (if the words

FIG. 1.

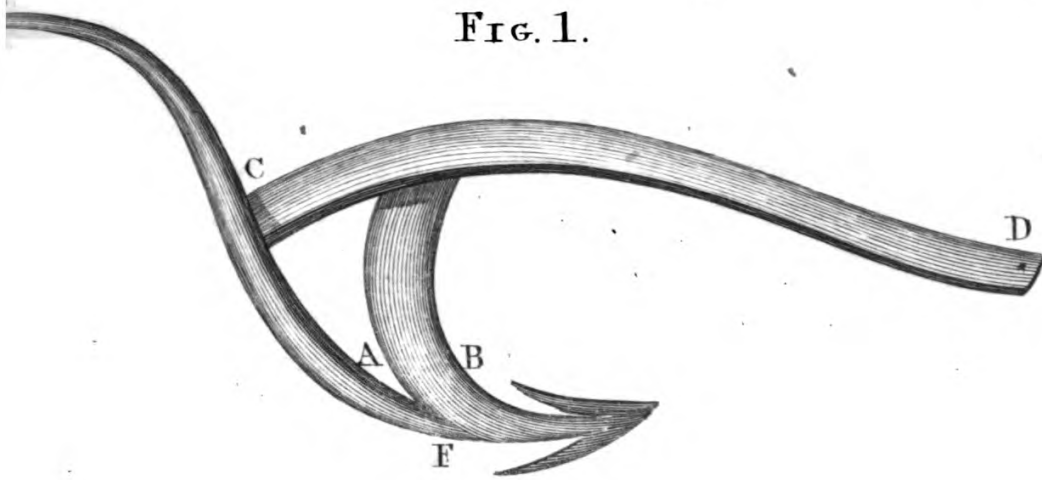
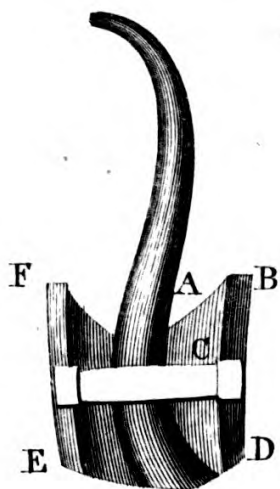
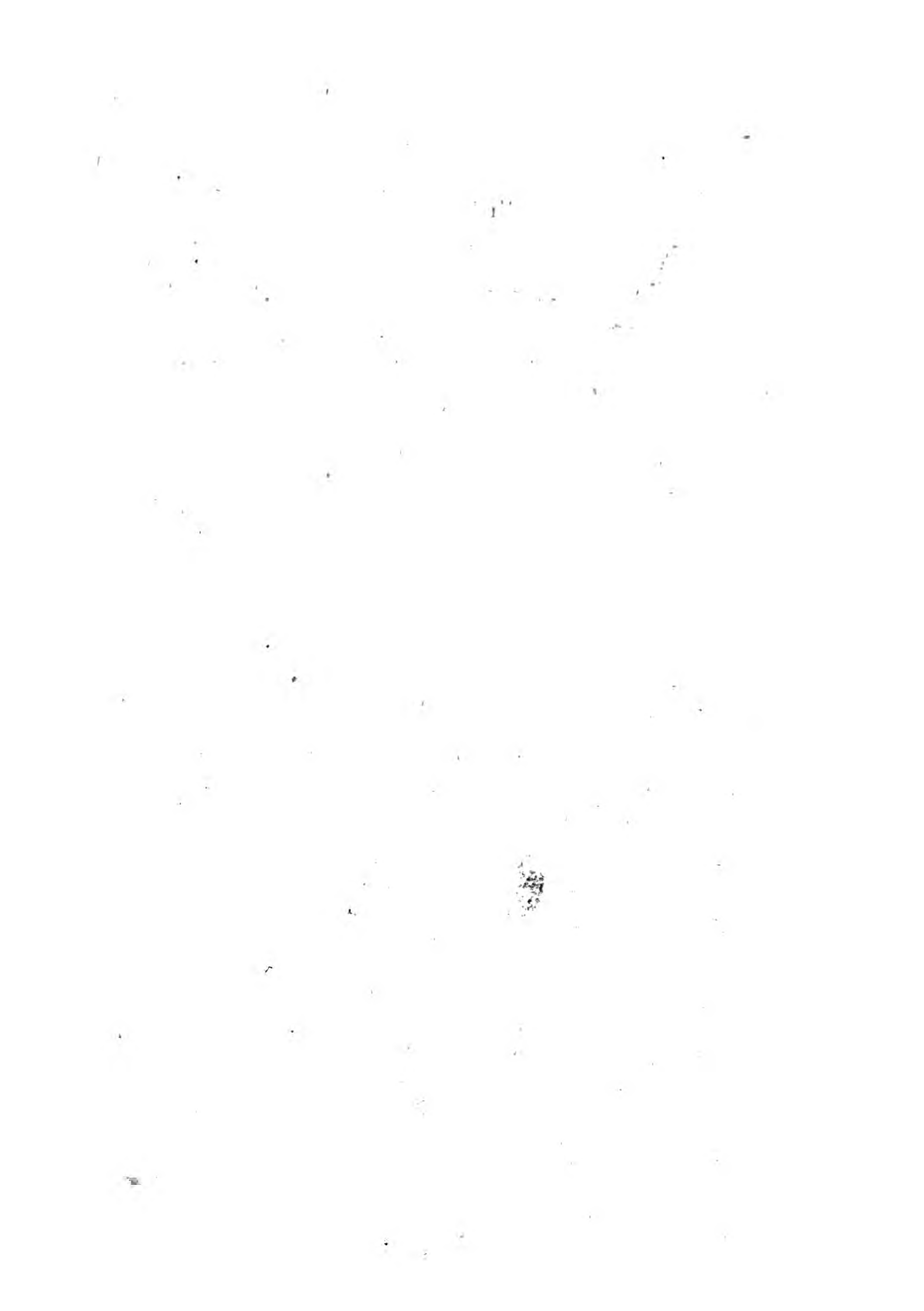


FIG. 2.







words will bear the interpretation), that, when he mentions a beech, he intends to inform us, not that the *stiva* alone was made of this timber, but that all the parts of the plough were made of it, except the *buris* and *jugum*, which last he mentions as a part of the plough, because it was made of timber. This is the more probable, as, in Italy at present, beech is the timber of which all rustic instruments are chiefly made. Thus Vincenzo Janaro says, ‘Noi de faggio halbramolancie, picche, aste, manichi da vanga, e Zappa, e per ogn’ altro stromento d’agricoltura;’ lib. vi. p. 509. Supposing then, that A B represents the *buris*, and C D the beam, E F will represent the *stiva* or handle fixed to the *buris* at A, and F A will represent the *dens*, or the dentile and share fixed to the *buris* at B, and to the handle at F.

Although it is not absolutely certain, that Virgil says the *stiva* was fitted to the *buris*, yet he plainly declares, that the two *ares* were fitted to it. It has been shown, that the *ares* of the Roman ploughs served the same purpose with the mold-boards of our ploughs. This ought particularly to be attended to; for, if the mold-boards were fixed to the *buris*, it will not be difficult to determine the place of the *buris* in the Roman plough, and the particular part of our ploughs to which it answers. Let us suppose that it was the lower part of the *stiva*, as some imagine, it is obvious, at first sight, that there is a very great impropriety in saying, that the mold-boards are fixed to it. The mold-boards are fixed to the fore part of the plough, and slope gradually outward as they are brought towards the plough tail; so that they are at a distance

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distance from the handle, at least, the one that is fixed to the beam. Let us even suppose, that the *buris* was one handle, and the *stiva* another; yet this supposition does not remove the difficulty; for, let it be remembered, that it is expressly said, that the *buris* was fixed to the beam; and it is difficult, or rather in some measure impossible, to construct a plough in such a manner as to fix both the beam and mold boards to the same handle. But let us, on the other hand, suppose, that the *buris* was in the fore part of the Roman plough, and served the same purpose with the sheath of our ploughs; then with great propriety the mold-boards may be said not only to be fixed, but even fitted to it; as it is from it that they in some measure take their form.

Virgil says likewise, that the *dentalia* were fitted to the *buris*. If *dentale* is the share beam, or what in some places is called the head of the plough, it may be said very properly that it is fitted to the *buris*, whether the place of the *buris* was on the fore part or the tail of the plough; for both the sheath and the large handle of our ploughs are fitted into the share beam.

Virgil mentions another part of the plough, which he calls *duplex dorsum*. It is difficult to determine what Virgil means by this, and whether it belongs to the *aures* or *dentalia*. It is probable, that a particular part of the plough got this name, though it has very little resemblance to a *double back*. It is probable likewise, that there were two pieces of timber to which the mold-boards were fixed behind with a cross bar, to join them, passing immediately behind the handle; this would be necessary to support

support the mold boards, and enable them to resist the earths of the furrows. These two pieces of timber, as one of them fell down on each side of the *stiva*, were probably called the *duplex dorsum*, and this part of the plough, properly speaking, belongs to the *ares*, and not to the *dentale*, unless Virgil's *dentalia* are ground rests; if so, the *duplex dorsum* may be said with propriety to belong either to them or to the *ares*.

Now, if we suppose that the *buris*, *temo*, *stiva*, and the *dentale*, with the *vomer*, are as represented in figure 1. then the boards A B C D, and A B E F, (see figure 2 ) represent the two *ares*, and C D and E F, with the cross bar C, represent the *duplex dorsum*.

But it is necessary to observe, that this plough described by Virgil, was not the plough used in the common operations of ploughing, but the plough to which boards were added for the purpose of covering seed. It appears, that the common plough consisted of no more parts than the *buris*, *temo*, *stiva*, and the *dentale*, with the *vomer*, as in figure 1. From its construction, it appears, that, when going upright, it could not turn the earth of the furrow as our ploughs do; but that, if held obliquely, and laid a little sloping, then the breadth of the share raised up on the land side, would raise the earth to the opposite side, which meeting with the *buris*, would by it be turned over, as by the mold board and ground rest of our ploughs; and it would be more or less turned, according to the obliquity of the plough. That the plough was managed in this manner, appears from a variety of passages in the rustic authors. It has already been ob-

served, that Pliny, when describing the going of the plough with the *coulter*, in cutting the earth of the furrows, represents the share as *resupinus*, intimating, that the plough is not always held in this position, which however is necessary, as has already been mentioned, when a coulter is added to it. There is another passage in the same author, in which, after mentioning the Gallic plough, he adds, ‘The breadth of the share turns the turff.—’ *Latitudo vomeris cespites versat;*’ Plin. Nat. Hist. lib. xviii. cap. xviii. Now, the breadth of a share cannot turn the turff in any way, but by placing it in the manner that has been described. Columella too, in his directions to the ploughman, mentions the holding of the plough sometimes in this manner: He directs the ploughman to plough alternately with oblique furrows, and alternately with an upright and full furrow: ‘*Bubulcum autem per proficissum ingredi oportet, alternisque versibus obliquum tenere aratrum, et alternis recto plerumque fulcare; sed ita necubi crudum solum, et immotum relinquat, quod agricolae scamnum vocant;*’ Col. lib. ii. cap. ii. By ploughing obliquely, the furrow was made sloping on the land side with a narrow bottom; and by ploughing with an upright and full furrow, the sloping firm earth was moved, the bottom of the furrow widened, and no *scamna* left, as the peasants called the firm earth, that by bad plowing was left betwixt the furrows, made by the plough in going. But this falls more naturally to be considered, when we inquire into the Roman methods of ploughing.

It

It is impossible, considering the small foundation we have to proceed upon, to determine with any degree of certainty, what was the construction of the Roman ploughs. As I know of no modern ploughs, constructed in the manner in which I have described those, and as all the commentators explain the passages concerning them in a sense different from what I have done, it is with great diffidence that I deliver my opinion. At the same time, I use the freedom to observe, that it is not in the least degree surprizing, that the whole class of commentators should go wrong in a matter of this kind; as there are none of these learned gentlemen, that seem to have given themselves the trouble to acquire any knowledge of the nature and construction of ploughs, or the various uses of their several parts.

C H A P.

## C H A P. XIX.

*Of the Irpex, Crates, Rastrum, and Sarcu-  
lum.*

**T**HERE is an instrument mentioned by Ca-  
to, which he calls *urpex*; it is probably  
the same with the *irpex*, which is mentioned by  
Varro, and of which he gives a description:  
He says that the *irpex* is a plank with several  
teeth, drawn by oxen as a wain to pull roots  
out of the earth\*.

The *crates*, it is probable, was an improve-  
ment upon the *irpex*, was made in the form of  
a harrow, and was drawn by oxen in the same  
manner, and for the same purpose with the *ir-  
pex* †.

The

\* *Irpices regula cum pluribus dentibus, quam item ut  
plaustrum boves trahunt, ut eruunt quae in terra sunt;  
Var. de L. L. lib. iv.*

† *Crates is a word found in so many passages of the  
rustic writers, that, if we attend to them, we can be at no  
great*

The *rastrum* was a rake, and used in manual labour, as we use rakes in our gardens. It was used

great loss to determine what kind of instrument it was that got this name. It appears, that *crates* was the name given to all kinds of grate or basket work. Thus there were *crates stercorariae*, dung hampers or baskets. Cato, among the utensils necessary in a farm, mentions the number of these *crates stercorarias* IIII.; Cat. cap. x. There were *crates pastorales*, woven with straw, rushes, or fern, used sometimes, as Columella says, to defend figs while drying from rain or dew: ‘Tunc ficus injicitur, et crates pastorales culmo, vel carice, vel filice textae ex utroque latere super terram planae desponuntur, ut cum sol in occasum fuerit, erigantur, et inter se acclives tectudineato tecto, more tuguriorum, inarescentem ficum a rore, et interdum a pluvia defendant;’ lib. XII. cap. xv. These probably the same with the *crates ficariae*, mentioned by Cato, which he proposes to place around a nursery bed, to defend it from the cold and sun: ‘Eo farina aut crates ficarias imponito, quae frigus defendant, et solem;’ Cat. cap. XLVIII. Columella mentions the roots of an old vine, forming by their thickness and crossing each other, a *crates* below ground: ‘Haec (vitis) autem, quae toto prostrata corpore cum inferius solum quasi cancellavit, atque irretivit, crates facit;’ lib. IV. cap. II. These passages are sufficient to give us some idea of the construction of the *crates*, that was drawn over a field to smooth the surface. The learned commentator

Popma,



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Popma, having observed in Cato the phrase *crates stercorarias*, takes upon him to condemn those who suppose that Virgil's *vimineas crates* is an instrument like a break harrow, and asserts, that Virgil, in that passage, directs the drawing dung carts, and not break harrows, over the field; Vir. G. 1. *Vimineasque trahet crates: Quod Servius male exponit, ad agrorum scilicet exaequationem, quam rustici irpicem vocant. Nam poeta intelligit agrorum stercorationem, ad quam adhibentur crates, multum diversae ab irpice de quo ante dixi;* Pop. de instrum. fundi, cap. viii. This learned Gentleman had given very little attention to many passages where *crates* is used, otherwise he could not have fallen into such a mistake. For it is certain, that there was an instrument for smoothing the surface of the ground, and breaking clods, called *crates*, which too, seems to have been drawn by cattle as our harrows are. Columella mentions them as used for smoothing the surface of land laid off for a meadow; and, as a certain evidence that they were of considerable weight, and must therefore have been drawn by cattle, he says of them, that they left small heaps of earth in turning: *Tum glebas farculis resolvemus, et inducta crate coaequabimus; grumosque quos ad versuram plerumque tractae faciunt crates, dissipabimus ita, ut necubi feramentum foenifecae possit offendere;* lib. ii. cap. xviii. Pliny mentions the drawing *crates* again and again over the land intended for *medica*, before dung is laid on: *Mox aratum, et occatum integitur crate iterum et tertium quinque diebus interpositis;* Nat. Hist. lib. xviii. cap. xvi. He says likewise, that toothed *crates* were used for covering seed: *Semen protinus injiciunt, cratesque dentatas*

used however by the Romans in their corn fields, both for breaking clods and covering seed\*.

The

‘ dentatas supertrahunt ; Nat. Hist. lib. xviii. cap. xviii.  
 ‘ Aratione per transversum iterata, occatio sequitur, ubi  
 ‘ res poscit, crate vel rastris ; et fato semine iteratio. Haec  
 ‘ quoque, ubi consuetudo patitur, crate dentata ;’ cap. xx.  
*Crates* were also used for combing corn ; this kind, Pliny says, had iron teeth : ‘ Sunt genera terrae quarum  
 ‘ ubertas pectinari segetem in herba cogat. Cratis et  
 ‘ hoc genus dentatae stilis ferreis ;’ cap. xxi. From these passages, it is evident, that *crates* were drawn as our harrows are. It is probable, that this kind was the heaviest instrument used for smoothing the surface, breaking clods, and pulling out roots ; that it was an improvement upon the *irpex* mentioned by Varro, and which, from the description which he gives of it, seems to have been a plank like a rule, with one row of teeth ; that it received the name of *crates*, because the bars into which the teeth were fixed, were joined together in the form of a grate by twigs. Hence Virgil calls them *vimineae crates*, which, though commonly translated osier hurdles, yet must have been the toothed *crates* mentioned by Pliny ; as these alone could be of any use in the case mentioned. Virgil is treating of the manner of reducing stubborn soils ; for this purpose, he recommends cross-ploughing, breaking the clods with harrows, and drawing over the field *osier crates*, which, unless we suppose them of some weight, and likewise toothed, could be of very little use.

\* Although the *rastrum* is very frequently mentioned

- by

The *sarculum* was a hand hoe, and used in the same manner as we use this instrument. It seems

by the rustic writers, yet the commentators are not agreed whether it was a rake used as we do our rakes, or a harrow drawn by cattle. Columella mentions the tearing of hard furrows with heavy rasters: ‘Tu gravibus rastris, cunctantia perfode terga;’ lib. x. v. 71. And Virgil mentions rasters of great weight: ‘Tribulaque traheaque et iniquo pondere rastri;’ Geo. i. v. 164. Hence some persons conclude, that the *rastrum* was an heavy instrument, and therefore not an hand rake. It is remarkable, that although the *rastrum* it frequently mentioned by the rustic writers, yet it is never represented as an heavy instrument, except in the passages that have been mentioned, the one in Virgil’s Georgics, and the other in Columella’s poem on the culture of gardens. It is not unnatural therefore, to suppose, that, when these authors in their poems mention a heavy *rastrum*, they intend an instrument different from the common *rastrum*. As the *irpex* and *crates* were used for the same purposes with the *rastrum*, as they were heavy instruments, and were drawn by cattle; it is not unnatural to suppose that these poets, when mentioning them, would sometimes call them *graves rastri*, and *iniquo pondere rastri*.

There are a variety of passages in the rustic authors, from which it plainly appears, that the *rastrum* was used in manual labour; and there are instances of its being employed in work, in which it could not be drawn by cattle.

The

seems, however, to have been different in its form from our hand-hoes; for it was often used  
as

The common *rastrum* had only four teeth, rather too few for an heavy instrument. Thus Cato, mentioning them among the utensils necessary in a farm, calls them *rastris quadridentibus*: ‘ Ferramenta, ferreas VIII. farcula VIII. palas IIII. rutra v. rastris quadridentibus II.’ Cat. cap. x. Columella recommends the *rastrum* for mixing dung in dunghills; an operation very improper for cattle and harrows. He says, the dunghill should be mixed with *rastris*, as if repastinated: ‘ Æstivis deinde mensibus non aliter, ac si repastines, totum sterquilinum rastris permisceri oportet;’ Col. lib. II. cap. xv. The same author informs us, that all kinds of digging in vineyards, so as to move the soil, was called repastinating: ‘ Unde etiam repastinatae dictae fuere vineae veteres, quae refodiebantur;’ Col. lib. III. cap. xviii. A heavy rake with four long teeth, and a short handle, such as it is probable the Roman *rastrum* was, would perform this work in a dunghill very well, provided the dunghill was not very deep; in this case, the assistance of a shovle would be necessary. Besides the common *rastris*, there were *rastris* of timber, that is, I presume, with timber teeth; Columella mentions them as proper for the culture of the *medica*, both for covering the seed after it was sown, and hoeing the plants after they were come above ground: ‘ Quod ubi feceris, ligneis rastris, id enim multum confert, statim jacta semina obruantur;’ and a little after, he adds,

as a rake for covering seed, and breaking clods in the fields, as well as in the garden. It seems also

‘ Atque, ut dixi, ligneis rastris farriendus;’ Col. lib. II. cap. XI. These timber *rastri* were sometimes called *rastelli*; for Columella, mentioning this operation of covering the *medica* seed, gives this name to the instruments by which it was performed: ‘ At medica obruitur non aratro, sed, ‘ ut dixi, ligneis rastellis;’ Col. lib. II. cap. XIII. And Varro mentions the *rastelli* among the instruments made of twigs, and the timber growing on the farm: ‘ Quae ‘ ex viminibus, et materia rustica fiunt, ut corbes, fiscinae, ‘ tribula, mallei, et rastelli;’ Var. lib. I. cap. XXII. Palladius mentions a particular kind of the *rastrum*, which, according to the description he gives of it, seems to have had an axe fixed to the side opposite to the teeth: ‘ Vel ‘ ascias in averso parte referentes rastros;’ Pal. lib. I. tit. XLIII. This kind of *rastrum*, it is evident, was not a heavy instrument drawn by cattle, but a light one used in manual labour. The culture that the Romans were in use to give their lands amongst trees, rendered an instrument of this kind very proper. Columella advises the ploughman to make use of the axe as well as the share to cut the roots of trees that interrupt his ploughing: ‘ Nec minus dolabra, quam vomere bubulcus utatur; et ‘ praefractas stirpes, summasque radices, quibus ager ar- ‘ busto confitus implicatur, omnes refodiat, ac persequa- ‘ tur;’ Col. lib. II. cap. II. Pliny advises the same thing, naturally observing, that it is much better to cut the  
roots

also to have been constructed in such a manner, as to make it possible in some measure to dig with

roots than tear them up with the plough: ‘Securiculam  
‘infitivam pendere, qua intercidantur radices. Hoc  
‘melius, quam convelli aratro, bovesque lustrari;’ Plin.  
Nat. Hist. lib. xviii. cap. xix. When there was occasion for harrowing land, where any of those roots were remaining, it is probable, that they used this kind of *rastrum* mentioned by Palladius, that by it they might cut any roots which the plough had passed by.

The *rastrum* was the instrument commonly used for covering seed, when this was not done by the plough, and, even when the seed was plowed in, the *rastrum* was commonly used after. Virgil having mentioned the season betwixt the autumnal equinox and the winter solstice, among other things, says, ‘now is the time to ply the  
‘rasters, while the land, yet dry, allows it, while the  
‘clouds are suspended,

———Et jamdudum incumbere aratris,

Dum sicca tellure licet, dum nubila pendent.

Vir. Geor. I. v. 213.

The man who used the *rastrum*, was commonly called *occator*; the verb *occare* was used to express the performing of the operation, and *occatio* the operation itself; and these words are applied not only to the covering of seed, or harrowing after seed is sown, but likewise to the smoothing the surface of a field, or breaking the chods upon it, whatever is the time in which this operation is performed.

performed. Columella applies *occatio* to culture given to a vineyard: ' In colder climates, says he, ' they make  
 ' a pulverizing, which the rustics call *occatio*, when eve-  
 ' ry clod in the vineyard is broken and reduced to dust.  
 ' —Sed frigidioribus regionibus pulverationem faciunt,  
 ' quam vocant rustici occationem, cum omnis gleba in vi-  
 ' neis refringitur, et resolvitur in pulverem; Col. lib. xi.  
 cap. ii. On another occasion, he says, ' But by many  
 ' ploughings, the fallow should be so reduced, as to re-  
 ' quire little or no *occatio*, when it shall be sown; for the  
 ' old Romans said, that the land was very ill reduced,  
 ' which needed the *occatio* when the seed was sown.—  
 ' Sed et compluribus iterationibus sic resolvatur vervac-  
 ' tum in pulverem, ut vel nullam vel exiguam desideret  
 ' occationem, cum feminaverimus. Nam veteres Ro-  
 ' mani dixerunt male subactum agrum, qui fatis frugibus  
 ' occandus fit; Col. lib. ii. cap. iv. Pliny mentions this  
 maxim likewise; ' A field, says he, ' is ill plough, that  
 ' needs the *occatio* when the seed is sown.—Male aratur  
 ' arvum, quod fatis frugibus occandum est; Plin. Nat.  
 Hist. lib. xviii. cap. xix. That this operation was per-  
 formed by manual labour, is evident, from comparing  
 these passages already cited with some other passages in  
 Columella. When giving an account of the day's labour  
 that a quantity of seed takes, from the first ploughing of  
 the field, to the reaping of the crop, he places always  
 the work of the *occator* immediately after the work of the  
 ploughman: ' Four or five *modii* of *triticum*, says he, ' take  
 ' four days of the ploughman, one of the *occator*, three  
 ' of the *sarritor*, one of the weeder, and one and one-half  
 ' of

of the reaper.—Tritici modii quatuor, vel quique, bul-  
 corum operas occupant quatuor, occatoris unam, far-  
 ritoris duas primum, et unam cum iterum sarriuntur,  
 runcatoris unam, messoris unam et dimidiam; Col. lib.  
 II. cap. XIII. And so of the other crops cultivated by  
 the Romans through the whole chapter. He sums up  
 the whole in this manner: ‘ From this account of days  
 labour, it appears, that a field of 200 *jugera* may be  
 cultivated with two yokes of oxen, as many ploughmen,  
 and six common labourers, provided there are no trees  
 upon it; but if it is an *arbusum*, *Saferna* asserts, that  
 the same quantity of land may be very well cultivated  
 with three labourers more. From which account we  
 learn, that one yoke of oxen is sufficient for the sowing  
 of 125 *modii* of *triticum*, and the same quantity of pulse  
 in the autumnal seed time; and, likewise, besides this  
 for 75 *modii* more in the *tremestrian* seed time, which  
 is proved in this manner: This quantity of seed, which  
 is sown upon 25 *jugera*, four times ploughed, requires  
 115 days work of the ploughman; for this quantity of  
 land, though of the stiffest kind, is ploughed for the  
 first time in 50 days; for the second time in 25; and in  
 40 it is ploughed the third time, and the seed covered.  
 The pulse take 60 days, that is, two months. The  
 number of rainy days, and holy days, in which there  
 is no ploughing, may be reckoned at 45; likewise, after  
 the seed time is over, there are 30 days of rest; these,  
 in all, amount to eight months and ten days; and there  
 remain of the year three months and twenty-five days,  
 which may be employed in sowing *tremestrian* corn, or  
 in



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' in carrying hay, fodder, dung, and other necessaries.  
 ' —Hac consummatione operarum colligitur posse agrum  
 ' ducentorum jugerum subigi duobus jugis boum, toti-  
 ' demque bubulcis, et sex mediastinis; si tamen vacet ar-  
 ' bombus; at si sit arbutum, eundem modum Saferna tri-  
 ' bus hominibus adjectis afferat probe satis excoli: quae  
 ' nos ratio docet, sufficere posse jugum boum tritici centum  
 ' viginti quinque modis, totidemque leguminum, ut sit in  
 ' assem autumnalis satio modiorum ducentorum quinqu-  
 ' ginta. Et post hanc nihilominus conferat trimestrium  
 ' modios quinque et septuaginta. Hoc deinde sic proba-  
 ' tur. Semina, quae quarto fulco feruntur in jugeribus  
 ' viginti quinque, desiderant bubulcorum operas cxv. Nam  
 ' profunditur is agri modus, quamvis durissimi, quinqu-  
 ' ginta operis, iteratur quinque et viginti, tertiatur et  
 ' comendatur xl. Caetera legumina occupant operas lx. id  
 ' est menses duos. Pluviales quoque et feriarum computan-  
 ' tur, quibus non aratur, dies quinque et xl. Item pe-  
 ' cunia sementi, quibus requiescunt, dies xxx. Sic in asse  
 ' sunt octo menses et dies x. Superfunt tamen de anno tres  
 ' reliqui menses et dies v. et xx. quos absumamus aut in  
 ' satioe trimestrium, aut in vecturis foeni, et pabulorum,  
 ' et decuram, aliorumque utensilium; Col. lib. ii. cap.  
 ' xii. Now, let it be observed, that although, agreeable  
 ' to what Columella says in the beginning of the chapter,  
 ' the quantity of triticum and pulse mentioned, would take  
 ' us less than 50 days of the *occator*, yet no mention is  
 ' made of this work being performed by the ploughman  
 ' and pair of oxen, which would certainly have been done,  
 ' if the *occator*, the instrument with which the *occator* per-  
 ' formed

formed his work, had been a heavy instrument and drawn by cattle. Besides the length of time that the *occator* took to finish a *jugerum*, which was a day, and sometimes a day and one-half, shows plainly, that he wrought with a hand-rake, and not with a harrow drawn by a yoke of oxen.

The person who laboured with the *rastrum* was sometimes called *farritor*. Thus Varro: 'Id genus praedii per farritores occare solent;' lib. i. cap. xxix. Although *occatio* and *farritio* were two different operations, and designed for two different purposes, the one for breaking clods or covering seed, and the other for hoeing the growing corn, yet it is probable, that these different operations had a near resemblance to each other, were performed much in the same manner, and by instruments resembling each other in their construction. That the operations were different is certain; some crops received both the *occatio* and *farritio*, others only one of them. According to Columella, *triticum*, *siligo*, *hordeum*, *faba*, and some others, received both; while the *vicia*, *phaseolus*, *cicera*, and some others, received the *occatio* only; Col. lib. ii. cap. xiiii. And, according to Pliny, *miliun* and *panicum* received both operations; and *filicia* and *fisceoli*, only one of them; Nat. Hist. lib. xviii. cap. xxi. As *occatio* and *farritio* were different operations, so the instruments with which they were performed were different likewise, and had different names given them.

with it, in the same manner as with the *rastrum* \*.

All

\* *Sarculum* was the name of the instrument used in the operation called *farratio*; it probably very much resembled the *rastrum*. There was no necessity indeed for its being so heavy, as there were few or no clods in the fields where it was used. It is true indeed, that the *sarculum* was used sometimes for covering seed, as well as the *rastrum*. Columella having said, that the *foenum Graecum* does not grow well if covered above four fingers deep, adds; ‘ For which reason, some farmers, before they  
 ‘ sow, plough the field with small ploughs, then they  
 ‘ scatter the seed and cover it with *sarcles*.—Propter  
 ‘ quod nonnulli priusquam ferant, minimis aratris pro-  
 ‘ scindunt, atque ita jaciunt femina, et sarculis adobruunt;’  
 Col. lib. II. cap. XI. Cato mentions the *sarculum* among the iron tools: ‘ Ferramenta ferreas VIII. sarcula VIII.’  
 cap. X. He likewise mentions them as proper for cleaning drains: ‘ Cum pluere incipiet, familiam cum ferreis,  
 ‘ sarculisque, exire oportet, incilia aperire;’ cap. CLV. Palladius mentions two kinds, the one simple, and the other two horned: ‘ Sarculos simplices vel bicornes;’ lib. I. cap. XLIII. The two horned *sarculum* was probably intended for going on each side of a row of corn, or other plants, and heaping the earth towards it; these might be used in the fields, as well as in the garden; for, as shall be shown afterwards, corn, in the Roman husbandry, was sown in such a manner as to rise in rows.

It

All these instruments were used in the corn fields, for stirring the soil, smoothing the surface,

It appears, that one of the kinds of this instrument, was of such a form, as to make it possible to dig with it. Pliny says, that the inhabitants of the mountains do not use oxen, but plough with *farcles*: 'Certe sine hoc animali  
'montanae gentes farculis arant;' Nat. Hist. lib. xviii. cap. xix. The two horned kind mentioned by Palladius, would in some measure answer this purpose. Columella mentions an instrument of the same kind, called *capreolus*, which he describes; and from his description it appears to have been a two horned iron tool. He directs, that asparagus in the spring be hoed with this instrument. Asparagus was planted in rows, at a foot distance the one from the other; an instrument, therefore, proper for hoeing this plant, when set in rows, would also be proper for hoeing rows of corn.

Columella, describing the manner in which the *farculum* is used, seems to represent it as making a little furrow, and heaping up the earth that comes out of it. Treating of the operations of the gardener, he says; 'Now likewise, he should take the shining *farcles* wore  
'with the soil, and drawing them in a tract across, again  
'form the narrow ribs obliquely with a small path.'

Tunc quoque trita solo splendentia farcula sumat,  
Angustosque foros adverso limite ducens,  
Rurfus in obliquum distinguat tramite parvo.

Col. lib. x. v. 91.

face, and breaking clods; the *sarculum*, besides these purposes, was constructed in such a manner, as to be used for destroying weeds amongst the growing corn.

There are some other instruments mentioned by the rustic writers; and, although they seem to have been principally used in the vineyards and gardens, yet it may not be improper to attempt a description of them, so far as it can be obtained from the passages in which they are mentioned.

#### CHAP.

The word I have translated ribs is *forus*, which signifies a bench in a theatre, or an oar-bank in a ship; and, in this place, certainly signifies something raised, as *limes* and *trames* signify places hollowed.

## C H A P. XX.

*Of the Bidens, Ligo, Pala, Securis, Delabra, and Marra.*

**T**HE *bidens*, was an instrument very much used by the ancients in the vineyards and gardens. According to Theophrastus, it was used by some in their corn fields, to give the last dressing to land when seed was sown. After observing, that this dressing ought to be given with great exactness, he adds: ‘ For which reason, the culture of the *bidens* is preferred to that of the plough; because this seems to leave some of the soil untouched \*.’ In the vineyard, Columella declares, that it is preferable to the plough, because it moves the whole  
soil

\* Quapropter bidentis culturam magis, quam aratri, commendant; id enim pleraque intacta videtur relinquere; Theo. de caus. plant. lib. III. cap. XXV.

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foil equally \*. And, in the garden, he recommends it as the most proper instrument for giving the nicest culture. He mentions four dressings of the ground intended for onions, and the last of the four, that required an equal digging, he says ought to be given by the *bidens* †.

From

\* Bidentibus terram vertere utilius est, quam aratro. Bidens aequaliter totam terram vertit, &c.; Col. lib. de arb. cap. xii.

† Cepina magis frequenter subactam postulat terram, quam altius conversam. Itaque ex calendis Novembris profundi solum debet, ut hyemis frigoribus et gelicidiis putrescat; intermissisque quadraginta diebus; tum demum iterari, et interpositis uno ac viginti diebus tertiarum, ac protinus stercorari: Mox bidentibus aequaliter perfossum in areas disponi, deletis radicibus omnibus; Col. lib. xi. cap. iii. The person that used the *bidens* was called *fessor*, the operation was called *fossio*, and the performing it served the same purpose with ploughing. Columella, treating of the planting of vines, says; ‘ Then having left a  
‘ space more or less, as the vineyard is to be cultivated  
‘ by the plough, or the *bidens*, they proceed, observing  
‘ the same order; and, if the earth is to be turned by a  
‘ *fessor*, the smallest distance betwixt the rows is five feet,  
‘ the greatest is seven; but, if the earth is to be cultivated  
‘ by oxen and a plough, then the smallest distance is  
‘ seven feet, and the greatest is ten.— Tum deinde re-

• lieto

From its name, it appears to have been an instrument with two teeth. It does not seem to have been used in the same manner as we use the spade, but as we use the hoe, when employed to open up hard or stony ground\*. It is probable,

‘lieto spatio prout cuique mos est vineas colenti, vel aratro, vel bidente, persequentes ordinem insistant. Et si fosse tantum terra versetur, minimum est quinque pedum interordinium, septem maximum; si bubus, et aratro, minimum est septem pedum, satis amplum decem;’ Col. lib. III. cap. XIII.

\* When the *fessor* used this instrument, he is said to throw it as well as dig with it. Virgil expresses himself in this way, when he directs the earth to be thrown towards the young vines, after being planted;

Seminibus positis, supereff deducere terram  
Saepius ad capita, et duos jactare bidentes.

G. II. v. 354.

Columella expresses himself in the same manner, and further says, that it is necessary that the *fessor* have room to throw the *biden*s freely and properly: ‘Contra, frigidis et pruinosis regionibus simplices ordines instituendi; nam et sic facilius insolat humus, et fructus percoquitur, perflatumque salubriorem habet: Fossores quoque liberior et aptius jactant bidentes;’ lib. IV. cap. XVII. He directs likewise, that vines be planted in the pits exactly



probable, that there was a kind of mall on the side opposite to the digging part of this instrument, like what is on the opposite of a carpenter's or couper's adz; by this, clods would be more easily broken than by the digging part. Virgil, treating of the culture of the vineyard, directs the *fossor* to break the clods by the *bidens* inverted\*.

When

actly perpendicular, and gives this reason; 'The vine,' says he, 'that is placed sloping in the pit, is in danger of being wounded when it is *ablaqueated*; for, while the *fossor* endeavours, with more than ordinary strength, to deepen the round pit, which he makes in *ablaqueating*, he often wounds the oblique vine, and sometimes cuts it through.—*Nam vitis supina, et velut recumbens in alveo deposita, postea quum ablaqueatur, vulneribus obnoxia est. Nam dum exaltare fortius orbem ablaqueationis fossor studet, obliquam vitem plerumque fauciat, et nonnunquam praecidit;*' lib. iv. cap. iv. Pliny directs, that the *bidens* be used in stony land to extirpate rushes; '*Juncosus ager verti pala debet; at in saxoso bidentibus;*' Plin. Nat. Hist. lib. xviii. cap. vi. From these passages, it is evident, that the *fossor*, when working with the *bidens*, raised it up with his arms, and brought it down with force.

\* ——— *Namque omne quotannis*

*Terque quaterque solum scindendum; glebaque versis  
Æternum frangenda bidentibus.*—Vir. Geo. ii. v. 397.

When the form of this instrument, and the manner of using it, are considered, it will not appear surprising, that in the vineyards, it should be preferred by Columella to the plough.

The *ligo* seems to have been an instrument like our spade. It was used chiefly in the garden and vineyard. In the first ages, it was probably used also in the corn fields\*.

#### The

I am sensible, that this passage is commonly translated very differently from the sense I have put upon it; *versis* is supposed to mean *bended*, and not *inverted*. But, as the *bending* of the instrument has no connection with the operation in which it is supposed to be employed, I am rather inclined to think, that Virgil directs the position of it to be changed, and the more especially, as the operation, which he mentions immediately before, was performed by the same instrument.

\* The *Ligo* is not mentioned by Cato, in his list of the iron tools; but it is mentioned by Palladius. Varro says, that this instrument is called *ligo*, because by it, on account of its breadth, any thing under the surface is easily gathered: ‘*Ligo, quod eo propter latitudinem, quod sub terra facilius legitur;*’ Var. de L. L. lib. iv. That it was an instrument used for digging and cultivating the earth, appears from several passages in Horace. Speaking of the ancient Romans that conquered Pyrrhus, Antiochus, and Hannibal, he calls them a stout race of rustic soldiers, taught to turn the glebe with Sabellian *ligos*.

Sed

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The *pala* seems to have been an instrument resembling the *ligo*; possibly it may only be a different name for the same instrument. For it is

Sed rusticorum mascula militum  
Proles, Sabellis docta ligonibus  
Verfare glebas, &c.—Hor. Carm. lib. III. ode VI.

In his epistle to his *villicus*, he charges him with cultivating fields long untouched by *ligos*; and with tending and feeding oxen that were never yoked;

——Et tamen urges  
Jam pridem non tacta ligonibus arva.

Hor. Ep. lib. I. ep. xiv.

That the *ligo* was an instrument not drawn with cattle, but used in manual labour, appears from a passage in an ode of the same poet, addressed to Canidia the forcerefs. He says, that Veia, with great labour, dug a hole in the earth with strong *ligos*;

Ligonibus duris humum  
Exhauriebat ingemens laboribus ——Hor. Epod. ode v.

Columella, in his poem on the culture of gardens, mentions the *ligo*, and directs that the turff and clods be bruised with the tooth of a broken one;

Mox bene cum glebis vivacem cespidis herbam  
Contunda marrae, vel fracti dente ligonis.

Col. lib. x. v. 88.

is remarkable, that Cato mentions the *pala* and not the *ligo*; and that Palladius mentions the *ligo* and not the *pala*. It is probable, that it was pointed like the spade used for casting turff. Pliny, as has already been observed, mentions a share pointed like a *pala*. A share with a square point, would be a very improper one; but there are shares pointed like the turff spade, which, from this, it is probable was the form of the *pala*: It seems to have been made of timber, and pointed with iron. Columella describes it as formed in this manner; his words literally translated are: ‘Then I ought to turn the sweet earth with the iron’d oak of the *pala*\*.’

There were some of them made wholly of timber. Cato mentions them †. They were probably used for the same purposes with our shovels.

As the culture given by the Romans to their farms, was often amongst trees, not only in the vineyards, but also in the corn fields, they needed instruments for cutting the roots of the

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trees

\* Tum mihi ferrato versetur robore palae

Dulcis humus.——Col. lib. x. v. 45.

† Palas ligneas XL.; Cat. cap. xi.

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... interrupted their culture. Of these, ... mentioned, the *securis* ... The *securis* seems to have been ... and used in the same ... of the pruning knife called ... in the shape of the half

... have been a kind of ... ploughman for cut- ... the plough in ... "ploughman," says Columella, ... as well as the share; ... and harrow the broken ... with which a field set ... It was sometimes u- ... of the *bidens*, and ... of the *rastrum*. Pal- ... were *disqueata* by it, ... performed with the *bi-* ... after the first ploughing, ... were

... species, *securis di-*

... *securis* utatur; et ... quibus ager ar- ... ac perfequa-

were broken by it, an operation commonly performed by the *rastrum* or *crates* \*.

The *securis* and *dolabra*, were sometimes joined in one, the *securis* on the one side, and the *dolabra* on the other; which Palladius calls *securis dolabrata*. When, in ablaqueating vines, the earth, opened up with the *bidens* or *dolabra* side of the tool, was thrown out with the *pala* or *ligo*, then the *securis* side would be proper for cutting any roots necessary to be taken away.

The *marra* seems to have been a kind of scraping instrument, like our hand-hoes. It is mentioned by Pliny, as proper for cleaning *medica*, when three years old †. Juvenal mentions it along with the *farculum* ‡. And Columella directs that roots be tore up, and that clods and turff be broke with its tooth §.

It

\* Januario mense locis temperatis ablaqueandae sunt vites, quod Itali excodicare appellant, id est circa vitis radicem dolabra terram diligenter aperire; Pal. lib. 11. tit. 1. Glebae omnes dolabris dissipandae sunt; tit. 111.

† Ad trimatum, marris ad solum radi; Plin. Nat. Hist. lib. xviii. cap. xvi.

‡ Ne marrae et farcula defint; Juv. 111. v. 311.

§ Tu penitus latis eradere viscera marris  
Ne dubita. — Col. lib. x. v. 72.

Mox

It appears from this account of the rustic instruments of the Romans, that a much greater variety were used by them in the culture of their lands than by us. The moderns seem fond of complex machines, to serve different purposes; these indeed are curious, but they are found so inconvenient, that they never become of general use. Simple instruments for every different purpose, are neither inconvenient nor expensive. It would certainly tend to improve agriculture, if our farmers had a greater variety of all the rustic instruments, than they commonly have. Different kinds of ploughs, harrows, hoes, &c. for the different kinds of work required, would be a means of having the work not only better performed, but also at less expence.

## C H A P.

Mix bene cum glebis vivacem cespitis herbam  
Contundat marrae, vel fracti dente ligonis.

Id. v. 88.

In some copies we read *matris* and *matre*, instead of *marris* and *marræ*. In the first line, indeed, *matris* does not alter the sense, as *rastris* may be understood; but *matre* in place of *marræ* in the other, makes the passage unintelligible; so that it is evident, that *marris* and *marræ* is the true reading.

## C H A P. XXI.

*Of Ploughing in General.*

**P**LOUGHING is certainly the most important operation in agriculture. By it the soil is exposed to the atmosphere, and thereby the food of plants communicated; by it the land is stirred and turned over, and thereby the mould divided, and the pasture of plants enlarged; by it the weeds growing upon the surface are destroyed, and the lurking roots exposed to be burned by the sun and wind; by it ridges being made, and furrows properly placed, wet land is made drier; and by it the surface being opened, and rain allowed to descend, dry land is made to retain water. An operation that served so many valuable purposes, is certainly most important, and deserves the greatest attention.

These



These valuable purposes served by ploughing, were well known to the ancients. Virgil informs us, that the great design of ploughing is to render soil loose and crumbling: ‘That land,’ says he, ‘is best for corn, that is almost black, that is fat as deep as the plough goes, and has a loose and crumbling mould, (for this we endeavour to make by ploughing\*.)’ This passage is cited by Columella, who expresses himself in the same manner: ‘To cultivate,’ says he, ‘is nothing more than to open and ferment the earth †.’ Theophrastus, who wrote long before either, is much more particular, in representing the great advantages of ploughing or digging: ‘Digging,’ says he, ‘is advantageous to all plants; for it removes the obstructions to vegetation, and communicates food: It likewise renders the land itself moister and more open: To these it may be added, that air mixed with the soil (for mixed it must be when the earth is stirred) produces a certain volatile

\* *Nigra fere, et pinguis presso sub vomere terra,  
Et cui putre solum (namque hoc imitatur arando)  
Optima frumentis.*—Vir. Geo. II. v. 203.

† *Neque enim aliud est colere, quam resolvere et fermentare terram; Col. lib. II. cap. II.*

' volatile moisture, and affords nourishment.  
 ' Wherefore, it is necessary, that all foul and  
 ' dry soils be frequently digged and agitated,  
 ' as I have already mentioned. To spouty and  
 ' wet soils, digging is likewise advantageous,  
 ' although it must appear surprizing, that the  
 ' same operation should cure defects in soils so  
 ' opposite to each other; but there is nothing  
 ' wonderful in this, for it dries the one, and  
 ' moistens the other, according as each needs  
 ' to be assisted \*.' The same author, in another  
 passage, expresses himself in this manner: ' Soil  
 ' often turned over, becomes free and light, and  
 ' free from every obstruction; so that it can most  
 ' easily

\* Fossio omnibus prodest; tollit enim quae impediunt,  
 vel auferant pabulum: Ipsumque solum humectius, atque  
 suspensius reddit. Ad haec aër humo permistus (permis-  
 ceatur enim necesse est, cum terra agitur) praebet va-  
 poratum quendam humorem, atque alimonium efficit.  
 Quo circa solum aridum atque siticulosum, fodere a-  
 gitareque saepe oportet; ut ante jam diximus. Palus-  
 tribus quoque uliginosisque fossio prodest; quanquam mi-  
 rum videatur, solis inter se adversis curam eandem posse  
 conducere. Verum nihil mirandum id est; alterum ete-  
 nim siccatur, alterum humefacit; scilicet cum utrumque  
 contrario adjuvari desideret; Theoph. de caus. plant. lib.  
 III. cap. XIV.

‘ easily give nourishment. For which reason,  
 ‘ no crop should be sown on fallow, unless it  
 ‘ is reaped so easily, as not to prevent the sum-  
 ‘ mer ploughings.’

As the ancients knew well the great advantages of ploughing, so, in consequence of this, we find that they represent it as the most important operation in agriculture. Thus Theophrastus, after observing how necessary it is for the farmer to exercise his judgment, and vary his operations, according to situations and circumstances, expresses himself in this manner: ‘ But, that I may mention a maxim that is general and holds universally: It is the first and principal thing in agriculture, to have land well ploughed; for seed committed to well ploughed soil, comes up luxuriantly, when the earth is by this operation softened.’ ‘ What,’ says Cato, ‘ is the best culture of land? Good ploughing. What is the second? Plowing in the ordinary way. What is the third? Laying on manure\*.’ Pliny cites this passage: ‘ In ploughing,’ says he, ‘ Cato’s maxim is chiefly  
 ‘ to

\* Quid est agrum bene colere? Bene arare. Quid secundum? Arare. Quid tertium? Stercorare; Cat. cap. LXI.

‘ to be observed. What is the first thing? To  
 ‘ cultivate land well. What is the second? To  
 ‘ plough well. What is the third? To lay on  
 ‘ manure \*.’

There is no doubt, that Pliny, in this passage, cites the above passage in Cato; but it may be observed, that there is a very great difference betwixt them. Whether the passage in Cato or in Pliny has been mangled in transcribing, or whether Pliny has mistaken Cato, is of no importance to inquire; in both passages ploughing is declared to be an operation most important.

That ploughing might answer the purpose for which it was intended, many important directions are given by the several rustic writers, most worthy of the attention even of a modern farmer.

The ploughing land when wet, is forbidden by all. Columella represents this as most dangerous: ‘ But when we plough,’ says he, ‘ we  
 ‘ must not touch wet land; for the fields which  
 ‘ are ploughed wet, cannot be touched for the  
 ‘ whole

\* In arando magnopere servandum est Catonis oraculum. Quid est primum? Agrum bene colere. Quid secundum? Bene arare. Quid tertium? Stercorare; Plin. Nat. Hist. lib. xviii. cap. xix.

‘ whole year, and are fit neither for being sown, ‘ harrowed, nor planted \*.’ Palladius gives the same caution, and takes notice of the same bad consequences: ‘ It ought to be observed,’ says he, ‘ that land must not be ploughed when wet; ‘ for land which receives the first ploughing ‘ when wet, cannot be touched for the whole ‘ season †.’ From this passage it appears, that it was reckoned particularly dangerous to give the fallow the first ploughing when it was wet; and that, when this was done, it was impossible, by any operations afterwards, to bring it to a right tilth that seed time. Pliny does no more than mention the received maxim: ‘ Do not,’ says he, ‘ touch wet land ‡.’

There is a kind of land which Cato calls carious land, *terra cariosa*. This land he forbids so much as to be touched or trod upon: ‘ Take ‘ care,’

\* Sed quandocunque arabitur, observabimus, ne lutofus ager tractetur.—Nam quae limosa versantur arva toto anno desinunt posse tractari, nec sunt habilia sementi, aut occationi, aut fationi; Col. lib. ii. cap. iv.

† Observandum est, ne lutofus ager aretur: Nam terra quae lutosa tractatur in primordio, fertur toto anno non posse tractari; Pal. lib. ii. cap. iii.

‡ Lutofam terram ne tangito; Plin. Nat. Hist. lib. xviii. cap. xix.

‘ care,’ says he, in his directions to the *villicus*,  
 ‘ that you do not plough carious land, nor drive  
 ‘ a cart or any kind of cattle upon it. If you  
 ‘ do not guard against this, wherever the plough,  
 ‘ or carts, or cattle, have gone, you will lose the  
 ‘ crop for three years.’ When treating of fow-  
 ing, he likewise forbids carious land to be touch-  
 ed \*. Pliny gives an explanation of this pas-  
 sage, and describes the kind of land which he  
 supposes Cato calls carious land: ‘ What can  
 ‘ be meant,’ says he, ‘ by carious land, which  
 ‘ Cato is so much afraid of, as to forbid it even  
 ‘ to be so much as trod upon? Let us compare  
 ‘ it with the cariousness of timber, and we will  
 ‘ find that these are the defects which he so very  
 ‘ much abhors, dry, spongy, rusty, hoary, con-  
 ‘ sumed, and full of holes; he said more in one  
 ‘ word than the most copious language can de-  
 ‘ scribe; for, by this phrase, he means certain  
 ‘ defects, not arising from age, (which cannot  
 ‘ be attributed to the earth) but from the nature  
 ‘ of the soil, which however may be compared  
 ‘ to

\* *Terram cariosam caveto ne ares, neve plostrum, ne-  
 ve pecus in eam impellas. Si ita non caveris, quo im-  
 puleris, triennii fructum amittes; Cat. cap. v. Terram  
 cave cariosam tractes; Cat. cap. xxxiv.*

‘ to things consumed with age, and thereby  
 ‘ weak and altogether unfruitful \*.’ But this  
 explication of Pliny’s is rather a learned criti-  
 cism upon the word *cariosus*, than an illustration  
 of Cato’s meaning. It is evident, from Cato’s  
 words, that by carious land, he does not mean  
 land barren from its nature, but land in a par-  
 ticular situation, and which, if ploughed in this  
 situation, is rendered barren for a number of  
 years: So that carious land is not land of a  
 certain kind, but land in a certain situation;  
 though, at the same time, it is probable, that  
 no kind of land is ever reduced to this situation,  
 but what is commonly called spongy or puffy  
 soil. Columella informs us what it is that ren-  
 ders land carious: ‘ When we plough,’ says he,  
 ‘ care must be taken not to touch wet land, nor  
 ‘ land

\* Quid putamus hac appellatione ab eo tantopere re-  
 formidari, ut paene vestigiis quoque interdicat? Redigamus  
 ad ligni cariem, et inueniemus illa, quae in tantum abomi-  
 nantur, vitia, aridae, fistulosae, scabrae, canescentis, ex-  
 esae, et pumicosae. Plus dixit una significatione, quam possit  
 ulla copia sermonis enarrari. Est enim interpretatione  
 vitiorum quaedam, non aetate (quae nulla in ea intelligi  
 potest) sed natura sua, anus terra; et ideo infoecunda ad  
 omnia, atque imbecilla; Plin. Nat. Hist. lib. xvii. cap. v.

‘ land half wet with small showers, which land  
 ‘ the rustics call various and carious. It is made  
 ‘ so, when, after long drought, a small rain has  
 ‘ moistened the upper part of the clods, and has  
 ‘ not touched the lower part.’ That this land,  
 described by Columella, is of the same kind  
 with that which Cato calls carious, is evident  
 from what he adds a little after: ‘ The fields,’  
 says he, ‘ that are ploughed when various, are  
 ‘ immediately affected with barrenness for three  
 ‘ years \*.’ Palladius, to the same purpose, says,  
 ‘ that, if land is ploughed when it is a little wet  
 ‘ and dry below, it is asserted, that it becomes  
 ‘ barren for three years †.’ From whence it  
 should arise that land ploughed in this situation,  
 becomes barren for three years, is uncertain;  
 but it cannot be denied that this has happened,  
 as

\* Sed quando arabitur, observabimus, ne lutosus ager tractetur, neve exiguis nimbis semimadidus quam terram rustici variam cariosamque appellant. Ea est post longas siccitates levis pluvia superiorem partem glebarum madefecit, inferiorem non attigit.—At rursus, quae varia subacta sunt, continuo triennio sterilitate afficiuntur; Col. lib. 11. cap. 1v.

† Quae (terra) autem supra leviter infusa est, et subter sicca, si tunc aretur, asseritur per triennium sterilis fieri; Pal. lib. 11. tit. 111.



as it is asserted so positively both by Cato and Columella. If we suppose the soil to be of the kind mentioned by Pliny, the great defect of it is this; by a fermentation arising from frost, or a sudden transition from dry to wet, and wet to dry, it throws out the seed, and even the young plants, or at least exposes their roots to be destroyed by drought: If this kind of land is ploughed when half wet, by mixing the wet and dry together, it is possible that it may be rendered more spongy and porous, so as to take a considerable time before it is reduced to such a situation as to render it fit for carrying a crop. This is offered only as a conjecture, for nothing but experiments are sufficient to determine the question. It would not be amiss, however, that farmers that have land of this kind, would pay some attention to the caution given by these writers, at least observe what effects are produced by ploughing such kind of land in such a situation.

It was another maxim in ploughing, to plough with an equal furrow, one furrow equal to another, and always of the same breadth. These are implied in Cato's maxim, not to plough with

a various furrow \*. Which maxim is cited by Pliny †.

It was a maxim likewise, that the ploughman should make straight furrows. Pliny mentions this, and observes, that the ploughman who ploughed crooked, was said to prevaricate, from whence, he says, this crime was translated into the forum; but that it ought to be as much guarded against in the fields, where first observed ‡.

To break and divide the soil, narrow furrows are recommended, so narrow as not to know, when the field is ploughed, where the plough has gone. Columella observes, that by this, the soil is not only divided, but all the roots of the weeds are cut and destroyed §. Pliny likewise represents it as a mark of well ploughed  
land,

\* Sulco vario ne ares; Cato, cap. LXI.

† Sulco vario ne ares; Plin. Nat. Hist. lib. XVIII. cap. XIX.

‡ Arator, nisi incurvus, praevaricatur. Inde translatum hoc crimen in forum. Ibi itaque caveatur, ubi inventum est; Plin. Nat. Hist. lib. XVIII. cap. XIX.

§ Sed tam frequentibus densisque sulcis arandi sunt, ut vix dignoscatur in utram partem vomer actus sit, quoniam sic omnes radices herbarum perruptae necantur; Col. lib. II. cap. IV.

land, if it is not known where the plough has gone \*.

The farmer is directed to take care, that the ploughman, in ploughing, leave none of the soil unmoved, no fast land or baulks betwixt furrows. Columella says, that the ploughman must plough in such a manner, as to leave no hard unmoved soil, such as the husbandmen call *scamnum* †. Palladius mentions this among the maxims : ‘ He,’ says he, ‘ who leaves unmoved ‘ soil betwixt furrows, lessens his crop, and de- ‘ stroys the fertility of the earth ‡.’ Pliny gives the same direction, and adds ; ‘ That it is ne- ‘ cessary to prevent clods from prevailing in the ‘ field §.’ This would certainly be the consequence of such bad ploughing ; for if, at the first ploughing, these baulks were left, when turned up at the second ploughing, which was com-  
monly

\* Id demum recte subactum erit, ubi non intelligetur utro vomer ierit ; Plin. Nat. Hist. lib. xviii. cap. xix.

† Sed ita necubi crudum solum et immotum relinquat, quod agricolae scamnum vocant ; Col. lib. ii. cap. ii.

‡ Qui arando crudum solum inter sulcos relinquit, suis fructibus derogat, terrae ubertatem infamat ; Pal. lib. i. tit. vi.

§ Scamna inter duos sulcos cruda ne relinquuntur, glebae ne exsulent ; Plin. Nat. Hist. lib. xviii. cap. xix.

monly across, they would naturally arise in large hard clods.

Such was the method of ploughing used by the Romans, that it was not possible for the farmer, by taking a view of his field, to know whether or no it was clean ploughed. He is therefore directed to push a pole into the ploughed land in a variety of places, by which he would know whether it was equally moved every where to the proper depth. Columella and Palladius both observe, that if the farmer does this frequently, his ploughmen will not venture to deceive him\*.

That

\* Eum porro an recte aratur, frequenter explorare debet agricola. Nec tantum visu, qui fallitur nonnunquam, superfusa terra latentibus scamnis; verum etiam tactu, qui minus decipitur, cum solidi rigoris admota pertica transversis fulcis inseritur; ea si aequaliter, ac sine offensione penetravit, manifestum est, totum solum deinceps esse motum: Sin autem subeunti durior aliqua pars obstitit, crudum vevactum esse demonstrat. Hoc cum saepius bubulci fieri vident, non committunt scamna facere; Col. lib. 11. cap. 17.

Sed aequaliter terram motam esse cognoscis, si transversam per fulcos perticam mittas. Quae res saepius facta, bubulcos ab hac negligentia submovebit; Pal. lib. 11. tit. 111.

That the mould might be more effectually reduced, cros ploughing is recommended. 'And he too,' says Virgil, 'greatly improves his land, who, turning the plough obliquely, again breaks through the furrows raised at the first ploughing \*.' It is probable, that this is Virgil's meaning in this passage, as the fallow was certainly ploughed across. This appears from a passage in Columella: When giving directions about the planting of vines, he observes, that some planted them at the distance of ten feet in the form of a quincunx, for this reason, that the earth might be ploughed after the manner of fallow land, in furrows across each other †. Pliny likewise observes, that land is best reduced first by furrows along, and then across ‡. That this is his meaning, appears from

\* Et qui, profcisso quæ fuscitat aequore terga,  
Rurfus in obliquum verso perrumpit aratro.

Vir. Geo. I. l. 97.

† Nonnulli tamen omnem vitem per denos pedes in quincuncem disponunt, ut more novalium terra transversis adversisque fulcis profcindatur; Col. lib. III. cap. XIII.

‡ Omne arvom rectis fulcis, mox et obliquis subigi debet; Plin. Nat. Hist. lib. XVIII. cap. XIX.

from what follows, in which he says, that hilly land is ploughed *only* across. In another passage, he observes, that the second ploughing given to the fallow was across\*. On hilly ground, they recommend ploughing across the hill, for this reason, that ploughing in this way is much easier for the cattle and men. This is mentioned by Columella, Palladius, and Pliny †. It was easier for the ancients to do this than for us. Their common plough had no coulter nor mould board; and it was by the inclination of the plough to one side, that it was made to turn the earth of the furrow; so that in going across the hill, by inclining at first to the one side, and then in returning to the other, the furrow was always turned down the hill. Of so great importance

\* Aratione per *transversum* iterata, occatio sequitur; Plin. Nat. Hist. lib. xviii. cap. xx.

† Sed in arando maxime est observandum, semper ut transversus mons fulcetur. Nam hac ratione difficultas acclivitatis infringitur, laborque pecudum et hominum commodissime sic minuitur; Col. ii. cap. iv.

In collibus transverso tantum monte aratur; Plin. lib. xviii. cap. xix.

Si collis est, transversus per latera fulcetur, quae forma tunc servanda est, cum semen accipiet; Pal. lib. ii. tit. iii.

portance was cross ploughing considered, that this was done even upon hilly ground, though they always ploughed across the hill. The manner of doing it was, by directing the plough not exactly across the hill, but at one ploughing higher, and at another lower, by which the earth of the furrows at the former ploughing were in some measure cut across, and thereby the mould better broke \*.

Modern farmers will probably be surprised, that it should be given as a mark of well ploughed land, that it is not observed in it where the plough has gone. In the way that we plough, it is impossible that this can happen; in our best ploughed land, the furrows are very distinct. However, the propriety of this maxim will appear, if we consider the manner of ploughing among the ancients, that seems to have been very different from ours in modern times.

[

\* Prulum tamen quotiescunque iterabitur, modo in elatiora modo in depressiora clivi obliquum agi sulcum oportebit, ut in utramque partem rescindamus, nec eodem vestigio terram moliamur; Col. lib. II. cap. IV. After *in collibus*, &c. as above, Pliny adds; Sed modo in superiora, modo in inferiora, rostrante vomere; Plin. lib. XVIII. cap. XXI.

I had occasion already to mention a particular manner of ploughing, described by Columella, which seems to have been always used, either when new ground was broke up, or when the fallow got the first furrow. When giving directions how to break up new or fallow land, he says; 'The ploughman must walk upon the ploughed land, and at every other furrow must hold the plough obliquely, and at every other furrow plough with an upright and full plough \*.' This passage was cited before, but I thought it necessary, upon this occasion, to render it as literally as possible. It is impossible to explain these words, in such a manner, as to make Columella direct that the land shall be first ploughed along, and then across; But the meaning appears to be, that, in ploughing, the plough shall be held alternately sloping, and alternately upright. To understand this, it is necessary to observe, as has already been mentioned, that the common plough used by the Romans, was not made so as to turn the earth always to the right hand, as our ploughs do, by

\* Bubulcum autem per profcissum ingredi oportet, alternisque versibus obliquum tenere aratrum, et alternis recto plenoque fulcare; Col. lib. II. cap. II.



by the rest and mould board; but, when held upright, only stirred the earth, without turning it to a side; and that, when it was proposed to turn the earth to a side and make an open furrow, then the plough was held obliquely, the side of the share to the land side was raised, and by this oblique position of the share and the *buris*, the earth was turned to a side: With this plough, in whatever manner it was held, it was not necessary to go about in ploughing as our ploughmen do; but the Roman ploughman returned again in the same tract, and, by sloping his plough alternately to the right hand, and alternately to the left, turned the earth always one way. Now, in breaking up a new field, or ploughing the fallow for the first time, Columella directs, that the plough be alternately held oblique, and alternately upright: When held oblique, the earth would be cut in a sloping direction, from the firm land to the ploughed land, and the part cut off would be turned towards the ploughed land, making the furrow very narrow below; and, when it returned in the same tract held upright, the earth would be cut perpendicularly, and the sloping firm land left by the plough, when held obliquely, would  
be

be stirred, and partly mixed with the earth of the former furrow.

On no occasion does it appear, that the Roman ploughman ploughed in ridges, except when he ploughed in feed, or ploughed immediately before sowing; an evidence, that, in the common way, he returned always in the same tract, and turned the earth one way.

That the fallow, at the first time, was ploughed in the manner that has been described, is the more probable, as the first ploughing is represented as always taking double the time in every kind of soil, that the second is represented as taking. This could not happen in loose soil, if both ploughings had been performed in the same way; nor in stiff soil, when the second ploughing is across, which was the practice of the Romans; as every farmer knows, that in this case, there is very little difference betwixt the two ploughings. Columella, treating of the ploughing stiff soil, says; ‘ A *jugerum* of such kind of land is completely reduced by four days work; by two it is conveniently enough ploughed for the first time; and by one it is ploughed for the second time \*.’ In another passage, he says;

\* Sed *jugerum* talis agri quatuor operis expeditur;  
nam

says; ' The seed which is sown when the land  
 ' is four times ploughed, takes one hundred and  
 ' fifteen days work of the ploughman: For this  
 ' quantity of land, though of the stiffest kind,  
 ' is ploughed at the first time in fifty days, at  
 ' the second time in twenty-five \*.' Pliny, to  
 the same purpose, says; ' That three fourths of  
 ' a *jugerum* may be ploughed, at the first time,  
 ' in one day, and one and one-half *jugerum*,  
 ' at the second time, when land is light; when  
 ' stiff, that one-half of a *jugerum* may be plough-  
 ' ed at the first time, and a whole at the second \*.'

The

*nam commode profcinditur duabus, una iteratur; Col. lib. 11. cap. 1v.*

\* *Nam profcinditur is agri modus, quamvis durissimi, quinquaginta operis, iteratur quinque et viginti; Col. lib. 11. cap. xiiii.*

† *Justum est profcindi fulco dodrantali jugerum uno die, iterari sesquijugerum, si sit facilitas soli; si minus, profcindi semissem, iterari assem; Plin. Nat. Hist. lib. xviii. cap. xix.*

Some understand by *fulco dodrantali*, a furrow three fourths of a foot deep. If this is the meaning, the proportions are different. But the other is probably the meaning, as Columella makes the proportion the same in the light as in the stiff soil; ' But,' says he, ' if the soil

' is

The difference between these can scarcely be supposed to have been so great, especially in light soils, if, at the first time, the land had been ploughed in the ordinary way. Varro observes, that a particular name was given to the first ploughing: 'When they plough the land for the first time,' says he, 'they call it *proscindere*.' That there was a difference betwixt this and the ordinary way of ploughing, is evident from a passage in Pliny: 'Plough,' says he, 'with all your strength, before you plough *proscindito*.' He adds, as an advantage attending this way of managing land; 'This way has an utility that the roots of the weeds are cut, the turff being turned over\*.' When the plough was held sloping, the turff would be turned over, and cut thin towards the land side; and, when the plough was held upright, a little earth would be thrown over it. In a field plough-

ed

'is easy, a *jugerum* is ploughed at first by two days work, and at the second time in one.—At si facilis est terra, *proscinditur jugerum duabus operibus, iteratur una*;' Col. lib. xi. cap. ii.

\* Vi omni arato; priusquam aras *proscindito*. Hoc utilitatem habet, quod inverso cespide herbarum radices necantur; Plin. Nat. Hist. lib. xviii. cap. xix.

ed carefully in the manner described, the mould would be thoroughly broken, and it would have this mark of good ploughing already mentioned, it would scarcely be known in what places the share had gone.

How deep it was common for the Roman farmers to plough, is uncertain: If the passage in Pliny, above cited, is to be explained as is done in the note, then the point is determined, and their ordinary way of ploughing was nine inches deep, which will be reckoned a very good depth in most of the counties of Britain. But, as the words will bear another explication, they cannot be cited as an authority for the deepness of their ploughing. Pliny calls ploughing four fingers deep a scarification\*. This is three inches deep, for there were reckoned sixteen fingers in the foot †. That it was the custom to plough very deep, appears from a passage in Columella, when treating of the qualities of good soil, he says; ‘ Nor ought we to  
‘ content

\* Et filicia, hoc est, foenum Graecum, scarificatione feritur, non altiore quatuor digitorum fulco; Plin. Nat. Hist. lib. xviii. cap. xvi.

† Modus omnis areae pedali mensura comprehenditur, qui digitorum est xvi.; Col. lib. v. cap. i.

‘ content ourselves with viewing the surface ;  
 ‘ but the quality of the matter below should be  
 ‘ diligently inquired into, whether or no it is  
 ‘ of earth. It is sufficient for corn if the land  
 ‘ is equally good two feet deep \*.’ If they i-  
 magined that corn received benefit from the  
 soil at the distance of two feet below the surface,  
 they would consider it as an advantage to plough  
 as deep as their cattle were capable of, and their  
 plough could go.

It may not be amiss, before this article is fi-  
 nished, to observe, that, according to the opi-  
 nion of some, it was a custom among the Greeks  
 to assign to each plough the quantity of land to  
 be ploughed by it in the day, or at the yoking ;  
 and, when there were two of them to go in the  
 same field, they began on opposite sides of the  
 field, and approaching always nearer and near-  
 er to each other by every furrow, and at last  
 met in the middle. Homer, according to Ma-  
 dam Dacier, alludes to this, when he compares

Diomed

\* Nec contentos esse nos oportet prima specie summi  
 folli, sed diligenter exploranda est inferioris materiae  
 qualitas, terrena necne sit. Frumentis autem sat erit, si  
 aequae bonae fuerit bipedanea humus ; Col. lib. 11. cap.

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Diomed and Ulysses, setting out after Dolon, to two teams of mules ploughing in the same field\*.

There

\* Αλλ' ὅτε δὴ ῥ' ἀπειν' ὄσσαν τ' ἐπιβρα πελοῖται  
 Ἑμιοῦσι, αἱ γὰρ τε βοῶν προφρεστεραὶ εἰσιν  
 Ἐλκεμένα νειοῖο Βαθείης πηκτον ἀροτρον.

Ili. lib. x. v. 351.

The story is this. Diomed and Ulysses having gone by night towards the Trojan camp, to inform themselves of the designs of the enemy, on the way heard the foot-steps of a person coming towards them, whom they supposed to be a Trojan spy, and therefore resolved, if possible, to take him prisoner: To do this the more effectually, it must be supposed, that, in hiding themselves, they retired to different sides, till he passed them, and that then they pursued him, each on his side, keeping a proper distance, but at the same time approaching each other as they approached him. Now, if this was the case, Homer might very well compare them to two teams of mules ploughing in the same field, to each of whom an equal share of land was allotted. As the furrows ploughed were of an equal length, and the quantity of land ploughed in a day determined, it follows, that the teams, when they began ploughing, were at a proper distance from each other to meet at the end of the yoking: So were the two Greeks at a proper distance to prevent the spy from turning to either side: As the teams, in ploughing, approached nearer

There is a bad manner of ploughing, against which Columella cautions the ancient farmers ;  
but

nearer to each other, and to the middle line, where the ploughing ended ; so the Greeks, in the pursuit, approached nearer to each other, and to the Trojan spy : As the teams, in approaching each other, frequently turned, so the Greeks turned frequently after the Trojan, attempting to regain the city. Mr Pope follows Madam Dacier, in the translation which he gives of this passage :

So distant they, such the space between  
As when two teams of mules divide the green,  
(To whom the hind like shares of land allows)  
When now few furrows part the approaching ploughs.

It is however uncertain whether this is Homer's meaning. The words literally translated are . ' But, when he  
' had got to such a distance as are the furrows of mules,  
' (for they are more excellent than oxen for drawing the  
' firm plough in deep fallow. ) Now, it is possible, that *επισεα*, which Madam Dacier supposed to be the space left by husbandmen betwixt two ploughs of mules, which plough in the same field, may signify the length of a furrow made by mules. This, among the Romans, when the plough was drawn by oxen, was fixed at 120 feet, and was called by them *actus*. Now, it is possible, that the length of the furrow was also fixed among the Greeks, that this was greater in ploughs with mules, than in ploughs with oxen, and that it is this greater distance here mentioned by Homer.



but it is a defect which modern farmers have as much reason to attend to and remove: In ploughing, except the plough is very well made, and the ploughman very attentive, the soil is not stirred to an equal depth in all places, but firm ground left between furrows, so that, were the loose soil swept off, the bottom would appear in the form of a ribbed field: This is occasioned by the form of the plough, and manner of ploughing; the under part of the plough, that goes in the bottom of the furrow, is horizontal, and of a certain breadth. Now, if the ploughman shall manage it in such a manner, as to make the coulter take off an earth above broader, than the horizontal part of the plough is wide below, then the land is not stirred to an equal depth; and, according to the proportion that these bear to each other, the ribs on the bottom are high or low. Let us suppose, for example, that the horizontal part of the plough is three inches thick, that the rest or mould board is raised upwards, and extended outwards, in such a manner, that the part of it which is raised six inches, is extended outwards from the land side of the share no more than ten inches. Let us suppose further, that a  
 ploughman,

ploughman, with this plough, takes off, in ploughing, an earth ten inches broad and six inches deep: Then, a field ploughed in this manner, instead of being cleaned, ploughed, or stirred, to an equal depth, has the bottom formed into ribs, having the hollows three inches broad, and the ribs themselves with a base seven inches broad, raised to a sharp top six inches above the bottom of the hollow or furrows; so that, were it not that the surface is a little raised by the earth being made opener, the tops of the ribs of hard untouched earth would be as high as the surface of the ploughed land; and, in consequence of this, not much more than one-half of the soil is stirred to the depth of the furrow. Such bad ploughing as this, is probably seldom observed; but to leave a third, or even a fourth, of the soil unmoved, as is often done, is so far to lose the advantages of the operation. Farmers ought therefore to prevent this, and, by attending to the manner in which their ploughs go, it is easy to know when it happens. If the earth taken off above is broader than the bottom of the furrow below, then the soil is not stirred to an equal depth. As the defect is obvious, so the remedy is easy: The plough may  
be

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be made to go wider below, or the ploughman may take off a narrower furrow above. But this last is not always convenient, because it renders the operation more tedious than is necessary. It is proper, therefore, to make the plough so wide below, as to allow as broad a furrow to be taken off above, as the cattle can manage, and the nature of the soil and design of the operation allow. A furrow, wide below, has another advantage, it allows the furrow-cattle to go easily, without being obliged, as they are often, by a narrow furrow, to tread upon the ploughed land.

C H A P.

## CHAPTER XXII.

*Of Fallowing.*

**P**LOUGHING, as was observed in the last chapter, is the most important operation in agriculture: But it cannot be performed in all its perfection, nor all its advantages obtained, except when land is summer fallowed. Of this the ancients seem to have been very sensible; for, instead of recommending fallowing, as is commonly done by writers on husbandry in modern times, the ancient writers mention it as a necessary preparation for a crop in ordinary soils. In Switzerland, Geneva, and some provinces of France, they have a crop and fallow alternately. This seems likewise to have been the common practice among the Romans, from whom these nations have no doubt received it. This practice probably arose from the opinion that the earth was in some measure

exhausted by carrying a crop, and needed a year's rest to enable it to produce another; or, perhaps they might be led to it from the culture given to olive trees. It is observed by Columella, that the olive tree carries a good crop only once in two years; For this reason he recommends to the husbandman to divide his olive yard into two parts, which might bear crops alternately, and thereby secure him in a crop every year: 'For,' say he, 'the olive tree is not fruitful for two years successively \*.' And this, it is probable, they might find, though they gave these trees the highest culture. Both Varro and Pliny, it is true, impute this chiefly to the manner in which the fruit was commonly taken from the trees: 'Often,' says Varro, 'the olives being struck off, carry along with them the buds from the branches, which is the cause of their want of fruit next year. This is not the least reason that occasions it to be said, that the olive garden does not carry a crop, at least an equally good one, every year †.'

'Those,'

\* Neque enim olea continuo biennio uberat; Col. lib. v. cap. ix.

† Saepe enim ita percussa olea secum defert de ramulo plantam;

' Those,' says Pliny, ' who act most cautiously,  
 ' strike them off with a small blow of a reed,  
 ' and not against the branches; for, when the  
 ' buds are beat off, there is not fruit but once  
 ' in two years \*.' But, whatever was the cause  
 of this, yet, from observing it, they might be led  
 to place the olive trees in their corn fields, ex-  
 pecting that one year's culture might produce a  
 crop, both of olives and corn once in two years:  
 Finding this succeed in the crops of corn amongst  
 olive trees, they might introduce a crop and  
 fallow alternately in the corn fields, even where  
 there were no olive trees. The success of this  
 way of managing in producing a crop of olives,  
 is mentioned by Columella: ' When the culti-  
 ' vated olive field,' says he, ' is not sown with  
 ' corn, the olive tree puts forth the tender shoots,  
 ' and when the field carries a crop, the olive  
 ' tree

plantam; quò factò, fructum amittunt posteri anni; ut  
 haec non minima causa, quod oliveta dicant alternis annis  
 non ferre fructus, aut non aequè magnos; Var. lib. I.  
 cap. LV.

\* Qui cautissime agunt, arundine levi ictu, nec adver-  
 sos percutiunt ramos. Sic quoque alternare fructus co-  
 gitur decussis germinibus; Plin. Nat. Hist. lib. xv. cap.  
 III.

‘tree brings forth a crop of fruit’\*. By the culture given to the field in the year of fallow, the trees were enabled to put forth young shoots, which, in the year of the corn crop, carried the fruit. That it was common to have olive trees planted in the corn fields, is evident from a variety of passages. Columella expresses himself in such a manner as to lead us to suppose, that whenever they were planted on rich land, they were placed in such a manner as to allow corn to be sown amongst them: ‘The smallest distance,’ says he, ‘betwixt the rows of trees in a rich field for corn, ought to be sixty feet the one way, and forty the other: On a poor soil, and not fit for corn, twenty-five are enough †.’ Cato directs, that not only olives, but also that other trees, be planted on the fallow when the corn is sown: ‘On the fallow,’ says he, ‘plant olives, elms, vines, figs, in pits  
‘ along

\* Cum subjectus ager confitus non est, arbor coliculum agit: cum feminibus repletur, fructum affert; Col. lib. v. cap. ix.

† Spatium inter ordines minimum esse debet pingui et frumentario solo sexagenum pedum in alteram partem, atque in alteram quadragenum; macro, nec idoneo fegetibus, quinum et vicenum pedum; Col. lib. v. cap. ix.

‘ along with the seed \*.’ It is certain likewise, that it was very common to have vines in their corn fields, or, which is the same thing, corn in their vineyards. The *arbustum*, as shall afterwards be shown, was a field planted with elms for supporting vines, and which had corn sown between the rows, when at a certain distance. But, that olive trees were the most common, appears from what the same author says about dividing the dung of the farm, to be applied to different purposes: ‘ Divide the dung,’ says he, ‘ in this manner; carry one-half to the corn fields, where pulse is sown; if olives are there, lay open the roots, cut off the upper ones, and then put dung around them †.’ This practice of having two crops upon the same field, a crop of corn or pulse, and a crop of fruit, would naturally lead the Roman farmers to fallow every other year. But, whatever was the cause of this practice, it is certain that it prevailed very much.

When

\* Scrobis in verfacto oleis, ulmis, vitibus, ficis, simul cum femine serito; Cat. cap. xvii.

† Stercus dividito sic. Partem dimidiam in segetem ubi pabulum seras, invehito: Et sic ibi olea erit simul ablaqueato, stercusque addito; Cat. cap. xix.



When the several authors treat of ploughing, and direct at what seasons this operation should be performed, they have the fallow land only in view. The seasons of ploughing, as shall afterwards be shown, were in the spring and summer, while the crop was on the ground; for the seed-time was in autumn, and the harvest in the end of summer. The directions given, must therefore relate only to the fallow. It would seem, that they considered the ploughings given to land that had carried a crop the preceding year, and was immediately to be sown for another, as of so little consequence, that it was needless to give any directions about them. From this we may conclude, that they considered ploughing and sowing immediately after a crop as bad husbandry, and only to be practised in a case of necessity; or, at least, that they were of opinion, that very little of their land was so rich as to allow this kind of management.

When Columella gives directions about sowing the several kinds of wheat, he says; ‘ That they require the very richest land, and that which rests, and is agitated and laboured by turns every other year.’ In this passage, showing the difference of the culture of wheat, from  
the

the culture of barley, he says; ' Strong, chalky, and moist land, does very well for *siligo* and *far*. Barley cannot endure any but what is free and dry. Those require land that rests, and is laboured every other year, is of the best kind \*.

When he treats of the culture of beans, he recommends the fattest soil, and adds: ' If the land has carried a crop the year immediately preceding, it must be well dunged;' intimating thereby, that they were frequently sown upon land that carried no crop that year †.

When mentioning the number of days labour that a *jugerum* requires, according to the kind of seed sown upon it, he does not so much as suppose that either wheat or barley are to be sown, except on land that has been fallowed; for he declares, that the wheat receives three ploughings, and the barley two, besides the feed furrows.

\* *Densa, cretosaque, et uliginosa humus, siligmem et far adorem non incommode alit. Ordeum nisi solum et siccum locum non patitur. Atque illa vicibus annorum requietum, agitatumque alternis, et quam laetissimum volunt arvum; Col. lib. ii. cap. ix.*

† *Sin autem proximae messis occupandum erit restibile, defectis stramentis, quatuor et viginti vehes stercoris in jugerum disponemus, dissipabimusque; Col. lib. ii. cap. x.*

furrows. Beans and tares, indeed, he mentions as sown either after a crop, or upon fallow : ‘ Four or five *modii* of wheat,’ says he, (that is, a *jugerum* to be sown with wheat, for this was the quantity commonly sown on the *jugerum*, as shall be afterwards shown) ‘ take four days ‘ work of the ploughman \*.’ These four days work gave the land three ploughings, besides the seed furrow : ‘ For,’ says he, in another place, ‘ a *jugerum* of land is completely cultivated by four days labour : It is ploughed at ‘ the first time in two days, at the second time ‘ in one, at the third time in three fourths of a ‘ day, and, when sown, is reduced to ridges in ‘ one-fourth †.’ ‘ Five *modii* of barley,’ says he, ‘ take three days work of the ploughman †.’ As barley was always sown upon light free soil, these

\* Tritici modii quatuor, vel quinque, bubulcorum operas occupant quatuor; Col. lib. II. cap. XIII.

† Sed jugerum talis agri quatuor operis expeditur : Nam commode profcinditur duabus, una iteratur, tertiatur dodrante, in liram satum redigitur, quadrante opere; Col. lib. II. cap. IV.

‡ Hordei modii quinque bubulci operas tres exigunt; Col. lib. II. cap. XIII.

these three days work would be sufficient for two ploughings and the seed furrow.

There was a kind of land called *restibilis*, which was sown every year; but of this there was a very small quantity. Cato mentions it as the kind of land upon which barley should be sown, and which was the only kind proper for the trimestrian or spring sowing\*. I had occasion already to observe, that there is a question put in Varro, whether it is best to sow on new ground, or upon *restibilis*, which was sown every year; or the *vervacum* of land which sometimes rested? It is first answered to this question: They say, that in Olynthia, they have land that carries a crop every year, but so ordered, that it carries every third year a richer kind of crop. It is not answered, that land either should rest every other year, or at least carry crops that draw less nourishment from the earth than ordinary †. From this passage, it  
may

\* *Hordeum qui locus novus erit, aut qui restibilis fieri poterit, serito. Trimestrem quo in loco sementim maturam facere non potueris, et qui locus restibilis crassitudine fieri poterit, feri oportet; Cat. cap. xxxv.*

† *Illud quoque multum interest in rudi terra, an in ea*  
Vol. I. 3 M *feras,*

may be observed, that the land that carried a crop every year, was sown commonly with easy crops, and that the very best of it carried a valuable and severe crop only once in three years.

These passages from the other authors make Virgil's meaning very plain, when he directs that the fallow lands, when cropped, shall be allowed to rest every other year\*. Pliny cites this passage from Virgil, and gives his approbation of the maxim which it contains, in these words: 'This, without doubt, is most proper, 'if the extent of the fields allow it †.' These passages likewise show, that the crops which the farmer chiefly depended upon, were always the  
crops

*feras, quae quotannis obfita fit, quae vocatur restibilis; an in vervasto, quae interdum requierit. Cui Agrius, In Olynthia quotannis restibilia esse dicunt; sed ita ut tertio quoque anno uberiores ferant fructus. Licinius, Agrum alternis annis relinqui oportet, aut paulo levioribus fati- nibus ferere, id est, quae minus fugunt terram; Varro, lib. I. cap. XLIV.*

\* Alternis idem tonsas cessare novales,  
Et segnem patiēre situ durefcere campum.

Vir. Geo. I. l. 71.

† Virgilius alternis cessare arva suadet; et hoc, si pati- antur ruris spatia, utilissimum procul dubio est; Plin. Nat. Hist. lib. XVIII. cap. XXI.

crops on the fallow; and that when seed was sown upon land that had carried a crop the year immediately preceding, this was only in a case of necessity, or intended for raising forrage for the labouring cattle; the several sorts of pulse used for this purpose being reckoned very easy crops, and much less hurtful to land than crops of corn.

To these things it may be added, that Columella, when giving an account of the number of days labour that land takes, according to the seed sown, and manner of cultivating, observes, that two hundred *jugera* of land may be cultivated with two yoke of oxen, as many ploughmen, and six common labourers; and yet, when he reckons up the work of one ploughman, and one yoke of oxen, he makes him only plough fifty *jugera*, except what was employed in the spring or trimestrian sowing. This trimestrian sowing he supposes to be very small, for, when treating of it, he says: ‘ There is another second sowing, when necessity forces; husbandmen call it trimestrian sowing. This is practised to very good purpose in cold and snowy places, where the summer is wet, and without great heats; but in other places, it  
‘ very

‘ very rarely answers \*.’ Cato, when mentioning this sowing, says; ‘ That it is to be practised only in places where the seed cannot be sown in the early seed-time †.’ And indeed there could not be much time for it, as it interfered with the ploughing of the fallow, upon the crop of which the farmer chiefly depended. If these two yoke of oxen, and two ploughmen, were sufficient for a farm of two hundred *jugera* of land in tillage, and if annually very little more than fifty *jugera* were ploughed with one yoke, it plainly follows, that nearly one-half was always in fallow.

It must indeed be acknowledged, that, when Columella mentions the sowing of two hundred and fifty *modii* of wheat in the autumn, he adds, that besides these, there may be seventy-five *modii* of trimestrian seed sown ‡. This is more than

\* Sed et est altera, cum cogit necessitas; trimestrem vocant agricolae. Ea locis praegelidis ac nivosis, ubi aestas est humida et sine vaporibus, recte committitur. Caeteris admodum raro respondet; Col. lib. II. cap. IX.

† Trimestrem quo in loco sementim maturam facere non potueris; Cat. cap. XXXV.

‡ Et post hanc nihilominus conferat trimestrium *modios* quinque et septuaginta; Col. lib. II. cap. XIII.

than one-fourth of the other, and amounts to fifteen *jugera*. If this quantity of trimestrian feed was sown every year regularly, there would be only thirty-five *jugera* of the hundred in fallow, instead of fifty, as we have supposed. But, though he mentions this trimestrian sowing as a thing that may be done, yet it is certain, from the passage already cited, that he did not approve of it, except in some particular circumstances. It may be observed likewise, that, when giving directions for preparing the land for the different kinds of corn and pulse, he requires more labour to do the work completely, than is mentioned in this chapter, in which he treats of the labouring necessary for the land, according to the crops intended. So that, if there was a complete culture given for the autumnal sowing, little could be spared for the spring or trimestrian. And, therefore, we may reasonably conclude, that it was reckoned the best husbandry, to have nearly one-half of the arable ground in fallow.

What quantity of the fallow was dunged, is uncertain. When Columella mentions dunging, he supposes that the land is poor and lean\*.

It

\* Prius tamen quam exilem terram iteremus, stercoreare conveniet; Col. lib. 11. cap. v.



It is certain likewise, that he considered fallowing in some measure as serving in place of dung. Sometimes, when giving directions about preparing for a crop, he observes, that if the land has carried a crop the year immediately preceding, it is necessary to dung \*. And sometimes, when mentioning the injuries done by a crop, he directs, that to repair these, the land be either fallowed or dunged †. Cato, when directing how the dung is to be divided and applied, mentions none to the corn fields, except to that part that was to be sown for fodder to the cattle ‡. From all which we may naturally conclude, that the land commonly dunged, was either the land upon which pulse was to be sown for fodder, or land that had carried a crop the year immediately preceding. And, if we suppose

\* Sin autem proximae messis occupandum erit restibile, defectis stramentis, quatuor et viginti vehes stercoreis in iugerum disponemus; Col. lib. 11. cap. x.

† Sed cum ejus messem sustuleris, optimum est novallia pati anno cessare; si minus stercore saturare, et omne virus, quod adhuc inest terrae, propulsare; Col. lib. 11. cap. ix.

‡ Stercus dividito sic. Partem dimidiam in segetem, ubi pabulum feras, invehito: Et si ibi olea erit, simul ablaqueato, sterCUSque addito; Cat. cap. xxix.

pose that there were twenty *jugera* of this land in every hundred, there would not be much dung remaining for the fallow. At the same time it must be observed, that, as there were many labourers upon the farms, and as the cattle were fed during the whole year upon fodder or green forrage, cut for them, a great quantity of dung would be made for the extent of the farms. Columella says, as has been already observed, that they are not careful husbandmen with whom each of the lesser cattle does not make a load of dung in thirty days, and with whom each of the larger cattle, and each of the servants, does not make ten times as much \*. This must be at least one hundred and twenty load in the month, made on a farm of two hundred *jugera*, by the necessary servants and cattle on the farm, which, at the rate of 24 loads to the *jugerum*, is 1440 loads in the year, made on a farm of 200 *jugera*, by the necessary servants and cattle, which, at the rate of 24 loads to the *jugerum*,

\* Parum autem diligentes existimo esse agricolas, apud quos minores singulae pecudes tricenis diebus minus quam singulas, itemque majores denas vehes stercoris efficiunt, totidemque singuli homines; Col. lib. 11. cap. xv.

*jugerum*, is a quantity sufficient for no less than 60 *jugera*.

Before this subject is finished, it will not be amiss to observe, that, in Italy, the Romans had much more encouragement to sow wheat after a crop, than we have in Britain. The harvest in Italy is very early in the season, so that after it, there is sufficient time for several ploughings before the season of sowing arrives. Whereas in Britain, particularly in the northern parts of it, our harvest is so late in the season, that we can give the land that has carried a crop, and is intended for wheat, only one ploughing. In Italy, in the time of Columella, the corn was not only all cut down before the first of August, but also threshed out, and the fodder necessary for the cattle in winter laid up. This author mentions the reaping and threshing of barley, the pulling up late beans, and threshing early beans in the month of June \*. In the beginning of July, therefore, we may suppose, that the ploughing after a crop might begin, and from this to the

\* Octavo, et vii. et vi. Cal. Julii, after several things, adds: ‘ Ordeum metere, fabam serotinam ducere, fabam maturam conterere, et paleam ejus diligenter recondere; Col. lib. xi. cap. 11.

the end of October, the season of sowing, there is sufficient time for several ploughings. And indeed, we find, that those who, to have a large sowing, sowed wheat and barley immediately after a crop of pulse, seem to have begun this ploughing so early, as to plough a second time in the end of July: For Columella says; ‘like-  
 ‘ wise those who prepare for sowing a large quan-  
 ‘ tity at seed-time, should now plough a second  
 ‘ time \*.’ This preparation for sowing a large quantity, can have no relation to the fallow, as he has given particular directions at what time it should be ploughed, it must therefore allude to the sowing after a crop. On another occasion, he mentions the first ploughing that this kind of land received; having observed, that it is the opinion of some persons, that a crop of lupines, beans, and vetches, &c. better land, he adds: ‘Concerning the lupines and vetches,  
 ‘ that are cut green for fodder, I have no doubt,  
 ‘ if the land is ploughed immediately after they  
 ‘ are cut, and the share tears up and buries  
 ‘ what

\* Item quibus magna sementis praeparetur nunc debet iterare; Col. lib. xi. cap. ii.

‘ what has been left by the scythe before it wi-  
 ‘ thers, that this will serve for a manuring. But  
 ‘ if, after the fodder is cut, the roots are left to  
 ‘ wither, they draw off the whole juice from the  
 ‘ soil, and power from the earth\*.’ These  
 kinds of pulse were cut green in the month of  
 May, and it is probable, that it is the land that  
 carried a crop of these, and was ploughed im-  
 mediately after the pulse was cut, that he directs  
 to be ploughed for a second time in the end of  
 July, as soon as the harvest was over.

When the Romans therefore had such advan-  
 tages from the early season of their harvest; if  
 they, notwithstanding, fallowed so frequently;  
 if they seldom had a crop of any kind immedi-  
 ately after a crop of wheat or barley; if they  
 even seldom sowed these seeds upon land that  
 had carried a crop, even of pulse, the year im-  
 mediately

\* De lupino nihil dubito, atque etiam de pabulari vi-  
 tia, si tamen eam viridem defectam confestim aratrum sub-  
 sequatur, et quod falx reliquerit, priusquam inarescat,  
 vomis rescindat, atque obruat: Id enim cedit pro sterco-  
 re; nam si radices ejus defecto pabulo relictæ inaruerint,  
 succum omne in solo auferent, vimque terræ absument;  
 Col. lib. II. cap. XIV.

mediately preceding, excepting when cut green for the cattle: Certainly the late season of our harvest, and the difficulty of preparing land after it for a winter grain, should engage us to fallow much more frequently than we do.

I am sensible, that the practice here insisted upon and recommended, in imitation of the ancients, is not agreeable to the most fashionable modes of husbandry. Our latest improvers, or rather our latest writers on agriculture, declare, that he is a slothful or ignorant farmer, who does not raise upon his fields at least one crop every year. When land is very rich, and the farmer remarkably skilful and attentive, and has it in his power by a command of hands, to introduce the garden culture into his corn fields, it is possible, that the schemes proposed by these gentlemen may be prosecuted with success. But, taking our farmers and land as they are in fact, and considering how much weeds still prevail in our fields, and how difficult it is, even for the most attentive farmers, to prevent their crops from being hurt by them, frequent fallowing, as the most proper method of destroying these enemies, cannot as yet be too much recom-

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recommended. When we have arrived at greater perfection in the several operations of agriculture, and brought our lands to a higher degree of fertility than at present, then, and indeed, in my opinion, not till then, should we think of introducing schemes of perpetual cropping.

CHAP.

C H A P. XXIII.

*Of the Manner of Managing Fallow.*

**T**HERE is a kind of light shallow land in Italy, which not only Virgil, but likewise Columella, Pliny, and Palladius, direct not to be ploughed till the month of September, at soonest in the end of August. The reason given for delaying so long the ploughing of this land, is this, lest the sun should exhale the juices: ‘ If it is not a fruitful soil,’ says Virgil, ‘ it will be sufficient to raise it up with a shallow furrow at the rising of Arcturus \*.’ According to Columella, this constellation began to appear on the fifth of September, and continued rising till the seventeenth †. The reason that Virgil gives

\* At si non fuerit tellus foecunda ; sub ipsum Arcturum tenui sat erit suspendere sulco.

Vir. Geo. I. v. 67.

† Non. Septemb. Arcturus exoritur xv. cal. Octobris Arcturus exoritur ; Col. lib. xi. cap. ii.



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gives for delaying the ploughing of such land till this season is, lest the small quantity of juice should forsake the barren sand \*. To the same purpose, Columella says; ‘ poor land on a plain which is wet, is first ploughed in the end of August.’ And a little after: ‘ Likewise thin foils on the descent, ought not to be ploughed in summer, but in the beginning of September; because, if ploughed before that time, the earth, wasted and without sap, is burned by the summer sun, and has no vegetative power left †.’ Pliny having mentioned a passage in Virgil, adds; ‘ It is a more useful maxim, which commands none but middling foils to be ploughed in the spring, because, in rich foils, weeds immediately grow up, and the heats that follow dry up the thin foils, and thereby draw the sap from the seeds that are to be sown. It is certain that it is much better  
‘ to

\* Hic, sterilem exiguus ne deserat humor arenam; Vir. Geo. I. v. 76.

† Exilis ager planus, qui aquis abundat, primum aretur, ultima in parte mensis Augusti. And a little after: Item graciles clivi non sunt aestate arandi, sed circa Septembres calendas; quoniam si ante hoc tempus profcinditur, effoeta, et sine succo humus aestivo sole peruritur, nullasque virium reliquias habet; Col, lib. II. cap. IV.

‘ to plough such soils in autumn \*.’ Palladius says, in the end of August, about the Calends of September, the ploughing of moist poor land upon the plain is begun †. And, in September, he says; ‘ Now thin soils on a declivity are to be ploughed for the first time ‡.’

I have collected these passages, to show, that Virgil was not singular in his opinion, because it is this direction given by him, that Mr Tull has taken upon him to censure with so much bitterness: Whether or not every kind of soil receives benefit from frequent ploughings in hot weather, is a question that Mr Tull has rather been rash in determining so positively. In Britain, it is probable, that the heats are not so great as to hurt even the driest and lightest soil,  
when

\* *Utilior sententia, quae non nisi temperatum solum in medio vere arari jubet: Quoniam in pingui statim fulcos occupant herbae, gracili infecuti aestus exsiccant: tum namque succum venturis feminibus auferunt. Talia autumno melius arari certum est; Plin. Nat. Hist. lib. xviii. cap. xxvi.*

† *Augusto mense ultimo circa Calendas Septembris ager planus, humidus, exilis incipiat exarari; Pal. lib. ix. tit. i.*

‡ *Graciles clivi nunc primum arandi sunt; Pal. lib. x. tit. i.*

when exposed to them. But in warmer climates, it is possible, that this may happen. From any theory of vegetation, to assert that this cannot be, is going too far, while we have not sufficient knowledge or experience to support it. It is probable, that the soil which these authors direct not to be ploughed till autumn, was what we call a dry sandy soil, that cannot have its pasture much enlarged by tillage, and therefore, upon Mr Tull's principles, cannot receive much benefit from this operation. It is of a very different nature from the light spongy soil, which, he says, is rendered more solid by ploughing. It is of the kind that most easily parts with water, and is susceptible of the greatest heat. The water that is exhaled from the fields by the sun, without doubt, carries along with it some of the principal ingredients of the vegetable food: This is evident from the nature of rain-water and snow, which contain oil and salt; and these too probably in greater proportions to the other ingredients in warmer climates than in this. It is not impossible then, that there may be some soils which may receive an increase of vegetable food in the winter season, and, from their nature, being susceptible of great heat, and easily part-  
ing

ing with water, may, in very warm climates, lose some of this in the summer season, if too much exposed to the sun; while other soils, from their stronger power of retaining water, and not being susceptible of so much heat, may, in the same climate, though exposed to the sun, resist the heat, and not only retain their juices, but even acquire an increase of vegetable food. Though we may not find any soil in Britain in the situation of the first of these, yet, were some of our warmest sandy soils exposed to Italian suns, we might find them the worse by being ploughed in the heat of summer. And, if there are such soils in Italy, the proper way to manage them in tillage, is certainly to allow them to lie unploughed till the greatest heat is past. This ought to be done for the very reason mentioned by Virgil; ‘That so the slothful field may become hard by resting \*.’ The land, unploughed and covered with stone, does not become too much heated, is more able to resist the rays of the sun, and can more easily retain its juices.

The Roman farmers certainly found from experience, that the exposing land to the sun

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\* Et segnem patiēre situ durefcere campum; Vir. Geo. I. l. 72.

in very hot weather, by opening it up, was hurtful. Columella, in giving directions about digging vineyards, requires, that, in hot weather, this operation be performed in the mornings and evenings \*. It was likewise a maxim, that land should not be ploughed from the solstice to the beginning of September, unless when thoroughly wet with showers †.

But, though this kind of land was not ploughed till September, yet it must be observed, that it received two ploughings besides the seed furrow, which was as many as possibly could be given before the time of sowing. Columella mentions two kinds of this land, the one on the plain, and the other on a declivity. He directs, that the first being wet, should be ploughed in the end of August, and the other between the first and

\* Item quascunque vineas culturi sumus, ne per aestum sed mane, usque in tertiam, et a decima usque in crepusculum fodiamus; Col. lib. xi. cap. ii.

† Cum id tempus ab aestivo solstitio convenit inter peritos rei rusticae, non esse arandum, nisi si magnis, ut fit nonnunquam, ac subitaneis imbribus, quasi hybernis pluviis terra permaduerit. Quod cum accidit, nihil prohibet, quo minus mense Julio vervasta subigantur; Col. lib. ii. cap. iv.

and thirteenth day of September; and that both kinds be ploughed for a second time soon after, that so they might be in a proper condition for being sown about the equinox\*.

The Greeks likewise, in determining the seasons of ploughing, made a distinction between soils according to their different qualities. Their practice, however, in this respect, seems to have differed from that of the Romans. Theophrastus, after observing, that, in the management of land, there are many things which require the judgment of the skilful farmer; as it is best for some kinds to be cultivated in summer, and to remain untouched in winter; and for others to be cultivated in winter, and to remain untouched

\* *Exilis ager planus, qui aquis abundat, primum aratur, ultima in parte mensis Augusti, subinde Septembris fit iteratus, paratusque sementi circa aequinoctium. Expediior autem labor ejusmodi solo est, eo quod pauciores impenduntur operae; nam tres uni jugero sufficiunt. Item graciles clivi non sunt aestate arandi, sed circa Septembres Calendas; quoniam si ante hoc tempus profcinditur, effoeta, et sine succo humus aestivo sole peruritur, nullasque virium reliquias habet. Itaque optime inter Calendas et Idus Septembris aratur, ac subinde iteratur, ut primis pluviis aequinoctialibus conferi possit; Col. lib. II. cap. IV.*

ed in summer; proceeds thus: 'These things  
 ' some persons have discerned: Therefore they  
 ' assert, that a wet, solid, heavy, and fat soil,  
 ' ought to be both ploughed and digged in sum-  
 ' mer; and, on the other hand, that a dry, free,  
 ' light, and poor soil, ought to be ploughed and  
 ' digged in winter. And indeed, this culture  
 ' in summer dries and attenuates, while in win-  
 ' ter it firms and moistens; which things the  
 ' defects of each soil require \*.' From this pas-  
 sage it seems probable, that it was the practice  
 of the Greeks to plough in winter the dry free  
 soil, which the Romans did not plough till the  
 heat of summer was over. It is probable, that  
 the climate of Greece allowed ploughing more  
 early in winter than that of Italy; or, that the  
 rains continued longer in spring: In either of  
 these cases, it would become proper to reverse  
 the

\* Quae nonnulli discernunt. Quippe solum pluvium, solidum, ponderosum, et pingue per aestatem, et proficiendum, et confodiendum affirmant: Contra sitiens, solutum, leve, et gracile per hyemem. Enimvero illa aestiva cultio afficcare attenuareque potest, hyberna vero crassare, ac humefacere: Quae scilicet natura indigens utriusque soli desiderat; Theoph. de caus. plant. lib. iii. cap. xxv.

the Roman practices. By an early winter ploughing, the soil would imbibe a larger quantity of the winter rains, and, if crufted but a little on the furface, by the fpring drought, would be found moifter and more folid when it received the feed furrow. On the other hand, when the foil was very wet, ftiff, and fat, or a ftrong wet rich clay, they found it neceffary to delay ploughing it till the beginning of fummer; becaufe, when ploughed before the wet feafon was over, by the fudden drought, it was rendered firmer and more folid: But they gave it frequent ploughings through the fummer, becaufe by this it was better reduced, and fecured the rain water, by giving it an eafy paffage to the bottom of the furrows. It feems, however, that the foils that needed thefe particular kinds of culture, were not the moft common; for it was the general practice to plough their lands both in winter and fummer.

Hefiod mentions the fpring and fummer as feafons for ploughing, and represents ploughing in both thefe feafons as neceffary \*. Theophrastus obferves, that the fallow in his time was  
ploughed

\* Hef. lib. II. v. 80.



ploughed both in winter and in summer; and he gives reasons for ploughing in both these seasons: 'That the earth,' says he, 'may feel the sun and the cold \*.' That it was their practice to plough the same fields in both seasons, is evident from what he adds: 'For the soil, often inverted, becomes free, light, and clear of weeds, so that it can most easily afford nourishment †.'

Winter ploughing seems likewise to have been practised by the eastern nations: The importance of it is very strongly expressed in one of Solomon's aphorisms: 'The sluggard,' says he, 'will not plough by reason of the winter, therefore shall he begin harvest and have nothing ‡.'

The rich and strong lands were ploughed by the Romans in winter, or in spring, as soon as they were in a proper condition for receiving this culture. They were also frequently laid open to the sun's rays in summer.

Cato

\* Cura novalium tempori utroque suscipitur, aestate ac hyeme, ut terra solem ac frigora sentiat; Theo. de caus. plant. lib. 111: cap. xxv.

† Solum enim saepe inversum, rarum, leve, atque materia vacuum redditur: Ita ut alere facillime possit; ibid.

‡ Prov. chap. xx. v. 4.

Cato directs, that the ploughings in spring begin immediately after the consecrated feast \*. This feast was celebrated at the flowering of the pear †. And Pliny places this in the season between the zephiroes and the vernal equinox ‡.

Varro directs, that land be ploughed in spring, that so all the weeds upon it may be rooted out before any seed fall from them; and he adds, that by this ploughing, the clods being warmed by the sun, are relaxed, and thus are rendered fitter for admitting showers, and become more easily reduced ||.

This is the season in which Columella proposes that the wet fat land shall be ploughed, and  
for

\* Ubi daps profanata comestaque erit, verno arare incipito; Cat. cap. l.

† Dapem pro bubus piro florente facito; postea verno arare incipito; Cat. cap. cxxxii.

‡ A Favonio in aequinoctium vernalium. And amongst other works he mentions this; Itemque piro florente arare incipiat macra arefonaque; Plin. Nat. Hist. lib. xviii. cap. xxvi.

|| Vere stationes quaedam fiunt, terram rudem proscindere oportet, quae sunt ex ea enata, priusquam ex iis quid feminis cadat, ut sint exradicata: Et simul glebis ab sole percalefactis aptiores facere ad accipiendum imbrem, et ad opus faciliores, relaxatas; Var. lib. i. cap. xxvii.

for this reason, that the weeds in it may be destroyed \*. And Virgil, to this, adds: 'That the sun may prepare the mould for the seed †.' Pliny, when mentioning the practice of ploughing in this season, takes notice of this reason given by Virgil; at the same time, he seems to think that it ought to be confined to the middling kind of soil, and ought not to be extended to the fat and free kind: The reason which he gives for this is far from being satisfying: 'Because,' says he, 'weeds would immediately arise ‡.' This, on the contrary, seems to be a reason for ploughing at that season; for, by encouraging

\* *Pingues campi, qui diutius continent aquam, praescindendi sunt anni tempore jam incalescente, cum omnes herbas ediderint, neque adhuc earum femina maturuerint; Col lib. II. cap. IV.*

† ———— *Ergo age, terrae*

*Pingue solum primis extemplo a mensibus anni*

*Fortes invertant lauri, glebasque jaces*

*Pulverulenta coquat maturis solibus aestas.*

*Virg. Geo. I. v. 63.*

‡ *Terra in futurum praescinditur Virgilio maxime auctore, ut glebas sol coquit. Utilior sententia quae non nisi temperatum solum in medio vere arari jubet: Quoniam in pingui statim fulcos occupant herbae; Plin. Nat. Hist. lib. XVIII. cap. XXVI.*

couraging weeds to spring, they are the more easily destroyed. In this, Pliny seems to differ from all the other writers on agriculture, who recommend to plough the dry fat soil more early than any other\*.

Cato

\* Some reasons may be assigned, why Pliny, in this matter, differs in opinion from the other rustic writers. It is probable, that it is the fat and free soil which he had in view, and that this soil, though it might be properly ploughed in spring, yet received damage from summer ploughings, except when sufficiently wet by rain. It is probable likewise, or rather certain, that agriculture among the Romans, before the time of Pliny, had greatly declined; and that the husbandmen, in his time, were not so attentive to circumstances in their operations, as the ancient farmers. In consequence of this, they might neglect ploughing the free land in summer, though in a proper condition, because it was hurtful to do it when dry. If this had become a common practice, it was certainly improper to plough this kind of soil in spring, because, before the return of the season for ploughing it again, the weeds would spring, come to perfection, and fill the soil with their seed. There was no such danger in ploughing moderate soils in spring; for these were of a stiffer kind, rose in clods when first ploughed, and on this account were not so apt to produce weeds, even though they should lie untouched through the heat of summer.

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Cato and Varro give only general directions to begin to plough the fallow in spring. The later writers are more particular, and observe, that the dry rich land should be ploughed even in the month of January. In Britain, we commonly plough in autumn and the beginning of winter; but it was not possible for the Roman farmers to do this, because their principal seed-time was in this season\*.

After

It is the more probable, that Pliny, in his approbation of the maxim under consideration, had in view the practice in his own time, of not ploughing in the heat of summer, because, in the general directions which he gives, relating to the seasons of ploughing the different kinds of soil in different climates, he requires all kinds to be ploughed in winter and spring, except such as are thin and dry, and particularly, that the rich and foul land shall be ploughed during the heats.

\* The seed-time continued from the 1st of October to the winter solstice; at the same time it was reckoned better husbandry to have it finished by the 5th of December. Varro says; 'that the seed-time continued from the equinox to the winter solstice, which is 91 days. — Sexto intervallo ab aequinoxio autumnali incipere scribunt oportere ferere, usque ad diem xci. Post brumam, nisi quae necessaria causa coegerit, non ferere;' Var. lib. 1. cap.

xxxiv.

After the seed-time, as soon as the rich land was in a proper condition, it received the first ploughing. ‘Early in the spring,’ says Virgil, ‘when the cold moisture begins to glide from the snowy hills, and the crumbling glebe to open to the zephyre, then plough \*.’ We are  
not

xxxiv. Columella remarks, from what Varro says about the time of sowing, that the wheat seed-time continued from the 22d of October to the winter solstice; at the same time, gives it as his opinion, that it may begin about the beginning of October in wet and cold climates, and informs us, that prudent husbandmen reckoned it improper to sow for 15 days before the solstice. ‘Propter quod intelligi debet tritici satio dierum sex et quadraginta ab occasu Vergiliarum, qui fit ante diem ix. Calend. Novemb. ad brumae tempora. Sic enim servant prudentes agricolae, et quindecim diebus prius, quam conficiatur bruma, totidemque post eam confectam neque arent, neque vitem aut arborem putent. Nos quoque non ambigimus in agro temperato, et minime humido fermentem sic fieri debere. Caeterum locis uliginosis, atque exilibus, aut frigidis, aut etiam opacis plerumque citra Calendas Octobris feminare convenire;’ Col. lib. ii. cap. viii.

\* Vere novo, gelidus canis cum montibus humor  
Liquitur, et zephyro putris se gleba resolvit;  
Depresso incipiat jam tum mihi taurus aratro  
Ingemere, et fulco attritus splendescere vomer;

Vir. Geo. I. v. 43.

not to imagine that it is Virgil's meaning, that the farmer was not to begin ploughing till the snow actually melted from off the mountains; but that he was to begin as early as the weather and situation of the soil would allow; at the same time, it seems to have been the intention of the poet, to inform the farmer, that he would certainly find some of his lands in a proper situation for being ploughed, so soon as the south-west wind began to blow. From the end of the seed-time, which was about the 13th of December to the 13th of January, the servants were commonly exempted from working in the fields, and the weather indeed was often stormy and unfit for it. But though the western breezes were not expected till the second week of February; yet the mildness of the season often allowed the rich and dry land to be ploughed, and, when this happened, the husbandman was directed to begin. The zephiro, according to Pliny, began to blow about the eighth of February\*: But he would not have the farmer to confine

\* *Primus est conceptus, flare incipiente vento Favonio, circiter fere sextum Idus Februarii; Plin. Nat. Hist. lib. xv. cap. xxv.*

confine himself to this day for the beginning of his operations, but to begin as soon as the weather changed by the blowing of this wind; whether it was sooner or later: ‘In the mean time,’ says he, ‘from that day (whatever day it shall be) on which the zephyre begins to blow, not on the eighth of February, but whether it comes before and brings in the spring weather, or whether it comes after, so as to allow the winter weather to continue longer; after that day, I say, innumerable cares employ the husbandman; and these things are first to be done which cannot be delayed\*.’ Columella declares himself of the same opinion: ‘An husbandman,’ says he, ‘ought not to observe the beginning of the new spring in the same manner as an astronomer, so as to wait for that particular day on which the spring is said to begin, but let him take even a part of the winter,

\* Interim ab eo die (quisquis ille fuerit) quo flare coeperit, non utique vi Idus Februarii, sed sive ante, quando praevernatur, sive post, quando hiemat; post eam diem, inquam, innumera rusticorum cura distringat, et prima quaeque peragantur, quae differri nequeunt; Plin. Nat. Hist. lib. xviii. cap. xxvi.



‘ter, because, after the solstice is past, the year  
 ‘begins to grow warm, and a milder day allows  
 ‘him to begin his operations\*.’ Agreeable to  
 this, he says, ‘That, in the month of January,  
 ‘after the thirteenth day, fat and dry land ought  
 ‘to be ploughed †.’ Palladius gives the same  
 direction in his kalander for January ‡.’ And  
 Virgil, besides the general direction which he  
 gives to plough as soon as the snow melts, when  
 he comes to distinguish between the rich and  
 poor land, says; ‘Come then, let the rich soil  
 ‘be ploughed immediately from the beginning  
 ‘of the year ¶.’

The

\* *Novi autem veris principium non sic observare rusticus debet, quemadmodum astrologus, ut expectet certum diem illum, qui veris initium facere dicitur; sed aliquid etiam sumat de parte hiemis; quoniam consumpta bruma, jam intepescit annus, permittitque clementior dies opera moliri; Col. lib. xi. cap. 11.*

† *Siccos quoque et pingues agros tempestivum est proscindere. This follows; Idibus Januariis, &c.; Col. id.*

‡ *Pingues et ficci agri proscindi et apparari jam possunt; Pal. lib. 11. tit. 111.*

¶ ————— Ergo age terrae

Pingue solum primis extemplo a mensibus anni

Fortes invertant tauri.

Vir. Geo. I. l. 63.

The Roman farmers were careful to have their land in a proper condition when ploughed, and for this reason, they had different seasons for ploughing the different kinds of land, though intended for the same kind of crop. It has already been observed, that they began to plough the rich land in the spring, and delayed ploughing the poor lands till the autumn. But they had also different seasons for ploughing both the rich and poor lands,

Cato directs, that in spring, the dry lands be ploughed first, and then the rich and moist, before they become hard \*.

Columella says, that rich ground on a hill ought to be ploughed for the first time in March, after the trimestrian seed-time is over, or in February, if the warmth of the climate and dryness of the season allow: And that the rich lands that are wet, are not to be ploughed till after the thirteenth

\* Verno arare incipito, et loca primum arato quae ficcissima erunt: Et quae crassissima, et aquosissima erunt, ea postremum arato, dum ne prius obdurescant; Cat. cap. l.

Postea verno arare incipito. Ea loca primum arato quae rudeata arenosaeque erunt. Postea uti quaeque gravissima atque aquosissima erunt, ita postremo arato; id. cxxxii.

teenth of April \*. In his kalander, however, he allows, that the first kind of land mentioned may be ploughed in January, and the second in March †. Palladius makes the same difference between the times of ploughing the dry and wet lands ‡. But the directing these lands to be ploughed thus early, is no doubt upon the supposition, that, in the seasons mentioned, they were in a proper condition for receiving this culture, which, no doubt, they would be when the winter was favourable.

As there were different seasons for ploughing the rich land in the spring; so likewise there were

\* Colles pinguis foli perfecta fatione trimestri mense Martio, si vero tepor coeli siccitasque regionis suadebit, Februario statim profcindendi sunt; Col. lib. 11. cap. 14. Igitur uliginosi campi profcindi debent post Idus mensis Aprilis; id.

† In his kalander for January: 'Siccis quoque et pingues agros tempestivum est profcindere.' And for March: 'Optime autem uliginosa et pingua loca nunc demum profcindantur;' Col. lib. 11. cap. 11.

‡ In January: 'Pingues et sicci agri profcindi et apparari jam possunt. In March: 'Locis gelidis colles pingues et agros uliginosos profcindere, atque exarare conveniet;' Pal. ib. 11. tit. 111. lib. 14. tit. 11.

were different seasons for ploughing the light poor land in the autumn. When this land was on the plain, and abounded with water, it was ploughed soon after the first of August; and when on the hill, it was delayed till after the first of September.

Pliny gives the following general directions about the times of ploughing the different soils in the different climates: ‘ In warm climates  
 ‘ the land should be ploughed as soon as possible  
 ‘ after the winter solstice; In cold climates, af-  
 ‘ ter the vernal equinox; and sooner in a dry  
 ‘ country than in a wet; sooner in a stiff soil  
 ‘ than in a free; and sooner in a fat soil than in  
 ‘ a lean. Where the summers are dry and warm,  
 ‘ the chalky and thin soil should be ploughed  
 ‘ between the summer solstice and autumnal e-  
 ‘ quinox. Where the summers are wet, and but  
 ‘ moderately hot, it is better to plough the fat  
 ‘ and foul land in the heats. A deep and heavy  
 ‘ soil is best ploughed in winter; and a thin and  
 ‘ dry soil, a little before the time of sowing\*.

The

\* Tepidioribus locis a bruma proscindi arva oportet. Frigidioribus ab aequinoctio verno. Et maturius sicca regione, quam humida. Maturius densa terra, quam so-

The propriety of almost all these directions, will be easily observed by every intelligent farmer. In spring, dry lands should be ploughed before the wet, because they are sooner in a proper condition for it; the stiff land before the lighter, because, if allowed to lie too long unploughed in spring, it becomes too dry and hard. In autumn, wet lands should be ploughed before the dry, because they are in the least danger of being hurt by the heat, and the dry lands, by the delay, are brought to a proper condition for being ploughed, by the rains expected in the beginning of September. Where the climate is dry and warm, the light and chalky land should not be ploughed till the heats are over, lest their whole juices be exhaled: And where the climate is wet, and the heat moderate, the fat and foul land, tho' light, should be ploughed in the heats, that so the weeds may be destroyed.

The

*luta, pingui quam macra. Ubi siccae et graves aestates, terra cretosa aut gracilis utilius inter solstitium et autumnum aequinoctium aratur. Ubi levis aestus, frequentes imbres, pingue herbosumque solum, ibi mediis caloribus. Altum et grave solum etiam hieme moveri placet: Tenue valde et aridum, paulo ante sationis tempus; Plin. Nat. Hist. lib. xviii. cap. xix.*

The rich and stiff land was ploughed as often as was necessary for reducing it to a powder. 'But let fallow land,' says Columella, 'be so reduced by ploughing it over and over again, that when we sow it, it may require very little or no harrowing at all \*.' Pliny observes, that a field is very ill ploughed; his meaning is, that land is very ill fallowed, if it needs to be harrowed after sowing †. 'He too,' says Virgil, 'much improves his lands, who breaks the hard clods with harrows, and draws over them the heavy breaks; and he, who having first ploughed along, ploughs again across, and frequently performs these operations, till he has entirely overcome the soil, and reduced it to powder ‡.'

Al-

\* Sed et compluribus iterationibus sic resolvatur ver-  
vactum in pulverem, ut vel nullam vel exiguam desideret  
occationem, cum seminaverimus; Col. lib. II. cap. 17.

† Male aratur arvum, quod satis frugibus occandum  
est; Plin. Nat. Hist. lib. XVIII. cap. XIX.

‡ Multum adeo rastris glebas qui frangit inertes,  
Vimeneasque trahit crates, juvat arva, neque illum  
Flava Ceres alto nequicquam spectat Olympo.

Et qui, profcisso quae suscitatur aequore terga,

Rursus

Although it was a general rule, to give fallow land as many ploughings and harrowings as were sufficient to pulverize it effectually; yet, in most cases, three, with the seed-furrow, were reckoned sufficient. Theophrastus observes, that this was the common practice among the Greeks in his time: They gave the first ploughing in winter, the second in spring, the third in summer, and the fourth, a slight ploughing, when the seed was sown \*. This practice of giving fallow four ploughings, was much older than Theophrastus. In the time of Homer, it appears, that fallow got more than three ploughings. It is said of the field represented in one of the compartments of the shield of Achilles, that it appeared to have been three times ploughed: ‘The next piece,’ says the poet, ‘represented a large field, a deep and fruitful soil, which

Rurfus in obliquum verso perrumpit aratro,  
Exercetque frequens tellurem, atque imperat arvis.

Virg. Geo. I. l. 94.

\* Post quam primas arationes novellarunt, rurfus Vere cespitem invertere solent, ut nascentem herbam interimant. Tum aestate arant, et cum ferere velint, proscindunt leviter; utpote cum solum bene praeagitatum praeparatumque esset; Th. de caus. plant. lib. III. cap. xxv.

‘ which seemed to have been three times plough-  
 ed \*.’ As no mention is made of seed or sow-  
 ing, but of ploughing, and it would seem deep  
 ploughing too, it is not the seed furrow that is  
 represented, but an ordinary ploughing: Hence  
 we are led to infer, that it was the practice in  
 Greece, before the time of Homer, to give fal-  
 low land more than three ploughings.

Four ploughings were likewise given to fal-  
 low by the Roman farmers, at least in the time  
 of Columella. In wet lands, the first ploughing  
 was given in April, the second in June, the third  
 in the end of August or beginning of Septem-  
 ber, and the seed furrow in October. In dry  
 lands on a declivity, the first ploughing was gi-  
 ven in February, the second from the middle of  
 April to the summer solstice, the third about the  
 autumnal equinox, and the seed furrow in Oc-  
 tober or November †. In the time of Varro,  
 however,

\* Ἐν δὲ τῷ νείον μάλα κηρ, πίσιραν αρουραν,

Ευρίαν, τριπολον.

† Igitur uliginosi campi proscindi debent post Idus  
 mensis Aprilis. Quo tempore quum arati fuerint diebus  
 interpositis circa solstitium, quod est nonum vel octavum  
 Calend. Julias, iteratos esse oportebit, ac deinde circa Sep-  
 tembris



however, it seems, that no more than two ploughings and the seed furrow were commonly given; for he mentions only three, when he informs us, that names were given to the different ploughings; and, as one of the three which he mentions was given after the seed was sown, it must have been the last \*. Pliny seems likewise to say, that three only were commonly given in his time, that is, two and the seed furrow †.

But,

*tembris Calendas tertiatos.*—Colles pinguis soli perfecta fatione trimestri mense Martio, si vero tepor coeli siccitasque regionis suadebit, Februario statim profcindendi sunt. Deinde ab Aprili medio usque in solstitium iterandi, tertiantique Septembri circa aequinoctium. That after these a seed-furrow was given, appears from comparing these passages with another in the same chapter: Sed jugerum talis agri quatuor operis expeditur; nam commode profcinditur duabus, una iteratur, tertiatur dodrante, in liram fatum redigitur, quadrante opera. Liras autem rustici vocant easdem porcas, cum sic aratum est, ut inter duos latius distantes sulcos medius cumulus siccam sedem frumentis praebeat; Col. ii. cap. iv.

\* Terram cum primum arant, profcindere appellant; cum iterum, offringere dicunt; quod prima aratione glebae grandes solent excitari, tertio cum arant facto semine, boves lirare dicuntur; Var. lib. i. cap. xxix.

† Aratione per transversum iterata, occatio sequitur,  
ubi

But, although in the time of Varro, it seems to have been the ordinary practice to give fallow

ubi res poscit, crate vel rastro; et fato semine iteratio. Haec quoque, ubi consuetudo patitur, crate dentata, vel tabula aratro adnixa, quod vocant lirare, operientes femine; Plin. Nat. Hist. lib. xviii. cap. xx. Pliny's meaning in this passage does not seem to be obscure: After the second ploughing, which was across, he says, that the surface was smoothed, and the clods broken; and that this operation was performed by a rake or a harrow, according as the situation of the field required a lighter or heavier instrument; that this operation was repeated after the land was again ploughed and the seed sown; and that the seed, when sown, was covered in different ways, according to the custom of the place, sometimes by a toothed *crates*, and sometimes by putting a mold board to the plough, by which the land is ridged. He does not directly mention the seed furrow when the seed was covered with a *crates*; but this is implied in the phrase *fato semine*; for the verb *fero* or *confero*, is used by the rustic writers, not only to express the throwing the seed on the ground, but also every thing necessary to be done at the time of sowing or planting. That a ploughing was necessary in the case mentioned is evident; for, as the land was harrowed after the second ploughing, a third became necessary, either for covering the seed, or for putting the land in such a situation as to cover it when harrowed. Although Pliny, in this passage, seems to have described

with

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low no more than three ploughings, yet to give four was reckoned better husbandry. This Virgil

with propriety the manner in which the fallow in his time was commonly managed, yet the famous critic Salmasius, after considering it with attention, and making many learned observations, is pleased to express himself in these words: ‘ Apparet Plinium in his, ut in aliis multis, necesse quid scriberet, et dum ex variis compilat, non recte eorum sententias inter se conciliasse;’ Plin. exercit. in Sol. Polyhistor. p. 513. This learned critic, cannot find that *occatio* was ever used till after the seed was sown; and observing, from the passage in Varro above cited, that the third ploughing was performed after this operation of sowing, he concludes, that, when Pliny says that *occatio* followed the second ploughing, he did not understand what he wrote, and that instead of *sato semine iteratio*, it ought to be *tertiatio*. Had this critic understood the subject, as well he understood the language of his author, he would not have made so indecent and so unjust an attack upon him. Harrowing fallow between ploughings, is an universal practice in this country, and commonly too after the second ploughing, as mentioned by Pliny; and every farmer must observe, that the manner in which the Romans commonly sowed their wet lands, rendered this operation necessary. After the second ploughing the seed was commonly sown, and by the third it was covered. Now if, after the second ploughing, which was across, there were many clods or hard lumps of earth on the

the

gil expresses in very strong language: 'That field,' says he, 'best satisfies the desires of the huf-

the field, it was necessary to break these, that so the seed might be sown upon a smooth surface. The necessity of this would suggest itself to a farmer of an ordinary capacity; and therefore it is natural to suppose, that it would be practised by the Romans. Pliny's attestation of this, though he stood single, is sufficient to convince us of it: But we have likewise the authority of Virgil, who, in his account of the management of fallow, expresses himself in this manner: 'He too greatly improves his fields, who breaks the clods with rakes, and draws over them the heavy harrows.'

Multum adeo rastris glebas qui frangit inertes,  
Vimeneasque trahit crates, juvat arva. G. I. v. 94.

Our learned critic, to evade the authority of this passage in Virgil, is pleased to assert, that the poet delivers the precepts of agriculture in no proper order: 'Certe nullo ordine praecepta agricolationis exequitur poeta;' p. 729. This attack on Virgil is still more inexcusable in a learned critic, than the other attack on Pliny. A person who understands the subject of Virgil's first Georgic, and considers it with attention, will observe, that the directions given in it, are not only most distinct, but also arranged in the most proper manner. He begins with giving directions at what times, and in what manner,

‘ husbandman ever covetous of a good crop, that  
 ‘ has twice, by ploughing, felt the influence of  
 ‘ the

fallow must be ploughed; and with mentioning the circumstances that must be attended to in this operation: He next describes the proper schemes of management in the succession of crops: After which, he introduces manuring, to which he is led by mentioning the kind of crops that are hurtful; the design of manuring being to restore that fruitfulness to land which it loses by cropping. The mentioning this, naturally led him to direct how fallow should be managed, so as to answer the same purpose; and harrowing he expressly declares to be one part of this management. And he concludes this part of his subject, with directions how land is to be treated immediately after the seed is sown, and how the growing crop is to be cultivated. The instance which the learned critic produces of the want of order in the manner of delivering Virgil’s precepts, is nothing to the purpose. After harrowing, he indeed mentions the reducing the land by ploughing; but it was not necessary to observe any order in this; he might indeed have said unpoetically, as Pliny does, that it was common to harrow after the second ploughing; but it was certainly much more proper, to represent the importance of harrowing fallow, and to leave it to the farmer to apply the operation according to circumstances. But, to put the matter beyond all dispute, let it be observed, that, in another passage, he mentions the harrowing after the seed is sown:

Quid

‘ the sun in summer, and twice the influence of  
 ‘ the cold in winter \*.’ Thus Virgil, besides  
 the early spring ploughing, proposes a winter  
 ploughing; by these the soil twice felt the influ-  
 ence of the cold; and by the summer and early  
 autumn ploughings, it twice felt the influence  
 of the sun. Besides these, it is probable, that  
 Virgil intended that the land should receive the  
 seed furrow: For it is certain, that the most in-  
 telligent farmers gave the stiff soil five plough-  
 ings, and sometimes more than five, Pliny,  
 after citing this passage from Virgil, and apply-  
 ing it to the number of ploughings that ought  
 to be given, adds, ‘ That it is better to give stiff  
 ‘ land five ploughings, and even nine, as is done  
 ‘ by the Tuscans †.’ There is no doubt, that it  
 was

Quid dicam, jactō qui femine cominus arva  
 Insequitur, cumulosque ruit male pinguis arenæ?

Vir. Geo. I. v. 104.

So that the harrowing mentioned in the other passage,  
 must be a harrowing given to the fallow before sowing.

† Illa seges demum votis respondet avari  
 Agricolæ, bis quæ Solem, bis frigora sensit.

Virg. Geo. I. v. 47.

† Quarto feri fulco Virgilius existimatur voluisse, cum  
 dixit

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was to show the advantage of giving fallow land two ploughings in cold weather, that our poet desires the farmer to pray for serene winters, to which he adds, 'The corn is most joyful in winter dust;' but, that the farmer might not imagine that the advantage of winter dust is confined to the growing corn, he further adds, 'The field is joyful \*.' The advantage of dry weather in winter and spring, is well known to every farmer in this part of the world, and hence the old proverb, 'A peck of March dust is worth a peck of gold.'

The Romans, in more ancient times, seem regularly to have given, at least some of their fallow, four ploughings. This appears from the number of the inferior gods presiding over agriculture, that were invoked at the feast of Ceres. Of these there were no fewer than twelve, four of which, from their names, appear to have presided

*dixit optimam esse segetem, quae bis Solem, bis frigora sensit. Spiffius solum, sicut plerumque in Italia, quinto sulco feri melius est; in Tuscia vere nono; Plin. Nat. Hist. lib. xviii. cap. xx.*

\* Humida solstitia, atque hiemes optate serenas]

Agricolae, hiberno laetissima pulvere farra,

Laetus ager.

Vir. Geo. I. v. 100.

presided over four different ploughings\*. The order in which these four deities were invoked, points out the order of the four ploughings, and the particular management of the fallow. At the third ploughing, the field was formed into little ridges, made by two earths thrown towards each other; after this the seed was sown and then ploughed in, probably by reversing the ridges, and turning the ribs into furrows. In place of this general scheme, they seem afterwards to have followed two different ones, applied to wet and dry soils. On wet soils they observed the method mentioned by Varro; after the second ploughing they sowed the field, and ploughed in the seed by forming ridges. Before the time of Columella, they added another ordinary ploughing

\* Servius, in a passage cited by the author of *Vet. Scrip. rei rust.* in a note *Var. lib. 1. cap. 1.* says, that Fabius Pictor enumerates the following gods; ‘*Vervactor, Reparator, Inporcitor, Infitor, Obarator, Occator, Sarritor, Subruncinator, Messor, Convector, Conditor, Promitor.*’ ‘*Vervactor* presided over the first ploughing when the land was made *vervactum* or fallow, *Reparator* over the cross ploughing when the land was prepared a second time, *Inporcitor* over the third ploughing when the field was ridged, and *Obarator* over the fourth when the seed was ploughed in.’



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ploughing before the seed furrow. This custom of sowing before the land was ridged, probably introduced the harrowing after the second ploughing, mentioned by Pliny and Virgil. On dry ground, after such a number of ploughings as were judged necessary, the field was ridged, then it was sowed, and the seed covered with rakes or harrows. The original seems to have been the best general scheme, the seed being lodged deep, the sap was preserved in dry land; and by the many furrows the superfluity was carried off in wet land. The substituting two schemes in the place of this general one, seems however to have been an improvement: By sowing upon a smooth surface in wet land, and ploughing in the seed by ridging, it is placed still upon a drier bed than in the general scheme, and by covering the seed sown upon a ridged field with harrows, the sap is still better preserved.

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.

tation. 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.

The practice of the ancients, in ploughing their fallow lands in winter, I would propose as particularly worthy of our imitation. Our most intelligent farmers are in the practice of giving these one winter furrow, and they find them the more easily cleaned and reduced by it. But it is probable, that it would be still an improvement to give two, one before winter, the other in the spring; and thus it might be said of our fallow, in the language of Virgil, that it twice  
feels

feels the influence of the cold. It is true, that the Roman farmers did not give their fallow lands the first ploughing till about the middle of January; but it must be remembered, that it was not possible for them to do it sooner; their seed-time, as has been observed, continued from the beginning of October to the winter solstice, and from the time that they began to plough after the harvest was over, they were taken up in preparing for this important and busy season. The months of August and September were seasons of severe labour, in which the greatest diligence and despatch were necessary; for, in this season, the poor light land received two ploughings, and the rich land one; and, after the sowing commenced, all the different kinds received the seed furrow. This made it impossible for the Roman farmer to plough his fallow lands earlier than the month of January. Our situation in Britain is very different; we sow in autumn much less in proportion than was done by the Romans, and our land too is commonly prepared for receiving the seed some time before it is sown. Hence, if fallowing becomes more frequent, and the harvest not very backward, it is in the farmer's power to give his fallow a ploughing before winter.

## C H A P. XXIV.

*Of the Methods of Sowing, and the Way of  
Covering the Seed.*

**T**HE farcling or hoeing, as has been observed, was an operation by which the surface of the earth was stirred, the earth itself heaped up around the growing corn, and any weeds growing amongst it destroyed. To be able to do this without destroying the corn, the seed must have been sown in some regular manner. It does not appear that they had any machine for this purpose like the modern drill. Columella mentions the seed basket: He says, ‘ That some persons covered it with the skin of a hyaena, and so sowed the seeds out of it, after they had remained in it a little time \*.’ Though  
he

\* Nonnulli pelle hyaenae fatorium trimodiam vestiunt, atque ita ex ea, cum paulum immorata sunt semina, jaciunt, non dubitantes proventura, quae sic fata sunt; Col. lib. II. cap. IX.

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he mentions this as a kind of charm used by some persons to make the corn grow, yet it serves likewise to show, that the common way of scattering the seed was out of the hand.

Pliny observes, ' That it requires art to scatter the seed equally, and that to do this, it is necessary that the hand move with the step, and always with the right foot \*.' This shows, that their manner of sowing was the same with ours.

Columella, when giving an account of the yokes of oxen and labourers necessary for a certain number of *jugera*, observes, that the seeds sown on twenty-five *jugera* of land, after four times ploughing, require 115 days of the ploughman; and, when he mentions the number of days that each ploughing required, he numbers only three ploughings with the sowing; and to the third time ploughing and sowing, he assigns almost double the time of the second ploughing †.

It

\* Artis quoque cujusdam est, aequaliter spargere. Manus utique congruere debet cum gradu, semperque cum dextro pede; Plin. Nat. Hist. lib. xviii. cap. xxiv.

† Semina, quae quarto sulco feruntur in jugeribus viginti quinque, desiderant bubulcorum operas cxv. Nam profcinditur is agri modus, quamvis durissimi, quinquaginta operis, iteratur quinque et viginti, tertiatatur et conferitur xl.; Col. lib. ii. cap. xiiii.

It seems from this, that the sowing was considered as a ploughing, and sometimes took up much more than half of the time of either the second or third ploughing.

The same author, when treating of the culture of the *medica* or *luserne*, directs, that it be covered with wooden rakes; and afterwards says, in another place, ‘But *medica* is put under ground, *not with the plough*, but, as I said, with small wooden rakes\*.’

When treating of the culture of vetches, he says, ‘That they may be sown on unploughed land, but better on ploughed †.’ And, when treating of the culture of Fenugreek, he says, ‘It may likewise not improperly be sown on unploughed land; but that they must be ploughed in with very narrow and shallow furrows.’ And adds; ‘That some persons first ploughed, then sowed, and covered the seed with rakes ‡.’

There

\* At *medica* obruitur non aratro, sed, ut dixi, ligneis rastellis; Col. lib. ii. cap. xiiii.

† Utraque ratio potest cruda terra fieri, sed melius proficissa; Col. lib. ii. cap. xi.

‡ Utraque (ratio) cruda terra non incommode fit; daturque operas, ut spisse aretur, nec tamen alte; nam si plus quatuor digitis adobrutum est semen ejus, non facile prodit.

There is one passage more in this author, which I shall mention: He says, 'that a *jugerum* ' is despatched by four days labour;' which is agreeable to what he mentions in other passages; and he adds, 'That it is ploughed the first time ' by two, the second time by one, the third time ' by three fourths, and by one fourth sown and ' reduced into ridges \*.' All these operations he

prodit. Propter quod nonnulli priusquam ferant, minimus aratris proscindunt, atque ita jacent femina, et sarcuculis adobruunt; Col. lib. 11. cap. xi.

\* Sed jugerum talis agri quatuor operis expeditur; nam commode proscinditur duabus, una iteratur, tertiatur dodrante, in liram statim redigitur, quadrante opere; Col. lib. 11. cap. iv.

Perhaps it may be necessary to observe, that the above cited passage from Columella, is in appearance inconsistent with that other passage of the same author, in which he mentions the number of days labour that 25 *jugera* take. For, in it, he says, that 25 *jugera* are ploughed a second time in 25 days, and ploughed a third time and sown in 40 days. To make this passage consistent with the other, he should have said, *and ploughed a third time and sown in 25 days*. But, it is probable, that there was a very great difference among the Roman farmers in their manner of ploughing, when the fallow got the third furrow, and when it got the furrow by which the seed was covered; which difference might arise too from the season. When  
the

he mentions as performed by the plough. And, agreeable to this, Varro mentions the third ploughing

the season was favourable for fallowing, the weeds destroyed, and the soil well reduced by the former ploughings, then both the third ploughing and seed furrow were given in very wide furrows, and so finished in the time of one ploughing. But, on the other hand, when the land was in a different situation, the third ploughing and seed furrow were given in narrow furrows, and then would take up more time. There is a passage in Columella, from which, I think, this may be inferred. In his kalendar for June, he observes, that land, according to the situation of the country and climate, must be ploughed for the first time or second time, and then adds; ‘ a *jugerum*, if the land is stiff and difficult to be ploughed, is ploughed for the first time by three days work, a second time by two, a third time by one, and by one, two *jugera* are ridged. But, if the land is free and easily ploughed, a *jugerum* is ploughed for the first time by two days work, a second time by one, and by one, four *jugera* are ridged; when, in land already well broke, broader ridges are made.—*Quinetiam pro conditione regionis, et coeli terra vel profcinditur, vel iteratur: Eaque, si est difficilis, profcinditur operis tribus, iteratur duabus, tertiatatur una; lirantur autem jugera duo opera una. At si facilis est terra, profcinditur jugerum duabus operis, iteratur una, lirantur una jugera quatuor; cum in subacta jam terra latiores porcae sulcantur;* Col. lib. xi. lib.



ploughing as sometimes given to land after the seed is sown \*.

From all these passages, we may infer, that the seed was commonly sown under furrow, as it is commonly called, that is, first sown and then ploughed in.

But the seed in the Roman husbandry, was not only ploughed in, but it was also sown and covered in such a manner, as to rise in rows,  
and

11. The last part of the passage, *Cum in subacta jam terra, &c.* instead of being misplaced, or an explication of the word *lirantur*, as some commentators imagine, ought to be considered as a reason for so many *jugera* being ridged in one day, when it takes so many days to give the first ploughing to one. The reason is very obvious: The land mentioned, being in its nature free and well reduced by ploughings, allows broader ridges to be made than otherwise would be proper; so that, according as the land was stiff and ill reduced, or free and well reduced, the ploughing by which the seed was covered took longer or shorter time. And, although free and easy land might have been cultivated by as few days work as Columella here mentions, yet, when giving an account of the number of *jugera* that a yoke of oxen could easily cultivate, it was natural for him to mention the greatest number of days work that this, in any ordinary soil, could be supposed to take.

\* *Tertio cum arant jacto semine, boves lirare dicuntur;*  
Var. lib. 1. cap. xxix.

and allow the operation of hoeing. Let us suppose, that, after the second or third ploughing, the land was harrowed, and the seed sown upon a smooth surface: If the land was then ploughed by a plough with two mold boards, or by one bout of a plough with one mold board, throwing the earth of one furrow towards the earth of another, then the field would be formed into ribs or small ridges, and the whole seed would rise on the tops of the ridges, so as to allow the hoe to be used in the furrows. This operation of covering the seed so as to rise in rows, would be performed with more exactness by a plough with two mold boards, such as was used by the Roman farmers, than by a plough with one mold board, such as is used in Britain. In ploughing with a plough that has only one mold board, it is impossible to prevent some of the earth that is cut off from passing between the coulter and sheath to the left or land side. When the land is very well reduced, as it was when seed was sown in the Roman husbandry, even the coulter itself, or the sheath, if there is no coulter, passes some of the earth this way; this earth, turned to the land side, carries some seed along with it, which is thereby put out of the  
row,

row, and commonly turned into the furrow. But this is effectually prevented by a plough with two mold boards, which turns the earth and the seed equally to both sides. It is the more probable that the seed in the Roman husbandry was covered in this manner, not only because necessary to make it rise in rows, but also because the kind of ploughing by which seed was covered and land ridged, is represented as taking not above a third, or even a fourth of the time of an ordinary ploughing.

It appears from some passages in Columella, that they had two different ways of sowing, which they called sowing upon the ridges, and sowing in the furrows. When describing ridges, he says; ‘ But husbandmen call these ridges, ‘ when the land is ploughed in such a manner, ‘ that between two furrows at a greater distance ‘ than an ordinary ploughing, the middle raised ‘ up affords a dry bed for the seed \*.’ And, when treating of the ploughing and sowing the light land upon a descent, he says; ‘ Nor must ‘ the

\* *Liras autem rustici vocant easdem porcas, cum sic aratum est, ut inter duos latius distantes fulcos medius cumulus siccam sedem frumentis praebeat; Col. lib. ii. cap. 17.*

‘ the seed in such land be sown on the ridges,  
 ‘ but on the furrows \*.’ From these passages  
 it is evident, that it was the custom on wet land  
 to sow on the ridges, and in dry land in the  
 furrows. This is confirmed by what this author  
 says, when treating of the culture of asparagus :  
 ‘ In dry land,’ says he, ‘ the seeds ought to be  
 ‘ sown in the bottom of the furrows, that they  
 ‘ may lie as it were in channels ; but, in wet  
 ‘ lands, they should be laid on the highest back  
 ‘ of the ridge, lest they should be hurt by too  
 ‘ much moisture †.’ These ridges made for the  
 asparagus were very narrow ; for he says, a few  
 lines before, ‘ but the trenches or furrows, a-  
 ‘ bout a foot distant the one from the other, are  
 ‘ made not above three fourths of a foot deep ‡.’  
 Of what breadth the ridges were made in the  
 fields where corn was sown, is uncertain. It  
 is

\* Neque in lira, sed sub fulco talis ager feminandus est ;  
 Col. id.

† Sed in locis siccis partibus fulcorum imis disponenda  
 sunt semina, ut tanquam in alveolis maneant. At uligi-  
 nosis e contrario in summo porcae dorso collocanda, ne  
 humore nimio laedantur ; Col. lib. xi. cap. iii.

‡ Sulci autem inter se pedali mensura distantes sunt  
 non amplius dodrantalis altitudinis ; Col. id.

is probable, that they were very narrow, so narrow, that the furrows were as wide as the ridges were broad. Columella, when treating of the culture of garlick, advises to plant it on ridges, and then adds; 'A ridge in a garden, is like to the ridge which husbandmen make when they sow their champaign lands, that they may prevent the corn from being hurt by wetness \*.' And we have no reason to imagine, that these ridges in the fields were broad, because he adds; 'But in gardens, this must be made less;' when we consider, that he directs that the furrows of the ridges for the garlick, be only one half foot distant the one from the other †. Cato indeed directs, that ridges be made five feet broad; but then these were not for corn, but for cypress seeds, and formed in the same manner as gardeners form beds in their gardens; for, after the seeds were sown, he requires, that earth be riddled upon them about a finger's breadth deep ‡. From these, then,  
we

\* Est autem lira similis ei porcae, quam in sationibus campestribus rustici faciunt, ut uliginem vitent; Col. id.

† Sulci lilarum inter se distent semipedali spatio; Col. lib. xi. cap. iii.

‡ Semen cupressi ubi seres, bipalio vortito. Vere primo serito.

we cannot form any judgment of the breadth of ridges in the fields where corn was sown.

I have had occasion already to observe, that a particular kind of plough was used for ploughing in seed. Varro informs us wherein the difference between this and the common plough consisted; and he describes in what manner it covered the seed: ‘At the third ploughing,’ says he, ‘which is after the sowing of the seed, they are said to ridge, that is, when with boards added to the share, they cover or ridge the sown seed, and make furrows for carrying off the rain water\*.’ He describes a ridge in these words; ‘That which is between two furrows where the earth is raised, is called a ridge †.’ Palladius, when mentioning ploughs of this kind,

*ferito. Porcas pedes quinos latas facito; eo stercus minutum addito, confarito, glebasque comminuito. Porcam planam facito, paululum concavam. Tum semen ferito crebrum tanquam linum, eo terram cribro incernito, altam digitum transversum; Cat. cap. XLVIII.*

\* Tertio cum arant jacto semine, boves lirare dicuntur; id est, cum tabellis additis ad vomerem simul, et satum frumentum operiunt in porcis, et sulcant fossas, quo pluvialis aqua delabatur; Var. lib. I. cap. XXIX.

† Quod est inter duos sulcos, elata terra, dicitur porca; Var. lib. I. cap. XXIX.

kind, says; ‘ by which the seed sown may be  
 ‘ raised upon a higher furrow, to secure it a-  
 ‘ gainst all injuries from the water that is apt to  
 ‘ stagnate upon the fields from the winter rains\*.  
 Pliny likewise mentions these ploughs, as used  
 for covering seed: ‘ The seed,’ says he, ‘ is co-  
 ‘ vered, according to the custom of the country,  
 ‘ either by harrows, or by the plough with a  
 ‘ board fixed to it, which operation is called  
 ‘ ridging †.’ Pliny seems, in this passage, to  
 allude to the two different methods of plough-  
 ing mentioned by Columella, ‘ sowing upon the  
 ‘ ridges, and sowing under the furrows.’ When  
 it was intended that the seed should be raised  
 upon the ridges, it was first sown, and then  
 ploughed in by the plough with boards; but  
 when it was intended that the seed should lie in  
 the furrow, then, it is probable, that the land  
 was

\* *Aratra simplicia, vel si plana regio permittit, aurita, quibus possint contra stationes humoris hyberni, fato celsiore fulco attolli; Pal. lib. I. tit. XLIII.*

† *Aratione per transversum iterata, occatio sequitur, ubi res poscit, crate vel rastro; et fato semine iteratio. Haec quoque ubi consuetudo patitur, crate dentata, vel tabula aratro annexa, quad vocant lirare, operiente semina; Plin. Nat. Hist. lib. XVIII. cap. XX.*

was first ploughed by the plough with boards, then the seed sown, and covered with rakes or harrows. Some passages in Virgil seem to allude to this way of sowing in the furrows: 'What praise,' says he, 'is due to him, who, 'lest his own corn should lodge by being too 'luxuriant, pastures it, *when the blade equals 'the furrows* \*?' This last expression seems to suppose that the corn arose in hollows. In another

\* Quid, qui, ne gravidis procumbat culmus aristis,  
Luxuriam segetum terra depascit in herba,  
Cum primum fulcos aequant fata?

Vir. Geo. I. v. III.

When corn is sown upon the top of a ridge, it may be said to equal the furrow as soon as it appears; which is not the situation of the crop here described by Virgil; and therefore, in this case, equalling the furrow could be no proper mark when the corn should be pastured. But, when corn is sown in the furrows, though these are partly filled up in harrowing, yet they still continue hollow, and it is some time before the blades that appear in them equal the tops of the ridges. When this happens, then is the time for pasturing. Virgil, in this passage, calls the ridges *fulci*. This is agreeable to what has already been observed, that this word signifies not only the trench made by the plough, but also, in many passages, the earth which it throws up.



ther passage, he says; ‘ What praise is due to  
 ‘ him, who, as soon as he has scattered the seed,  
 ‘ falls upon his fields and breaks down the heaps  
 ‘ of barren sand \*?’ By heaps, Virgil, from his  
 manner of describing them, seems to intend the  
 ridges made by the plough with boards before  
 fowing.

\* Quid dicam, jacto qui femine cominus arva  
 Insequitur, cumulosque ruit male pinguis arenae?

Vir. Geo. I. v. 104.

Virgil, by the *cumulos male pinguis arenae*, cannot be supposed to mean hard clods. The kind of soil here mentioned, called *arena*, makes this very improbable: Besides, when land is properly fallowed, there are no hard clods upon it when sown. This, as has already been observed, was the opinion of the Roman farmers. Although, therefore, when there were such clods upon a field that was sown, it was necessary to break them; yet Virgil would never have commended the farmer as he does here, who was under the necessity of doing this. It is probable, then, that by *cumulos male pinguis arenae*, we are to understand the ridges made in ploughing for the seed, which it was necessary to break down by harrowing, as soon as the seed was sowed, that so the sap in this dry land might be preserved as much as possible. This is the more probable, as Columella calls the top of the ridge *cumulus*:  
 ‘ Liras autem rustici vocant easdem porcas cum sic aratum  
 ‘ est, ut interduos latius distantes fulcos, medius cumulus  
 ‘ siccam sedem frumentis praebeat;’ Col. lib. II. cap. IV.

sowing. That there were two different ways of sowing among the Romans, as with us, is certain, a sowing above furrow, and a sowing under furrow: But in what manner these different operations were performed, is indeed uncertain. It is evident, however, that they were not performed by the Romans as they are by us; for, besides that by them the corn was made to rise in rows, in the one case it was laid so as to be secured from wetness, and in the other, so as to be secured from drought.

It is very probable, that, when the seed was sown on the ridges, it was done in the manner that has been described. For, if in this manner seed is sown and covered, it is certain that the corn will rise in rows, that on each side of the rows there will be furrows for carrying off the superfluous water, and that there will also be intervals for the operation of hoeing; the very things by which the Roman method of sowing upon ridges was distinguished. This is still the more probable, as the method of sowing described, was practised in Italy not many years ago, and, perhaps, is still practised at this day. Vincenzo Janara gives a particular description of it: ‘But,’ says he, ‘let us return to the plough,  
‘by

‘ by which we lay out land in two ways, the one  
 ‘ way in broad lands, (*vannegie*) which is the  
 ‘ union of many earths of furrows together, by  
 ‘ us called (*laghe*) the other way in fitches (*qua-*  
 ‘ *derni*) which, from the Latins, are called *porche*.’  
 After describing the *vannegie*, and giving di-  
 rections how to plough in them to the best ad-  
 vantage, he adds; ‘ It is common to plough in  
 ‘ *quaderni*, when seed is sown. After the broad  
 ‘ lands are harrowed and sown, the ploughman,  
 ‘ making a furrow, covers about a foot and a half  
 ‘ broad of the sown land with the earth which  
 ‘ he raises with the plough; afterwards, turning  
 ‘ to the other side, he makes another furrow a-  
 ‘ bout three feet distant from the first, the earth  
 ‘ of which he throws against the other earth,  
 ‘ which he had just before raised from the oppo-  
 ‘ site furrow, so that the whole grain is laid un-  
 ‘ der the two earths united, and thus is formed  
 ‘ as it were a little bank, (un’ *arginetto*) called  
 ‘ so by some, as called by us *quaderno*, about  
 ‘ three feet broad, with furrows on the sides to  
 ‘ carry off the superfluous moisture, so hurtful  
 ‘ to the sown corn \*.’ There is no difference  
 between

\* Ma ritorneamo all’ aratro, col quale disponeamo ter-  
 ra

between this and the old Roman method, except that in the Roman method, the seed was covered with a plough that had two mold boards, by which the work would be done more exactly and also more expeditiously.

When the seed was sown in the furrows, it is probable that the land was ploughed in the same manner, or by the common plough in very broad furrows, and then sown or covered with rakes or harrrows. By this method, the seed would likewise be laid in rows, but in the furrows, instead of its being on the ridges, as by  
the

ra in due modi, l'una in vanneggie, quale é un' uncone di molle glebe insieme, da noi chiamate laghe; l'altro in quaderni, quali da latini sono chiamate porche. — Araft a quaderni per lopiu quando si femina, però che appianate con l'erpico la vanneggie, e feminate, il Befolco facendo un folco con quella terra, qual con l'aratro alza copre circa un piede, e mezo del terreno feminato, dappoi voltando dall' altra parte col fare un altro folco dillante dall' primo circa tré piedi, con quest' altra gleba, che rivolge contro l'altra, che poco dianzi hà levata dall' opposto folco, accio che tutto il grano resti coperto da queste due glebe unite, e cosi formi quasi un' arginetto in tal quisa da alcuni chiamato, come da noi quaderno largo tre piedi con li latterali folchi par deviar e scholar l'humidita superflua tanto nociva a feminati; Vincenzo Tanara, lib. vi. p. 428. 430.

the other way. That the corn would grow up in rows, if sown upon land ploughed in the manner here mentioned, in very wide furrows, is certain; we may observe many fields of spring barley in this country, almost all the plants of which appear in rows, at about one foot distant the one from the other, with very few in the intervals. This is owing to the land being ploughed in two broad furrows, and the seed being sown immediately after ploughing. When the plough, in going, takes off very broad earths, they are laid distinct from each other with hollows between them, and, if seed is sown before the earths subside, it falls naturally into these hollows, and by that means rises in rows. Were these earths taken off but a little broader, the hollows between them would be like furrows, and was seed immediately sown, and raked along the earths with the hand, as was probably done by the Romans, instead of being harrowed both along and across, as is commonly done with us, I am persuaded that corn would rise in very distinct rows, with scarcely a plant in the intervals\*.

In

\* Since writing the above, this method of sowing has been

In these ways of sowing, one half of the land would only be sown; and, it is probable, that this was the case, as they used only one half of the seed commonly sown with us, as shall be afterwards shown.

The drills invented of late years, make the sowing in rows very easy, as by them we can sow in rows at the distance the one from the other that is found most convenient. This practice is attended with this very great advantage, that one-half, or perhaps more of the seed, commonly sown, may be saved, which will do much more than balance the additional expence of hoeing. It is not certain, however, whether the modern drills are an improvement upon the ancient method of sowing. By the drills, the seed is indeed scattered more equally through the field, and the corn more easily hoed and cleared from weeds; but, by the Roman method

been tried. A field having been prepared for the seed-furrow, was ribbed across, each rib being formed by one *bout*, or veering of the plough, throwing two furrows upon or towards each other. In this situation the field was sown, and the corn appeared in distinct rows, at about 14 inches distance the one from the other. The field was twice hand-hoed, and produced a very good crop.

thod of sowing, the corn is better prevented from lodging. By the drills, the whole field is covered in narrow rows, at some distance the one from the other, by which means, hoeing the intervals clears the field of weeds ; whereas, in the Roman method of sowing, it was necessary not only to hoe the intervals, but also to weed the rows ; but, by the Roman method of sowing, a greater quantity of seed being laid together, and the intervals being much wider, the top of the plants are less heavy in proportion to the root, and more air is admitted to harden the surface, and strengthen the stalks.

The number of plants crowded together in the Roman method of sowing, is probably an advantage to the crop in other respects. Young plants placed near to one another, seem to strengthen each other as long as they have as much air and food as they require. When, in any part of a field, the seed, by some accident, has fallen very thick, the plants, from this seed, spring up with much more vigour than in the other parts of the field, where a less quantity of seed has fallen : They continue to flourish for some time, and, it is probable, would come to perfection, were they arranged in such a manner

as to admit the air and afford a sufficiency of nourishment. This is confirmed by an experiment made by M. Lullin de Chateauvieux: He prepared a piece of land, 120 feet long and one and a half foot broad; this he divided into squares of six inches each; in these squares he sowed barley from one to six grains in each, and, when the plants had come to perfection, he found that the squares produced nearly in proportion to the quantity of grains sown in them: The difference too being commonly on the side of the grains, according to the quantity of them sown in the squares; so that the squares, where six grains were sown, produced more than six times the quantity of stalks produced by the squares where there was only one grain sown, more than three times the quantity produced by the squares where two grains were sown, and so of the others. The only exception is in the squares where three grains were sown, which produced a little more than half of the quantity produced by the squares with six grains\*. Whether the quantity of grains in such squares may be further increased to advantage, is uncertain; however, from this experiment,

\* Du Hamel; tom. iv. p. 432.

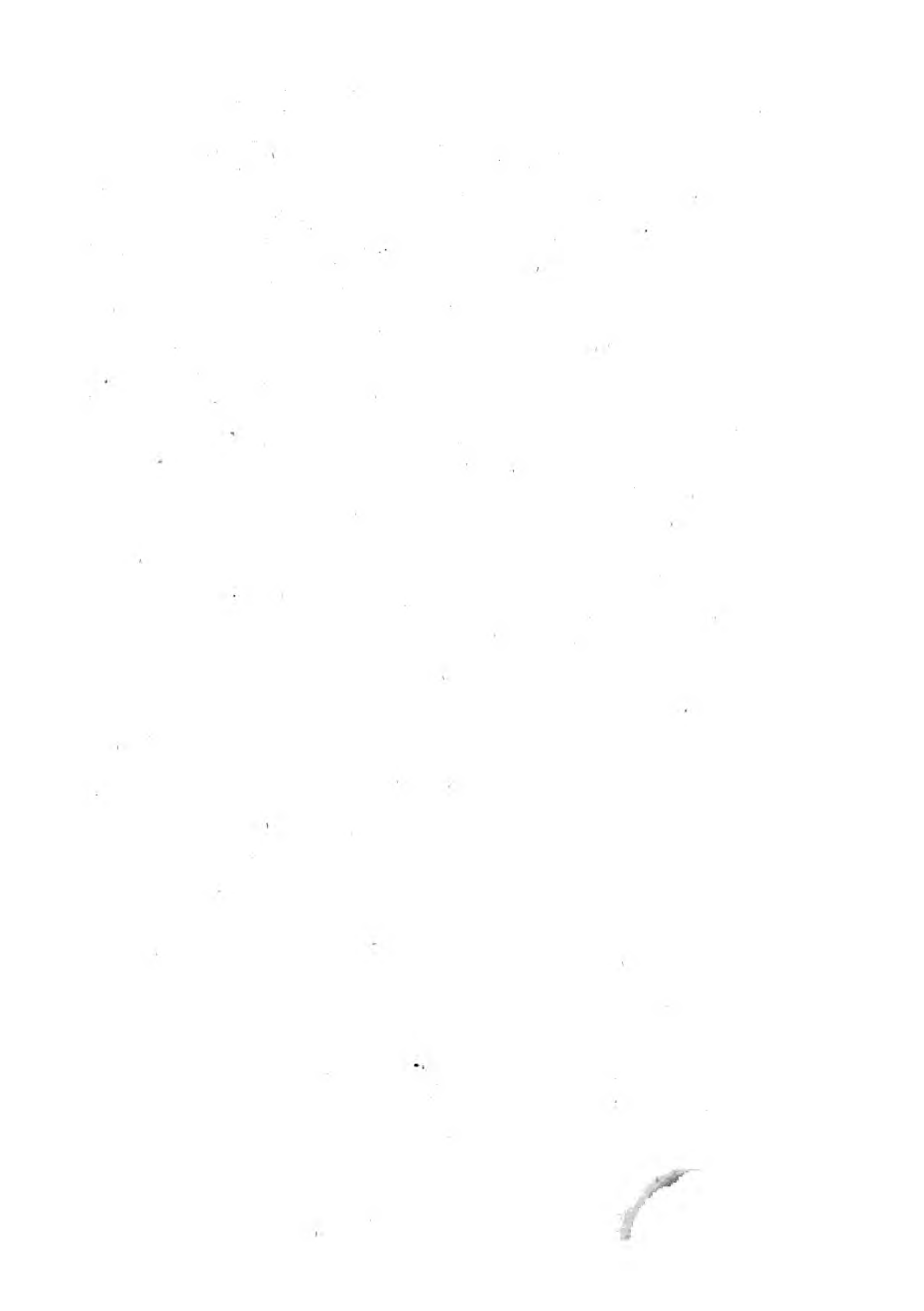


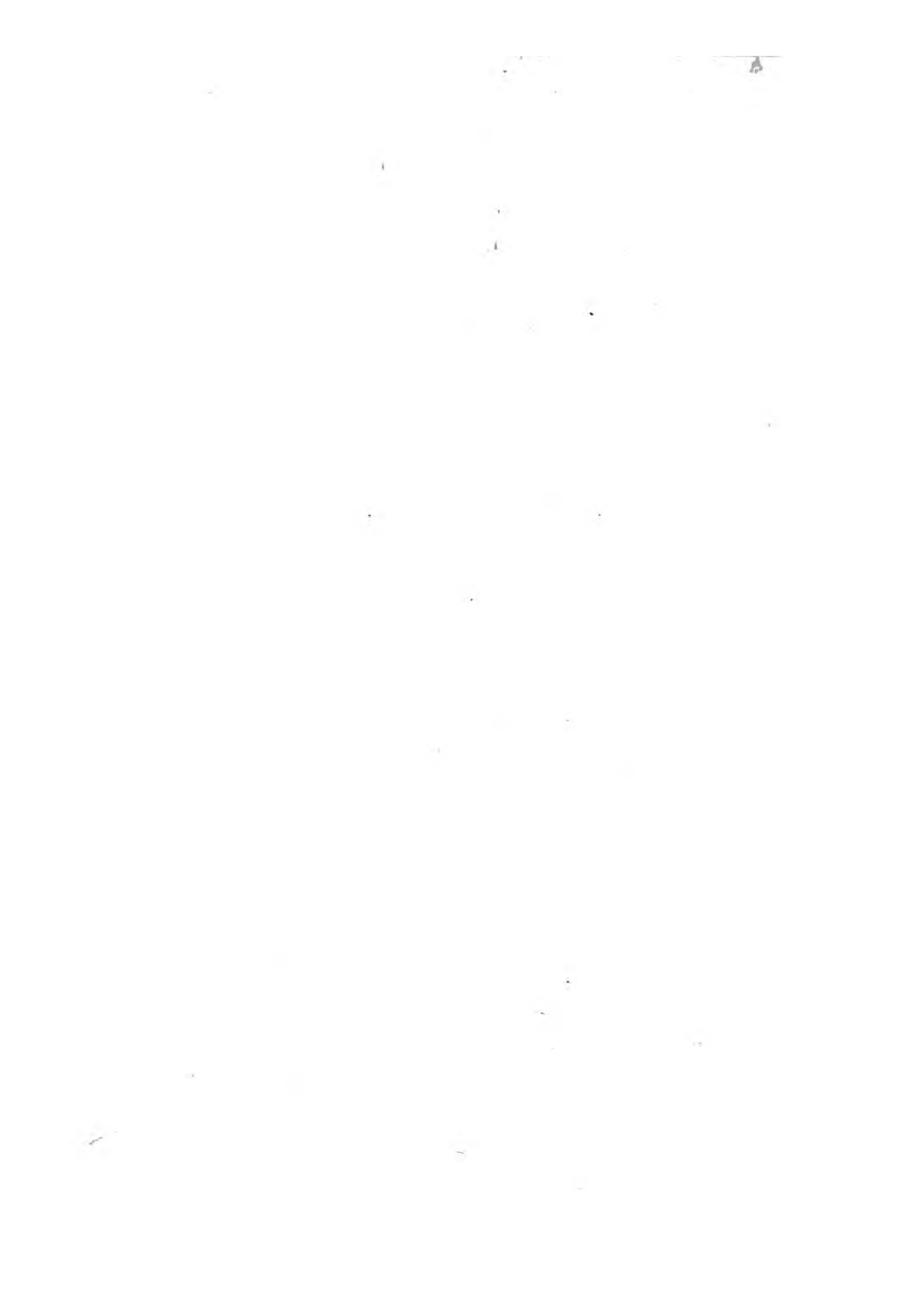
riment, it appears, that plants of corn, to a certain number, placed near to each other, instead of being weakened, are thereby strengthened, and therefore, that it is an advantage to sow corn in broad rows, or very thick where the rows are narrow, provided there are sufficient intervals to admit the air, and give the plants room to extend their roots, which is the very thing that seems to have been done by the Roman method of sowing. This plan of sowing seed, supposing the crop should not be augmented, must prove of great advantage to the society in which it is executed, by providing both food and useful labour to a greater number of hands; it is therefore worthy of the attention of every person who has the good of his country at heart. Could this scheme be universally introduced, it would have an effect far beyond what a person, at first sight, can imagine. Let us consider what effect it would have upon a farm, in which, for example, a hundred Scots acres, or one hundred and twenty-five English, are sown annually; these hundred acres take, in the ordinary way of sowing, about one hundred bolls of corn for seed. Now, could any scheme be established, by which the same crops could be raised from one-half of  
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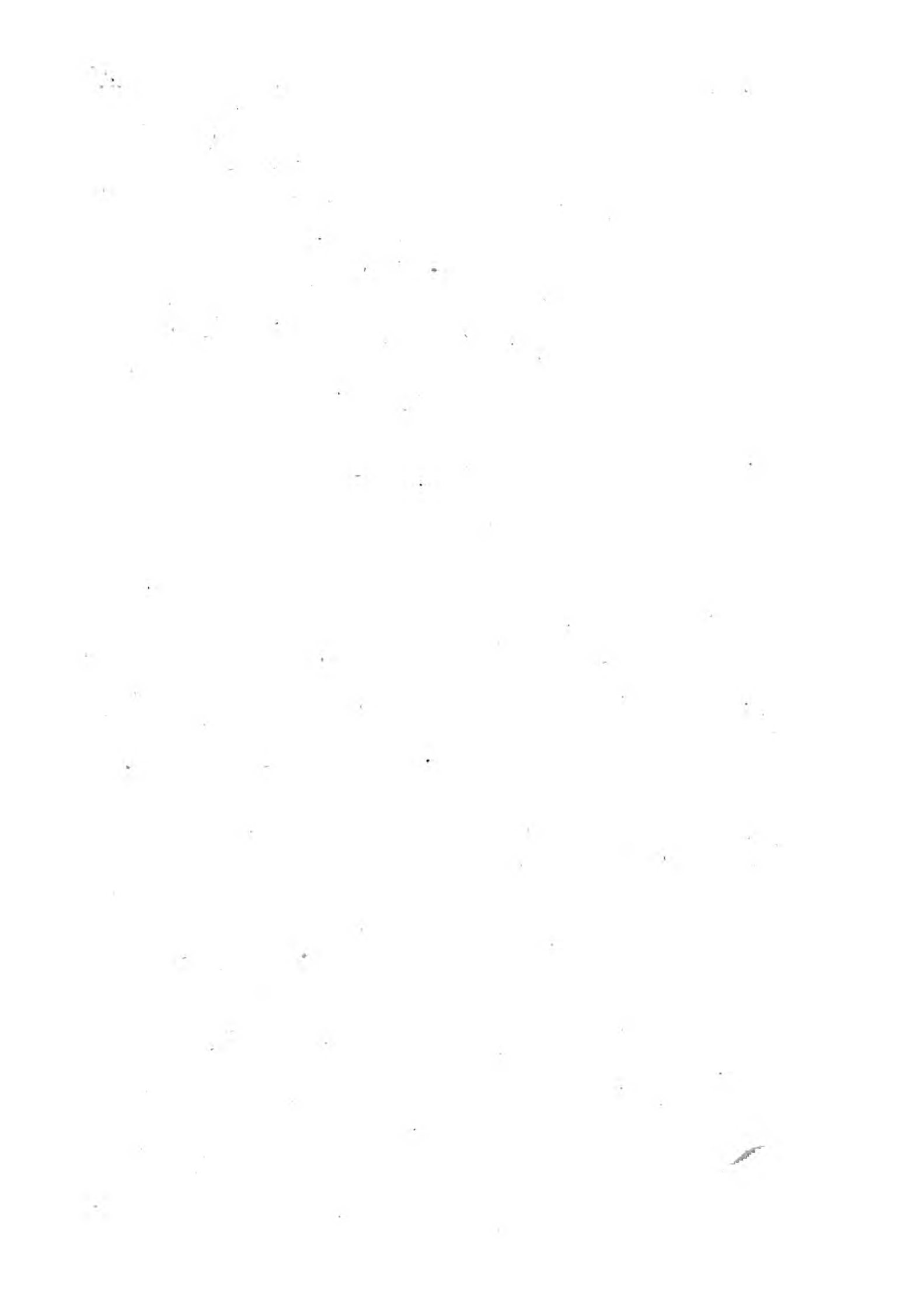
the seed, there would be on this farm fifty bolls of corn sowed, which is almost sufficient to maintain four families, and which is as much as is consumed by the whole labourers upon a farm of this kind in the present management. Was the number of labourers in the kingdom to be increased in this proportion, and the same quantity of corn provided for the other members of the society, the increase of power and riches thereby produced, would be much greater than one can at present imagine.

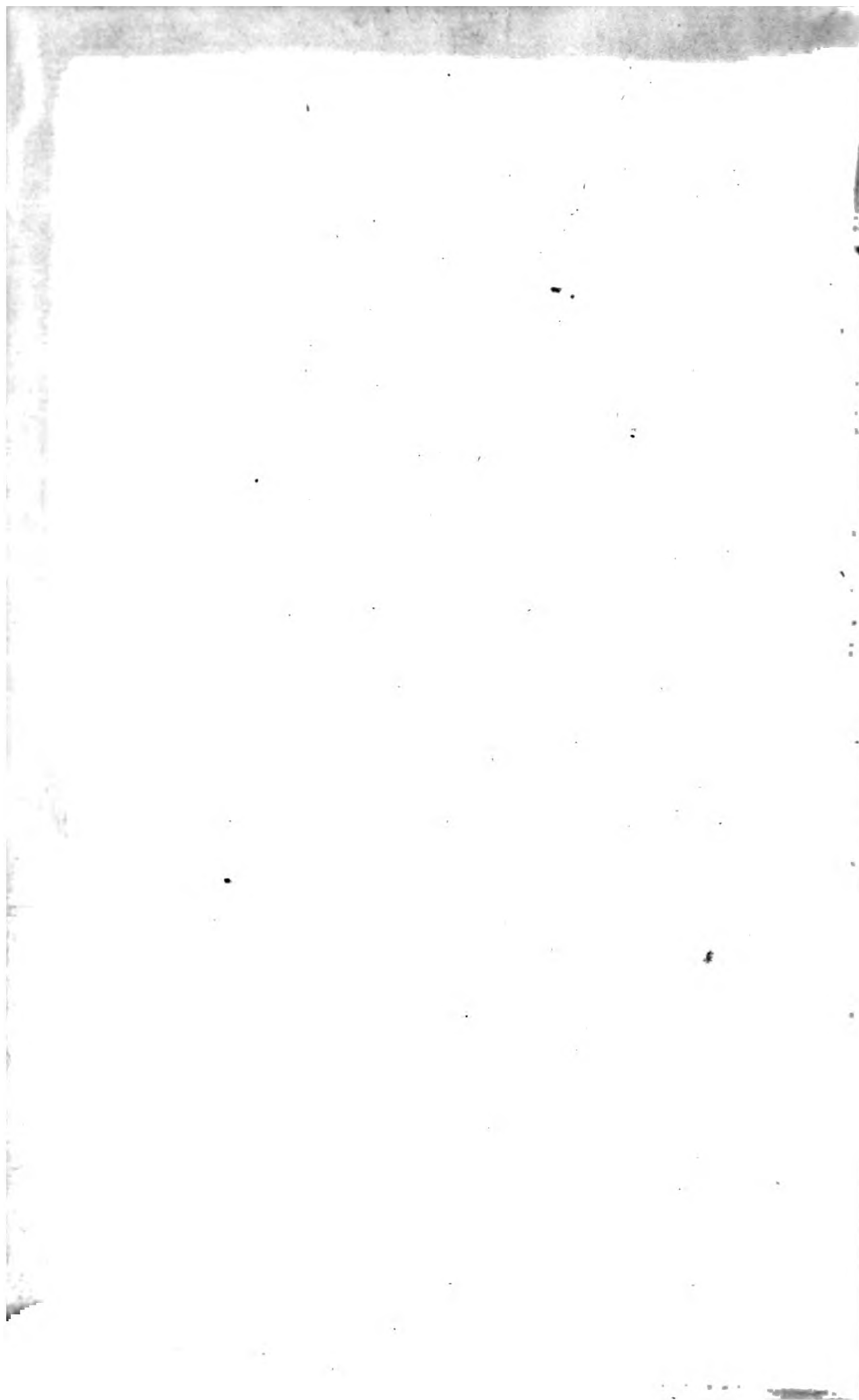
END OF VOLUME FIRST.











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