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ESSAYS

RELATING TO

AGRICULTURE

AND

RURAL AFFAIRS.

VOL. II.

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ESSAYS

RELATING TO

AGRICULTURE

AND

RURAL AFFAIRS.

THE FOURTH EDITION,

WITH CORRRECTIONS, AND LARGE ADDITIONS.

BY

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VOLUME SECOND.

And he gave it for his opinion, that whoever could make two ears of corn, or two blades of graſs, to grow upon a ſpot of ground where only one grew before, would deſerve better of mankind, and do more eſſential ſervice to his country, than the whole race of Politicians put together. SWIFT.

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M.DCC.XCVII.

PREFACE.

THE following ESSAY is a very inconſiderable fragment of a much larger work, in which the Author had made but a ſmall progreſs, when the event mentioned in the introductory advertiſement, put a ſtop to the farther proſecution of it. And as it is poſſible he may never be in a ſituation which ſhall enable him to finiſh that work as he at firſt intended, he has been prevailed upon to offer it to the Public in its preſent imperfect ſtate,—hoping, that even in this imperfect ſtate, it may be of ſome uſe in directing the attention of future enquirers to proper objects.——To contribute farther towards that end, the following account is given of the Author's deſign, and the motives that induced him to engage in this undertaking.

From particular circumſtances, nowiſe intereſting to the Reader, he was neceſſarily engaged in the practice of Agriculture, at a very early period of life; and being naturally delighted with the innocent pleaſures which that mode of life preſented to an ingenuous

mind, he engaged in the ſtudy of it, with an ardour natural to the impetuoſity of youth. By conſulting ſuch authors on this ſubject as fell in his way, he ſoon found himſelf deeply involved in intricate phyſical diſcuſſions about the *pabulum* of plants,—the influence of ſalts, oils, acids, and many other like ſubſtances, of which he could form but a very vague and indeterminate idea, ſo as not to be able with certainty to perceive the full force of ſuch arguments as were adduced by theſe authors, in ſupport of their favourite hypotheſes. And being unwilling to be inſtructed by halves, or to take the *word* of any author as a *demonſtration* of the propoſition he aſſumed, he applied himſelf with diligence, to acquire a knowledge of thoſe ſciences that ſeemed neceſſary to be attained, before he could peruſe theſe authors with profit.

But, inſtead of reaping the benefit from thence that he had at firſt expected, he had the mortification to find, that theſe Writers were in general equally ignorant of the real qualities of the ſubſtances whoſe names they employed, as he himſelf had been; and that each having formed in his own mind, a vague idea of ſome

imaginary

imaginary ſubſtance, endowed with as imaginary qualities, modelled by his fancy, ſo as exactly to ſuit the hypotheſis he had aſſumed, gave it the name of *ſalt*, *oil*, *acid*, or any other that chanced firſt to occur to his memory,—and then employed it on all occaſions to explain every difficulty that might occur with regard to the Theory or Practice of Agriculture.

And as they for the moſt part argued with a degree of confidence exactly proportioned to their own ignorance, he found that the influence of theſe dogmatic Theoriſts had extended ſo far as to pervert the minds of practical farmers to ſuch a degree, as to render them in many caſes incapable of drawing impartial concluſions from the obſervations that their own experience afforded. Thus even practical farmers were prevented from writing intelligibly on almoſt any ſubject, they being conſtantly deſirous of adapting facts to their own whimſical and abſurd theories.

Tired, at length, with repeated fruitleſs endeavours to attain uſeful knowledge in this way, and diſguſted with the nonſenſical jargon he was obliged to read,

he, in a ſort of literary apathy, threw aſide his books, and reſolved to diſengage his mind from theoretical reaſoning as much as poſſible, and, with unprejudiced ſincerity of intention, attend to practice alone, as the only ſure mode of inſtruction.

Being thus, in ſome meaſure, obliged to retire as it were within himſelf for inſtruction, and to meditate upon the moſt effectual means of attaining it, he ſoon perceived, that as a vague and inaccurate mode of reaſoning had been too freely admitted into this ſcience, in conſequence of which, concluſions were frequently drawn from premiſes that could not have been authoriſed by any accurate mode of induction; it behoved a farmer who wiſhed to make any ſolid attainments in uſeful knowledge, to be particularly careful to accuſtom himſelf to an accurate mathematical mode of reaſoning. And being thus enabled to diſtinguiſh between the *eſſential* and *accidental* circumſtances that might on any occaſion tend to vary the reſult of an experiment, he would be cautious how he admitted any thing as a fact upon which any future reaſoning ſhould be erected, until it had been previouſly demonſtrated to be ſuch.

But

But when he began to examine into the truth of thoſe facts uſually admitted as axioms * in the ſcience of agriculture, it is difficult to deſcribe his diſappointment, when, inſtead of that certainty he hoped for, he found himſelf continually involved in doubt and uncertainty. Nor does he imagine, that any one who has not examined this ſubject with the ſame attention that he has done, could think it poſſible that an art which has been practiſed for ſo many ages by all civilized nations, ſhould be ſtill involved in ſuch great uncertainty, in almoſt every particular, as it will be found to be.

This being the caſe, it was obvious that materials for forming any rational theory of agriculture were ſo very ſcanty, that little elſe but hypothetical conjecture could be expected in that way, until facts were more accurately authenticated. And as he is ſenſible it requires an un-

* Axiom, in mathematics, is a term employed to denote thoſe ſelf-evident truths that are ſo obvious to the underſtanding as to be readily recognized as ſuch, without any ſort of demonſtration, and therefore ſerve as a baſis upon which other demonſtrations may be erected—Such as, a part is not ſo great as the whole, &c.

commonly

commonly philoſophical turn of mind, and cultivated underſtanding, to be able to ſelect with judgment ſuch leading facts as might ſerve as a baſis to an infant theory, or to make ſuch experiments as might be deciſive in this point of view, he wiſhes to turn the attention of the practical farmer altogether from theſe vain purſuits, and to perſuade him to be contented with viewing it as an economical art, on the proper knowledge of which, as ſuch, his proſperity and happineſs depend. Happy will he deem himſelf, if his efforts in this way ſhall be attended with ſucceſs.

Leaving, therefore, the philoſopher to purſue his ſublime ſpeculations, and proceeding in the more humble walk to which he had confined himſelf, it readily occurred, that as thoſe who practiſe Agriculture are uſually confined to a particular ſpot, their obſervations muſt neceſſarily be confined to thoſe few objects that come within their own narrow ſphere. And as their attention is uſually employed in cultivating ſuch plants, or rearing ſuch animals, or proſecuting ſuch a mode of culture as chance may have recommended to their notice, without being acquainted with all the varieties of theſe that may

be

be met with in different parts of the earth, or knowing the caſes in which others might be ſubſtituted inſtead of them, with advantage; they are, in a great many caſes, ignorant of what might be done for their own emolument, nor know they how to make the greateſt advantage of their own particular ſituation:—ſo that, not being ſenſible of their real wants, they remain contented with what they only know in part, without making thoſe efforts, which, if properly directed, muſt naturally tend very much to improve that art which they practiſe.

In theſe circumſtances, he imagined that nothing could promiſe to be of more real utility to the practical farmer, than a work that was calculated to preſent to him a conciſe view of all thoſe objects that ſhould have a claim to his attention, when he was ſo circumſtanced as to have any particular object of purſuit in view; that, by thus having a diſtinct knowledge of all the circumſtances that could affect him, he might be in no danger of overlooking any of them. He would thus be enabled to advance with ſome degree of certainty, inſtead of purſuing that devious and deſultory courſe, to which

which he is, in the preſent ſituation of affairs, ſo much expoſed.

In purſuing theſe diſquiſitions, he imagined, that as the proper buſineſs of the farmer may be ſaid to conſiſt in rearing ſuch crops as may be uſeful to man, and in managing or diſpoſing of theſe ſo as that they might turn out to the greateſt benefit to himſelf, and good to the Public, the whole of the objects that could lay claim to his attention might properly be reduced to the three following general heads, *viz.*

1*ſt*, The knowledge of the different properties of all the plants that can be raiſed by the farmer;—the different uſes to which theſe can be in any caſe applied; and the moſt economical method of conſuming, or otherwiſe diſpoſing of them.

2*d*, The knowledge of the nature and diſtinguiſhing qualities of the different animals that may be kept for carrying on the various operations of Agriculture, and of thoſe that are reared for the purpoſe of conſuming theſe plants; and the proper method of treating the

different varieties of them, ſo as to make any one kind of food, on all occaſions, produce the greateſt poſſible effect. And,

3*d*, The knowledge of ſoils; the way of manuring and cultivating theſe, ſo as beſt to fit them for rearing ſuch valuable plants as may be moſt beneficial to the farmer. For,

Unleſs a man is acquainted with *all* the plants that can be reared in his ſoil or climate, and with *all* the diſtinguiſhing qualities, and peculiar properties * of each, ſo as to know with certainty in what circum-

* This paſſage has ſomewhat the appearance of a tautology, or unmeaning amplification, that the Author knew not how to avoid. By *diſtinguiſhing qualities*, he would wiſh to denote thoſe peculiarities that are often remarked in the manner of growth, time of vegetating, &c. of plants; and by *peculiar properties*, he would be underſtood to mean the medical qualities, if he may uſe that expreſſion, or thoſe qualities by which they are fitted to affect the animal economy, when conſumed by any living creature. The meaning of this diſtinction will be more obvious from many paſſages in the following Diſquiſitions.

ſtances

ſtances any one of theſe could be raiſed to the greateſt perfection, and for what purpoſes they could be moſt economically employed, he cannot be ſaid to have attained a perfect knowledge of rural economics *.

Unleſs a man is acquainted with *all* the animals that it is in his power to rear, and knows the peculiar diſtinguiſhing qualities, and the moſt proper method of treating each claſs of animals, in all circumſtances; the ſeveral products that may be obtained from each, and the eaſieſt method of increaſing or diminiſhing any one of theſe, as he may find beſt to ſuit his circumſtances—he muſt be conſidered as ignorant of a very important branch of knowledge in this art. And,

Unleſs he knows the particular ſoil, and the mode of culture, that is beſt adapted to rear each of theſe plants,

* I have here ventured to adopt a term from a foreign language, for want of a proper one in our own. The word Agriculture, in Engliſh, is often underſtood to expreſs all thoſe circumſtances that belong to the ſcience here treated of,—although, from the obvious etymology of the word, it ſeems to be forced from its natural and proper ſignification.

to the greateſt poſſible perfection, he cannot practiſe the art of Agriculture, with all the advantage that he might otherwiſe derive from it.

But if he knew, in every caſe, what plants his ſoil, in the ſtate in which it might chance to be in at any one time, could rear to the greateſt perfection;—if he knew the manner of treating that ſoil, ſo as to bring it to rear other plants that it was not naturally fitted to produce;—if he were thoroughly acquainted with all the diſtinguiſhing qualities of every one of theſe plants, and knew with certainty the way in which they might be diſpoſed of, or conſumed with the greateſt advantage to himſelf;—and if he were perfectly acquainted with the nature and peculiar qualities of every animal that he could rear, and particularly inſtructed in the beſt method of managing ſuch animals as the plants he could raiſe were beſt adapted to nouriſh, ſo as to make every particular ſpecies of food produce the greateſt poſſible effect;—he would on all occaſions be able to employ his time and labour to the utmoſt advantage to himſelf, and benefit to the public, and might be ſaid to have attained the higheſt degree of knowledge in this art that could be deſired.

Whether

Whether it is poſſible for human powers ever to attain to this ſummit of perfection, is extremely doubtful. But it is probable that thoſe will come neareſt to it, who, having their eye conſtantly fixed upon the goal, know, with ſome degree of certainty, the diſtance they are from it, and the obſtacles that muſt be overcome before they can reach it; and, with a well-directed perſeverance, ſteadily preſs forward with unremitting ardour.

To aſſiſt ſuch ingenious enquirers, it was propoſed to enter into an accurate examination of all the particular branches that might appertain to each of the general heads above enumerated;—to endeavour to point out, under each particular head, what were the circumſtances that it would be of the greateſt importance for him to know;—to enquire with accuracy, what particulars relating to each particular head had been already diſcovered:—to diſtinguiſh, by a careful diſcrimination, the facts that had been eſtabliſhed with certainty, from thoſe that had been adopted without ſufficient proofs;—and to lead to the moſt probable means of proſecuting future diſcoveries.

Such

Such was the original plan of that work which gave riſe to the following diſquiſitions:—But the enterpriſe was arduous, and the ſituation of the Author by no means favourable for completing ſuch an extenſive undertaking: upon which account, as well as the diſcouraging event mentioned in the introductory advertiſement, the proſecution of it upon that large ſcale has been laid aſide.

What is now offered to the Public, can only be looked upon as a bare ſkeleton of a ſmall part of that work; the following ſketches containing little elſe than a few unconnected doubts and queries, with a view to direct the attention of the farmer to ſome objects that do not ſeem as yet to have been ſufficiently elucidated, without ſo much as an attempt to accompliſh the other parts of the plan. Probably, it may at leaſt be uſeful, in ſo far as it will tend to give a check to the preſumptuous vanity of thoſe who through ignorance of the limited ſtate of our knowledge with regard to this art, are apt to think themſelves thoroughly acquainted with every particular relating to it, when they have only got a ſlight ſmattering of the rudiments of it: For, it is imagined that few

perſons who ſhall take the trouble to peruſe theſe ſketches, will be able to avoid perceiving, that it is hardly in his power to give ſatisfactory anſwers to many doubts that are there ſtarted, or to deny that it would be of great importance to the farmer to know them.

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MISCELLANEOUS

MISCELLANEOUS DISQUISITIONS,

DOUBTS, AND QUERIES,

RELATING TO

AGRICULTURE.

In omnibus rebus, et maximè physicis, quid non sit citius quam quid sit dixerim. CICERO.

ESSAYS, &c.

MISCELLANEOUS DISQUISITIONS, DOUBTS, and QUERIES, relating to AGRICULTURE.

I.

IT can hardly be doubted, that ſome plants afford more nouriſhing food for certain domeſtic animals, than others: —The well-inſtructed farmer, therefore, ought to know which of all the plants that are or may be cultivated by him, will ſooneſt fatten any ſpecies of animals that he may have it in his power to rear; as alſo the comparative degree of nouriſhment afforded by each of theſe plants to each ſpecies of animals reſpectively.—Wanted, on this account, an exact liſt of all the plants that will be eaten by, and may be employed as food for cattle *, arrang-

* *Cattle* is here employed as a general term, denoting all the animals of the cow (or Bos) kind.

ed in order, according to the degree of nouriſhment they will afford; beginning with thoſe that are moſt nutritive, and deſcending to ſuch as will hardly be eaten by this claſs of animals, or that afford them only a bare ſubſiſtence?—Wanted alſo, a ſimilar catalogue of plants with reſpect to horſes,—ſheep,—goats,—hogs,—rabbits,—geeſe,—and every other ſpecies of domeſtic animals that could in any caſe become an object of the farmer's attention.

The benefits that would accrue to the farmer from the knowledge of the above-mentioned particulars, are ſo obvious, as hardly to need being pointed out. It is evident, that he would thus be made to know exactly, not only what kind of plant would be moſt proper for him to endeavour to cultivate in his own particular ſituation, but would alſo know in what manner he ought to conſume any particular plant that chance or neceſſity might throw in his way, ſo as to make it turn out to his greateſt profit. Yet, the experience

perience of every reader will eaſily ſatisfy him, that ſo far are we from having attained the accuracy of knowledge required above, with regard to *all* the domeſtic animals, that we hardly as yet know the exact comparative value of any two plants with reſpect to any ſingle animal; not even the favourite horſe himſelf, who has long obtained ſuch a particular ſhare of attention. It is, indeed, in general, known, that certain plants may on ſome occaſions be employed with profit for fattening ſome particular animals; but the exact proportional value of each has never, in any caſe that I have heard of, been aſcertained by proper experiments, with that degree of preciſion which would be neceſſary in this caſe.

The only thing that approaches to this, is the attempt that the Swediſh Naturaliſts have made in the *Pan Suecicus* (*Amoenit. Acad.* Vol. III.) in which they have, by a numerous ſet of experiments, endeavoured to diſcover what plants are eaten or rejected by the five moſt common and moſt valuable kinds of domeſtic animals: oxen,

ſheep, goats, horſes, and ſwine *. But as it is by no means certain that animals always ſhow a preference for thoſe kinds of plants that afford them the moſt nouriſhing food, or the reverſe †; the plan that

* See the Appendix.

† Although it may be preſumed, that in general, inſtinct points out to animals the plants that are hurtful to them, or the reverſe; yet experience ſufficiently ſhows, that this cannot be relied upon as an invariable guide —among domeſtic animals at leaſt; which, by having little freedom of choice from their infancy, have their taſte, in all probability, depraved, as well as our own.—I have ſeen an ox that on no account could be brought to eat turnips; and there are very few put upon them, who do not eat them at firſt with ſome degree of reluctance, if they have not been ſometimes accuſtomed to taſte them before: yet it is very well known, that few kinds of food are more nouriſhing or palatable to cattle, after they have been once accuſtomed to it. In the ſame manner, ſheep that have been accuſtomed to eat whins (furze) browſe upon them at all times greedily, and prefer them to almoſt every other kind of food; whereas, others that have not been accuſtomed to this plant, will never touch it, till they are reduced to the greateſt extremity by hunger; although few plants, perhaps none, afford a more nouriſhing food for ſheep than this. The ſame might be ſaid of Burnet, Myrrh, and a great many other plants, which are for the moſt part refuſed at firſt by ſuch animals as have not been accuſtomed

that they have proceeded upon in this valuable ſet of experiments, does not entirely anſwer the purpoſe here required, nor afford us that degree of certainty in this reſpect that could be wiſhed for. Experiments, therefore, are ſtill here wanting: Nor can theſe ever in this caſe be concluſive, unleſs they are carried on upon a large ſcale, and ſo much varied as to guard againſt the particular exceptions that might be occaſioned by particular idioſyncracies *, or particular habits of body in the animals

cuſtomed to them, although they are afterwards eaten with a ſufficient reliſh.

And if the reluctance that an animal ſhows to eat any plant that may be offered to it, does not always indicate that ſuch plant is unwholeſome, ſo neither does their eating it at firſt freely afford a certain proof that it is innoxious. Thus Linnæus obſerves, that animals which have been accuſtomed to feed in the open fields, are frequently hurt when carried into woodlands, by eating plants that are pernicious to them, which the cattle that had been bred in theſe laſt paſtures have learned by experience to avoid. Here, then, it is *experience*, and not *inſtinct*, that guards from danger.

* *Idioſyncracy* is a term uſed by phyſicians, to denote certain peculiarities with which particular animals may be affected, that is by no means common to others of the ſame claſs. Thus one man may have a natural antipathy

animals upon which the experiments have been made.

It would be no difficult taſk to point out ſuch a train of experiments, as, if faithfully executed, would bring this particular to the certainty required. But as it would require little leſs than princely munificence to execute that ſet of experiments properly, it is perhaps unneceſſary here to propoſe them. How much is it to be regretted, that this nation, which gives the moſt liberal encouragement to almoſt every other kind of improvement, ſhould never have thought of applying a ſmall portion of the public money (and a very ſmall proportion would ſuffice) towards the proſecuting of ſuch national experiments in Agriculture as exceed the power of individuals to perform; and thus bring certainty into an art the moſt uſeful and eſſentially neceſſary to the exiſtence and well-being of mankind! The preſent inſtance is a ſtriking example of the real utility of ſuch an inſtitution.

tipathy at one kind of animal, or at one kind of food, which no reaſon can overcome, or length of habit reconcile: This is called an idioſyncracy.

II.

Hitherto the attention of the farmer has been too much confined to the common herbaceous plants that ſpring up in the fields, and are uſually eaten by our domeſtic animals in their native ſtate.—Is it not probable, that there may be many plants that do not ſeem at firſt ſight to be reducible to this claſs, that might be profitably cultivated as a crop for food to ſome of our domeſtic animals?—If ſo, What are they?

It is not neceſſary here to take notice of cabbages, coleworts, turnips, the coleſeed plant, &c. which have been long known to be good kinds of food for cattle and ſheep, although they have only of late been generally cultivated as a field-crop by the Britiſh farmer.—I would wiſh here to turn the attention of the reader to the examination of ſome other plants that have not been commonly thought capable

of

of affording good and wholeſome food for domeſtic animals.

The Myrrh plant * (wild Cicely or Cow-weed) is often ſeen growing in neglected corners, with great luxuriance, early in the ſpring; and, in that ſtate, is ſeldom eaten by any kind of animal, unleſs by ſheep, which ſometimes crop it.—But it is not in general known, that this plant affords one of the moſt nouriſhing kinds of food that can be found for cows and other ſorts of cattle, at a ſeaſon when few other green plants can be met with; and might undoubtedly be cultivated for that purpoſe, with very great profit, by the farmer.

The ſame might be ſaid of the *Willow-herb*, or French Willow †:—a plant that grows with luxuriance upon ſome ſoils where few other ſorts can be made to thrive. The young ſhoots of the *Epilobium*, if cut before they harden too much, af-

* *Chaerophyllum ſylveſtre.*

As plants have very different Engliſh names in different places, to prevent the miſtakes that might ariſe from this cauſe, I ſhall ſubjoin the Botanical names of ſuch as are univerſally known.

† *Epilobium.*

ford an abundant and wholeſome food for cows, at any early ſeaſon—before the common kinds of graſſes are fit for being cut, —as I myſelf have often experienced *.

It has been diſcovered of late, that the roots of carrots are readily eaten by horſes, and yield them plentiful nouriſhment.—Probably many other roots, that are now neglected, might be employed as a rich food for horſes, and other domeſtic animals.

Potatoes are well known to afford abundant nouriſhment to cattle—and horſes; and probably they would be equally nouriſhing to all the other domeſtic animals.

It ſeems alſo probable, that the *roots* of the Myrrh plant, if ever it ſhould be extenſively cultivated as a crop, would be of very great value in this reſpect;—as cattle, when they have once been made acquainted with the taſte of this root, become extremely fond of it. The weight of roots of this ſort upon an acre of

* The *Chicorium intybus*, lately introduced as a cultivated crop into Britain, poſſeſſes qualities ſomewhat akin to this.

ground,

ground, when fully grown, would be inconceivably great.

Cattle are alſo extremely fond of the roots as well as the tops of the Carraway plant *, which might on ſome occaſions be employed for the ſame purpoſes.

Beets † were formerly more cultivated in our gardens than at preſent. Perhaps, they ought to be chiefly valued as a food for cattle. They carry abundance of ſucculent leaves, which are readily eaten by cattle;—but their roots, which uſed always to be thrown away, would be the principal crop as a food for cattle. Theſe roots contain a larger proportion of ſaccharine juice than any other plant common with us. An ounce of grained ſugar has been extracted from a pound of the green root: and it is well known, that nothing fattens animals in general ſo quickly as plants that contain ſugar in large proportions ‡.

Sheep ſeem to ſhow a greater fondneſs for the roots than any other part of many

* *Carum carvi.* † *Beta vulgaris.*

‡ The root of ſcarcity which has attracted the attention of the public a good deal ſince the above was written, belongs to this claſs of plants.

plants,

plants, and would probably be much nouriſhed by them, if we were at pains to ſelect ſuch plants for cultivating for other uſes, as had roots that were peculiarly grateful to them; and the value of ſuch crops might be greatly augmented by this circumſtance.

Sheep are uncommonly fond of the leaves of the common Dandelion *, and other plants of the ſame claſs;—but they will leave almoſt any other ſort of food, to ſearch for the *roots* of the Dandelion among ploughed fields, where theſe abound. They are alſo exceedingly fond of the roots of all the plants of the Hawkweed tribe †.

They likewiſe ſearch with avidity for the roots of the common Mugwort ‡.

And they are alſo very fond of the root of graſſy-leaved Plantain §, which ſometimes grows to a conſiderable ſize.

Whether they or ſwine, or any other domeſtic animal, would eat the roots of the *Epilobium*, which are extremely tender, and very numerous, I cannot ſay:—But

* *Leontodum taraxacum.* † *Hieracium.*

‡ *Artemiſia vulgaris.* § *Plantago minima.*

if

if they did, it might be cultivated on many occaſions by the farmer, with greater profit than almoſt any other crop.

I do not know if any uſe has hitherto been made of the roots of the Lucerne.—Theſe, where the crop has been luxuriant, are extremely large, and afford a ſaccharine juice, that would probably be very nouriſhing to ſome ſorts of animals. The roots are indeed tough and ſtringy in their natural ſtate;—but if maſhed by a ſtone rolling about on its edge like a tan-mill, or by any other contrivance, they would become tender enough for uſe.

The ſame might be ſaid of *Sain-foin* (*Saint-foin* vulgo) roots. But of theſe I ſpeak leſs poſitively, not being ſo well acquainted with the nature of them.

But no plant that I am acquainted with, promiſes to be more valuable in this way, than the garden everlaſting Pea; the roots of which grow in time to a very large ſize, and are full of a rich ſaccharine juice, little inferior to the garden liquorice.

How theſe roots could be moſt eaſily taken out of the ground, might be enquired

quired into, after their ſeveral qualities were fully aſcertained.

Many other roots might be mentioned —ſome of which grow to an enormous ſize, and are juſt now accounted of no value, that might poſſibly be of great uſe as food for domeſtic animals.—All theſe deſerve to be examined: for ſome of them might perhaps admit of being profitably cultivated as a crop; and others, which, though they could not be thus employed, might ſtill be of great utility in ſupplying the deficiencies of a ſcanty crop, were they properly known.

Neceſſity has been, with ſome appearance of juſtice, called the mother of invention—and ſome perſons have ſo ſtrongly annexed the idea of want and poverty to every economical experiment of this kind, that they would be aſhamed to be ſeen making them. Thoſe may reckon themſelves happy who are under no *neceſſity* of exerting their genius in this manner, and ought thankfully to avail themſelves of the *forced* experiments of the poor. But it would be more for their honour, if they, with a liberal ſpirit of

enterprize,

enterprize, made the diſcoveries for themſelves.—Many trials may prove abortive;—but if one, among a great number, ſucceeds, they will have the agreeable ſatisfaction to *feel*, that they have not been entirely uſeleſs to their country and poſterity:—Nor do they ſpring up on the face of the earth, and decay like the weeds of the field, that only incumber the ground for a ſeaſon—are trodden under foot, and ſoon forgotten,—or are only remembered with abhorrence and diſguſt.

In the northern regions of Norway and Lapland, the inhabitants are obliged to try many plants as food for themſelves and cattle, which have been neglected by thoſe whoſe milder climate leaves them a greater variety to chooſe from. They gather the leaves and tender twigs of various ſorts of trees, which they carefully preſerve, inſtead of hay, for their beſtial, and find that it affords them as abundant nouriſhment as any hay whatever*. Ought

* And in the ſouthern parts of France, Italy, and in India, they gather the leaves of trees, with which they feed their beaſts in ſummer, when the graſs is burnt up by the parching heat of the ſun.

not

not this to afford us a hint, not to neglect our own trees or ſhrubs; ſome of which might be employed with profit, even by us, were their qualities ſufficiently known?

The moſt valuable hay that the Romans were poſſeſſed of, conſiſted of the leaves and twigs of a ſhrubby plant,—the *Cytiſus*.

And the experience of many perſons in the north of Scotland, as well as of ſome of the diſcerning few in England, has ſufficiently proved, that the tender twigs of the common whin*, (furze), when bruiſed, afford a more wholeſome and nouriſhing winter-food for horſes and cattle, than perhaps any other plant that has ever yet been diſcovered,—not excepting the Roman *Cytiſus* itſelf: Yet few experiments have been made, to diſcover the moſt proper manner of cultivating this valuable plant †.

Another

* *Ulex Europæus.*

† Since the former edition of this book was publiſhed, I have learned, that the tender twigs of the common Scots Fir affords a wholeſome food for cattle and ſheep. In the ſpring of the year 1782, fodder for

Another plant that might poſſibly be of uſe to the farmer in this way, is the common *Laburnum*. This is nearly allied to the Roman *Cytiſus*, in its botanical characters. Its leaves and tender ſhoots are very much liked by cattle; and it grows with ſuch a rapid luxuriance when young, as ſeems to promiſe that a very great weight of hay might be obtained from an acre of ground under this crop.

It may perhaps appear a little extraordinary to ſome readers, to hear of a propoſal for making hay from trees; yet they have ſeen, that the only nation of antiquity which made agriculture its particular ſtudy, followed this practice with ſucceſs.

cattle was very ſcarce in the north of Scotland; and the ſeaſon was ſo backward, that many cattle died before the graſs ſprang up. On that occaſion, one gentleman kept 250 head of cattle alive, and in good health, for upwards of two months, without any other food but the twigs of common fir. The branches were cut freſh for them every day, and in this caſe were given to the cattle in the houſe.—Another gentleman kept ſeveral cattle abroad during the whole winter, with ſcarce any other food but the twigs of this tree, which were cut down every day for their uſe. The cattle came and readily browſed upon them. Horſes take to this food with greater reluctance.—Sheep, I am told, eat it heartily.

Nor

Nor will this appear ſo extraordinary, when nearly examined, as it may ſeem at firſt ſight. The ſhoots of the laburnum, as well as of many other trees, are as tender while young, and as entirely herbaceous, as thoſe of clover, or any other of the moſt ſucculent graſſes; and if theſe twigs were cut while in that ſtate, they might perhaps afford as nouriſhing hay as clover or lucerne.

The Lucerne plant, which affords, beyond any degree of compariſon, the moſt valuable hay that we moderns are acquainted with, if ſuffered to run to their full length for a whole ſeaſon, are more firm and woody than the ſhoots of the Laburnum at the end of the ſeaſon.

It is well known, that almoſt all ſorts of deciduous trees, when cut over cloſe by the ground, ſend out ſtrong and numerous ſhoots, which quickly attain a much greater magnitude than if the tree had been ſuffered to grow in its ordinary manner. The ſhoots of a willow managed in this way, will often exceed nine feet in a ſeaſon, which would not have been above two or three if the ſtem had not been lately cut over.

I have often ſeen the ſhoots of a young *Laburnum*, in ordinary health, without amputation, exceed four feet in a ſeaſon: —If a vigorous ſtem had been cut over cloſe by the ground, theſe ſhoots would probably have been much above that length. Theſe young ſhoots are extremely herbaceous, and are covered cloſely, over their whole length, with numerous large ſucculent leaves, which, in figure, taſte, and ſmell, greatly reſemble thoſe of red clover*.

If,

* There are two ſorts of *Laburnum* common in this country, which may be diſtinguiſhed by the appellation of the *broad* and *narrow*-leaved Laburnum. It is the firſt ſort I here allude to, in all that has been ſaid above.

The ſhoots of this ſort are long, irregular, and hang dangling on every ſide; the leaves are large, have long and weak foot-ſtalks, ſoft and pliable to the touch, and are of a light-green colour, with a ſlight tinge of red on the young ſtalks. The flowers are ſmaller than thoſe of the other ſort; and the pods are flatted, with a ſoft pliable ſkin upon them.

The pods of the other ſort are hard, round, and ſomewhat knotty; the leaves ſmaller than the other, and of a darker Saxon-green colour, with ſhorter and ſtronger foot-ſtalks. The branches grow more erect, and are garniſhed with much fewer leaves.—This ſort

is

If, then, a plot of ground were filled with the roots of this ſort of tree, and the ſtems cut over cloſe by the ground, a great number of theſe herbaceous ſhoots would ſpring up from every one of theſe ſtems, which might be cut over with a ſcythe at any time in ſummer, with as great eaſe as a crop of clover; and might either be made into hay, or conſumed green, as ſhould be moſt convenient for the farmer. Theſe ſhoots ſpring up much earlier in the ſeaſon than red clover, and might be cut once, twice, or thrice in a ſeaſon, as ſhould beſt ſuit the purpoſes of the owner.

The roots would continue to increaſe in ſize, and the annual ſhoots in vigour, for many years, and yield ſucceſſive crops without any additional trouble or expence,—if it ſhould be found, upon trial, that the hay or graſs (if I may uſe that phraſe) was of a valuable ſort.

Nearly the ſame thing might be ſaid of

is a more beautiful tree, but would not anſwer the purpoſes here required near ſo well as the other.

Theſe trees, after they are ten or twelve years old, produce abundance of ſeeds, which ſpring up as readily as creſſes, if ſowed in a good ſoil.

the common wood-bine, or honey-ſuckle*; ſome of the freeſt ſhooting, and moſt herbaceous ſorts † of which grow to a very great length in one ſeaſon; and, if managed in the ſame manner, would, no doubt, yield a prodigious weight of fodder. I find, that ſome cattle ‡ eat the leaves and tender ſhoots of this plant without

* *Lonicera Periclymenum.*

† There is a very great difference in this reſpect, among the different kinds of wood-bines. The wild ſort, with woolly leaves, and long thread-like ſtalks, would be very improper. The beſt ſort ſeems to be one that has thick and ſtrong ſhoots, of a greeniſh colour, with a tinge of red on one ſide, large bright-coloured ſmooth ſucculent leaves, and a large tuft of big flowers, yellow tinged with red on the outſide, which begin to open about the middle of June, and continue to blow till the end of the ſeaſon.

‡ The reader ought to be informed, that there is a very great difference among cattle in this reſpect. Some cows, eſpecially thoſe that have been bred with gardeners, refuſe hardly any green thing; others can ſcarcely be prevailed with to eat any thing but common graſs. The beſt way to bring a beaſt to eat any kind of food it has not been accuſtomed with, is to make it ſtand near one which eats the kind of food you mean to give it. In a ſhort time, moſt animals will be brought, in this manner, without conſtraint, to eat almoſt any ſort of food that others do.

reluctance,

reluctance. Whether it would afford them a wholeſome nouriſhment, I have not had experience enough to ſay;—but there is no reaſon to think it would not.

Willows, and many other trees, afford long and tender ſhoots, which might poſſibly be of uſe in this way on ſome occaſions, were they properly tried.

This is a walk in agriculture, that may be ſaid to be in ſome meaſure untrod: and although theſe obſervations may to ſome appear whimſical, yet the ſubject does not on that account the leſs merit the attention of the liberal-minded enquirer into the principles of rural economy.

III.

It is ſuppoſed, that ſome plants may not yield ſuch wholeſome food for animals when green, as when made into hay; and that, perhaps, others, on the contrary, afford better nouriſhment as a green food, than as a dry.——Wanted, an exact liſt of all our plants, compared with one another in this reſpect, with regard to each of the domeſtic animals above named.

With regard to mankind, we know that many plants, which, when green, are hardly fit for food, become extremely nouriſhing when dry;—and that ſome are even poiſonous in that ſtate, which afterwards become an agreeable and wholeſome food;—as the Caſſava-root. And as the *virus* * of many plants depends upon a very volatile eſſential oil, that may be evaporated in drying the plants, as happens with regard to the root of the horſe-radiſh †, it is extremely probable that the qualities of the ſame plant may frequently be very different in a dried or a green ſtate. Till the farmer, therefore, is made acquainted with this particular, his knowledge is not ſo great as it ought to be; and he muſt be often at a loſs to know which plant he ought to cultivate

* I have ventured to adopt this word, as I know no proper Engliſh word that is equivalent to it.—It is here employed to denote that particular power by which plants are enabled to produce any ſenſible effect upon the animal ſyſtem, whether this be ſalutary or pernicious.

† *Cochlearia Amorica.*

for

for any particular purpoſe, or which way he could conſume any particular plant to the greateſt advantage.

IV.

It is probable that ſome plants, which may perhaps be poſſeſſed of the ſame qualities when green as when in a dry ſtate, may nevertheleſs be more properly and economically conſumed, by cutting them green, and employing them in that ſtate, than by allowing them to be made into hay; and, in ſome caſes, perhaps, the reverſe of this may be the caſe.—Wanted, a liſt of each of theſe claſſes of plants as above.

Broad clover, and many other ſucculent plants, are with ſome difficulty made into hay; and, in all probability, may be conſumed much more profitably as a green than as a dry fodder: becauſe, as ſoon as they are cut over, the plants quickly vegetate afreſh during the ſummer-ſeaſon; and, by being repeatedly cut over, produce

duce a much greater weight of forage than if they had been allowed to bring their ſeeds to maturity. For it is obſervable of almoſt all theſe ſucculent plants, that they puſh out very vigorous ſhoots ſoon after they are cut over, which advance with great rapidity until the plant hath attained nearly its full ſtature; after which period, it advances more ſlowly, till it at length becomes entirely ſtationary, and is ſolely employed about the formation of its ſeeds. Now, if the plant be always cut when it approaches towards that ſtationary ſtate, it will be always kept in the ſtate of vigorous vegetation; and thus it would ſeem that a much greater quantity of vegetable matter would be produced, than if it were allowed to arrive at greater maturity before each cutting.

This is ſtill more apparent with regard to Lucerne than broad clover. This plant, if allowed to come to its full ſize, will, in a good ſoil, attain the height of four feet, or a little more, in one ſeaſon. But I myſelf have cut a plant of Lucerne ſix times in one ſeaſon, allowing it to be about

about twenty inches high before each cutting; which gives upwards of ten feet for the growth of one year;—conſiderably more than double the height that it would have reached if it had not been cut at all. And although it be acknowledged, that the more ſucculent ſhoots, obtained in conſequence of frequent cutting, would not contain ſuch a quantity of ſolid matter, as an equal weight of the better maturated ſtalks would have done; yet it does not ſeem at all probable, that the deficiency ariſing from this cauſe, would nearly counterbalance the ſurplus quantity obtained by frequent cutting. This is an object, among many others, that cannot be determined exactly without accurate experiments.

On the other hand, it would ſeem probable, that ſome of the culmiferous plants * or graſſes *(gramina)* properly ſo called, being leſs capable of recovering themſelves after being cut over, when the ſtalks have been allowed to advance to

* Culmiferous plants are ſuch as carry an erect hollow jointed ſtalk, as wheat, oats, rye, &c.

any

any conſiderable length (as is evidently the caſe with regard to common rye-graſs *) would afford but poor returns if cut green, although they may yield a very weighty crop of hay if ſuffered to attain a proper degree of maturity. But however great the probability is that this may be the caſe, ſtill it is no more than a probability. Nor can the farmer hope to arrive at certainty in this caſe, till he knows, by accurate experiment, not only the exact qualities of each of theſe plants when green or dry, but alſo the quantity of each that can be produced upon the ſame ſoil with equally ſkilful management.

V.

Some plants that may be equally nouriſhing to animals, and that equally require to be conſumed green, may nevertheleſs differ in this reſpect, that one claſs

* *Lolium Perenne.* Properly, perennial darnel-graſs, improperly called rye-graſs; as there is another plant, *ſecale villoſum*, properly called rye-graſs, that has no other Engliſh name.

may

may be more economically conſumed by having the plants cut, and given by hand in that ſtate to the animals that feed upon them, while another claſs may be more profitably conſumed by being depaſtured by animals.——Required, a liſt of each of theſe two claſſes of plants.

It will be in general allowed, that the two plants mentioned above, broad clover and Lucerne, are more advantageouſly conſumed when cut and given green by the hand, than when paſtured upon. Probably, this may likewiſe be, in ſome meaſure, the caſe with all quick-ſhooting ſtrong-ſtemmed plants, that do not grow cloſe enough at the root to form a firm bottom for animals to bite upon. It is likewiſe probable, that, in general, ſuch cloſe-growing leafy graſſes as require to be conſumed green, and other weak ſucculent trailing plants, which run along the ground, and form a thick ſward there, but do not riſe quickly to a great height, ſo as to admit of being readily cut by the ſcythe, would be more profitable for paſturage.—But, here again, we are in the region of probability;

probability; nor do we as yet know, with any degree of certainty, either the different plants reducible to each of these classes, or the several limitations that in particular circumstances might take place with regard to any of these.

On this subject, it may not be improper to take notice of a circumstance that ought not by any means to be overlooked by those who are obliged to supply the want of accurate experiments, by probable reasoning from detached facts that accidentally occur.—It is this: by accurate observations, any one may soon be satisfied, that if the flower-stalks of the greater part of culmiferous grasses are destroyed after they are fully formed, the plants do not attempt to form other flower-stalks that season, but run afterwards chiefly to leaves, and spread by their roots. Now, if in this state these plants are allowed to remain for any considerable length of time, without being either pastured upon or cut, the leaves gradually stop from growing,—remain after that for some time stationary, and then fade away, if they are not so luxuriant as to rot; and

in this way, the whole produce of a field may frequently amount to no more than a few inches in length in a ſeaſon. But if theſe leaves had been cut over, or afreſh bit down by the animals paſturing upon the field ſeveral times, the vegetation would at each time have been renewed, and it would have produced perhaps five or ſix times more than if this repeated cropping had been omitted.

This I once had an opportunity of being ſatisfied of experimentally, with regard to two plants of ſheep's feſcue-graſs *, which grew upon the ſame ſoil,—were in equal health, and in every other reſpect alike when the experiment was tried. The leaves of each of theſe two plants, before the end of May, or beginning of June, had advanced to about ſix inches in length, and after that remained quite ſtationary for ſome weeks:—Obſerving which, I cut off with a ſharp knife, all the leaves of one of the plants quite cloſe by the ground; and in a very few days it puſhed out a ſet of freſh leaves with great vigour. Theſe were cut three or four ſeveral times during

* *Feſtuca ovina.*

the

the remaining part of the ſeaſon, when about the height of three inches at each time; although it was not poſſible to remark the ſmalleſt increaſe of one blade upon the other plant, during all that time.

From this experiment, it would ſeem that we might fairly draw the following obvious corollary, *viz.* That if graſs, in theſe circumſtances, is to be conſumed either by paſturing or cutting, it is the greateſt want of economy to allow it to remain long between each of theſe operations; and if we mean to reap the full profit from the field, the oftener theſe cuttings are repeated, after the graſs is of a ſufficient length for a bite to the animals which may paſture upon it, or for the ſcythe to ſtrike it, ſo much the better.

From this experiment, we may farther infer, that it will be in general perhaps more for the advantage of the farmer, to conſume graſſes of this ſort by paſturage than by cutting; for, as theſe graſſes are always much cloſer at the roots than the top, when we attempt to cut them by the ſcythe, unleſs the field is as ſmooth as a bowling-green, a great deal of the cloſeſt

of

of the pile will eſcape the edge of the ſcythe, and be loſt. And if theſe cuttings are frequently repeated, the proportion that this under-ſtubble will bear to that which is above the ſcythe, muſt be at each cutting very conſiderable. And as the ſtems, when cut over, do not for the moſt part continue to advance afterwards, but die, and are ſucceeded by freſh ſhoots that ſpring up from the roots, all of theſe ſtubbles are entirely loſt; which, in theſe circumſtances, might perhaps amount nearly to one-half of the whole produce of the field; a great part of which would perhaps have been ſaved, if the field had been judiciouſly paſtured upon. But if it can be kept firm on the ſurface, and ſmooth as a bowling-green, ſo as to ſuffer the ſcythe to cut cloſe, perhaps more benefit would be derived from cutting than paſturage, as no parts of the field could eſcape the ſcythe, though it is well known that no art can make animals eat down the graſs of a field quite equally, if it be not greatly over-ſtocked.

VI.

As the value of any plant, conſidered as a food for animals, varies greatly, according to the ſeaſon of the year when it is in perfection—Wanted, A liſt of all the plants that could be moſt commodiouſly employed for food to each different kind of animal at each particular ſeaſon: —That is to ſay, of plants that are in the greateſt perfection in ſummer,—or autumn,—or winter,—or ſpring.

The variations that take place with regard to the growth of plants, at different ſeaſons, have been hitherto but too little attended to by the farmer; ſo that were it not for the obſervations of the floriſt and botaniſt, we ſhould be apt to think, that all plants were naturally diſpoſed to vegetate chiefly in the ſummer-ſeaſon; advancing always with a vigour in ſome degree proportioned to the warmneſs of that ſeaſon, if not deprived of a due degree of moiſture.

But the curious gardener knows well, that, however neceſſary the ſummer's heat may

may be for bringing to perfection the greateſt part of the plants that he cultivates, yet there are ſome plants endowed by nature with ſuch particular powers of vegetating, as to grow with the greateſt vigour, ſome at one ſeaſon, and that alone, and others at another. Thus the common ſaffron-plant begins to advance towards the end of autumn, — ſhoots up with vigour during the winter, and, having attained its full length in the ſpring, gradually declines as the ſummer advances; and dies away entirely in the month of June, when the greateſt part of the plants we rear are in full vigour. The ſnow-drop, — vernal crocus, — tulip, — narciſſus, and many other bulbous-rooted plants, advance early in the ſpring, and decline before midſummer; — as alſo the common chickweed, lambs-lettuce, &c. Carnations, and many other late flowering plants, remain inactive during the beginning of ſummer, and only advance haſtily towards perfection in autumn. The horſe-cheſnut-tree makes its whole annual ſhoots in a few weeks on the firſt approach of ſummer, and has entirely ſtopped its progreſs for that ſeaſon long before the aſh

or the oak have diſcovered the ſmalleſt ſymptom of vegetation: and this laſt, as well as the beech, after having made one ſhort ſhoot in the beginning of ſummer, ſtops entirely for ſeveral weeks, and then, towards autumn, begins anew to vegetate, with much greater vigour than before.

Now, as we have remarked theſe variations in the ſeaſon of vigorous vegetation in theſe plants, is it not probable, that ſomething of the ſame kind may take place with regard to ſome of thoſe plants that are, or may be cultivated by the farmer?—It would ſurely be of importance for him, to know all the peculiarities that take place, in this reſpect, with regard to the plants that it could be in his power to rear.

Some of theſe he is already, in ſome meaſure, acquainted with, and employs for his own emolument,—particularly the turnip; which only grows in a proper manner during the latter part of ſummer, in autum, and in winter. He knows that rye-graſs advances in the ſpring ſooner than clover, or the greateſt part of the other graſſes that he has been accuſtomed to obſerve; with a few a other particulars

ticulars of that ſort. But ſtill ſo much remains unknown in this reſpect, as to be out of all proportion to what he is already acquainted with.

The plants that advance chiefly during the ſummer-ſeaſon, and wither or die in winter, bear ſuch a great proportion to the whole, that the farmer's chief deſire ſhould be to diſcover ſuch plants as continue to vegetate late in autumn, or retain their verdure in winter, or advance very early in the ſpring: and it is probable that theſe are much more numerous than is at preſent imagined. Although I have not had an opportunity of proſecuting this ſubject as I could wiſh, the following hints may perhaps be of ſome uſe.

It would ſeem, in the firſt place, to be worthy the attention of the farmer, to examine all the evergreen perennial plants, with a view to diſcover if any of them could be eaſily cultivated, and profitably employed as food to any of our common domeſtic animals. Among theſe, it is well known that the common whin, furze, or gorſe *, can be reared without any trou-

* *Ulex Europæus.*

ble, and that it furniſhes an exceedingly plentiful and wholeſome food for ſheep during the winter and ſpring. Nor is this plant leſs uſeful for horſes or cattle, when it is properly bruiſed; in which ſtate it is eaten by horſes, in preference to the beſt hay or oats, and probably affords them as rich and wholeſome nouriſhment: —and the fineſt winter-made butter that I ever ſaw, was obtained from the milk of a cow that was fed with bruiſed whins. Whether any other evergreen-ſhrubs might not, on ſome occaſions, be profitably employed for the like purpoſes, deſerves to be enquired into *.

But ſhrubs and trees are not the only evergreen-plants that we are acquainted with; as pinks, and many other garden-plants, not to mention cabbages and other greens, retain their verdure during the winter. All ſuch plants, therefore, ought to be attended to with care, and accurate trials made of ſuch of them as could be profitably cultivated by the farmer. Cabbages have been of late much praiſed as an ineſtimable winter-food for cattle;

* See note, page 17.

and

and although it is more than probable that the encomiaſts of this plant are at preſent too ſanguine in their expectations with regard to it, there is little room to doubt, that this, or ſome hardy kinds of borecole, may be found to be of real utility to the farmer, as a green winter or ſpring-food for cattle, on many occaſions.

But it does not ſeem that any of our culmiferous graſſes have as yet been ſuſpected of being poſſeſſed of any quality approaching to this, in any degree: For, although it is well enough known, that common rye-graſs, and many other ſorts of graſs frequently found in our fields and meadows, ſend out ſome freſh ſhoots during mild weather in winter, ſo as to aſſume a kind of verdure in rich grounds, in a very ſhort time after the froſts are gone; yet it is as well known, that every leaf of this plant is quickly killed by any froſt, and that the verdure we at any time perceive in theſe graſſes during the winter-ſeaſon, is always owing to a freſh vegetation from the roots. This happens to be ſo generally the caſe, that we have, perhaps with too much precipitancy, concluded, that it is univerſally ſo. I have

good reaſon to believe, that there may be ſeveral ſpecies of graſſes whoſe leaves are only in part killed by cold, and ſome that reſiſt the ſevereſt winters we ever have in this climate, without being more affected by it than our common ever-green ſhrubs and trees.

This ſeems to be in a particular manner the caſe with regard to the otherwiſe valuable graſs called ſheeps-feſcue *, which firſt catched my attention by reaſon of the unuſual verdure of a tuft of it which chanced to ſpring up in the midſt of a field of other graſs: And having ſince ſown the ſeeds of it, I find, that this was not merely accidental; but that if it is allowed to advance before winter to a conſiderable length, the leaves retain their verdure during all that ſeaſon, and might be employed at any particular period during the winter or ſpring, as a rich paſture to any animal that could live abroad during that ſeaſon.--I had a ſmall patch of this graſs in winter, 1773; which having been cut in the month of Auguſt or September preceding, was ſaved, from that period,

* *Feſtuca ovina.*

and

and had advanced before winter to the length of five or ſix inches, forming the cloſeſt pile that could be imagined.—And although we had about ſix weeks of very intenſe froſt, with ſnow, and about other ſix weeks immediately ſucceeding that, of exceedingly keen froſt every night, with frequent thaws in the day-time, without any ſnow, during which time almoſt every green thing was deſtroyed, yet this little patch continued all along to retain as fine a verdure as any meadow in the month of May,—hardly a point of a leaf having been withered by the uncommon ſeverity of the weather. And as this graſs begins to vegetate very early in the ſpring, I leave the reader to judge what might be the value of a field of graſs of this kind, in theſe circumſtances.

Purple feſcue graſs * likewiſe retained its verdure much better than the rye-graſs during the winter-ſeaſon; but it had more of its points killed by the weather than the former. It likewiſe riſes in the ſpring at leaſt as early as rye-graſs.

Vernal graſs † ſeems likewiſe to reſiſt

* *Feſtuca rubra.* † *Anthoxanthum odoratum.*

the

the winter-cold longer than many other graſſes:—As does alſo the creſted dogs-tail-graſs *, which ſeems to be ſtill more hardy than the vernal graſs. But whether either of theſe can be conſidered as altogether ever-green, I cannot pretend as yet to ſay, not having had an opportunity of trying them properly by themſelves.

Common rye-graſs, as has been already ſaid, is altogether incapable of reſiſting froſt, and has its leaves killed down almoſt as ſoon as any other of our common graſſes. And although it advances quickly in the ſpring, and furniſhes abundant food as a paſture at that ſeaſon; yet it has ſuch an irreſiſtible propenſity to run to ſeed, that if it be not eaten down very cloſe in the ſpring, ſo as to prevent its ſeed-ſtalks from ever getting up, it becomes in a ſhort time diſliked by all animals, and is at every other ſeaſon of the year, if it has been ever allowed to puſh up its ſeed-ſtems, of little value as a paſture-graſs.

Soft graſs †, upon damp ſoils, is ſtill more early than rye-graſs; and forms a

* *Cynoſurus criſtatus.* † *Holcus lanatus.*

paſture-

paſture-graſs, that may perhaps, in ſome reſpects, be very valuable.

All the tribe of *Poa*-graſſes have their leaves entirely killed by a very ſlight degree of winter-cold—but they begin to vegetate pretty early in the ſpring.

But the earlieſt vegetable that I know, is the myrrh-plant * (wild cicely or cow-weed) which ruſhes up in the month of March with amazing rapidity; and may be cut twice at leaſt, if not thrice, before red-clover could be cut once. Cows and other cattle eat it very greedily, after they have been a little accuſtomed to it; although they do not always take to it at firſt very readily.

It deſerves to be remarked, however, that this plant ſeems to be chiefly valuable in the *ſpring*, as it ſeems to advance more quickly then, and during the firſt part of ſummer, than towards the end of it.—About autumn, its vegetative powers ſeem to be much abated.

In a few years, I ſhall be more able to ſpeak with certainty of the qualities and

* *Chærophyllum ſylveſtre.*

beſt

beſt methods of cultivating this and ſome other plants, as it requires ſome time to bring experiments relating to them to a proper period *.

And the *epilobium*, or common willow-herb, may be employed for the ſame purpoſe, about the ſame early period.

Burnet † retains its verdure pretty well during the winter-months; but affords ſuch ſcanty crops, as hardly to be worth the attention of the farmer.

All theſe graſſes ſpring up early, and may be employed with moſt advantage as winter or ſpring-fodder. There are, however, others that do not make their appearance till late in the ſeaſon, but on ſome accounts may be deemed very valuable. Of this claſs is the milk-wort, *vulgo* ‡, and all the claſs of perennial peaſe and vetches; which ſeldom appear above-ground till the month of May; but con-

* My experience ſince the above was written, tends ſtrongly to confirm what is ſaid in the text. The Myrrh-plant is a valuable article early in the ſpring; but towards the end of the ſeaſon, it vegetates very feebly.

† *Pimpinella ſylveſtris.* ‡ *Aſtragalus glycyphyllos.*

tinue

tinue to yield a great burden of valuable graſs during the remaining part of the ſeaſon, till the winter froſts ſtop them. If theſe, therefore, were ſowed along with ſuch plants as either ſtand the winter, or advance early in the ſpring, the farmer would have it in his power to reap the benefit of his early paſture for his cattle or ſheep, without damaging his crop for the remaining part of the ſeaſon; as theſe would only begin to advance after the others were wholly conſumed. And as moſt of theſe plants are equally proper for being cut and made it into hay, or for being paſtured upon, it puts it in the farmer's power to employ them in either of theſe two ways that may beſt ſuit his conveniency.

I have not as yet been able to diſcover any plant that could be cultivated by the farmer, which advances only during the winter-ſeaſon: but, as we yet know little or nothing with regard to this article, it is to be hoped, that future enquirers will make many valuable diſcoveries relating to it.

VII.

Some plants ſpring up quickly, and ſoon arrive at perfection; while others advance more ſlowly, and are long in attaining maturity:—Some periſh in a ſhort time; and others, when once well eſtabliſhed, remain almoſt for ever without decay. It would, therefore, be neceſſary for the farmer who wiſhed to improve his ground to the utmoſt, to be acquainted with the natural period of exiſtence, if I may uſe that phraſe, of every plant that it might be in his power to cultivate. Required —A liſt of plants conſidered in this point of view.

Naturaliſts have already eſtabliſhed a few diſtinctions among plants in this reſpect;—but theſe are by no means ſo far extended as the farmer would require. For almoſt all that they have done, is to reduce plants to the three general claſſes of annuals, biennials, and perennials;—under which laſt head are arranged all

thoſe

thoſe plants which endure more than two years. But the experienced farmer knows many plants which have but a ſhort period of life, although they exceed this term. Broad clover uſually laſts one or two years good; but ſeldom ſurvives that period:—And rye-graſs commonly laſts five or ſix years; but for the moſt part diſappears ſoon after that time:—Sainfoin (St. Foin *vulgo*) laſts from twelve to twenty years;—as does alſo lucerne in a favourable ſoil; but both decline at laſt, and die away: whereas milk-wort, and all the claſſes of perennial tares and vetches, ſeem to be perennial in the moſt extenſive ſenſe of the word;—as no period can be aſſigned to their duration. This is probably the caſe with many kinds of meadow-graſſes, although we are as yet ſo little acquainted with theſe, as not to be able to point them out with certainty.

VIII.

Some plants grow beſt upon ground that has been lately in a tillage, and diſappear after a ſhort time, if it is not again ploughed

ploughed up; and others only begin to flouriſh after the ground has remained ſeveral years in graſs. Required—A catalogue of all the plants that may be reduced to each of theſe claſſes.

Common couch-graſs *,—knot-graſs †, and earth-nut ‡, only appear while the ground is in culture,—or, at moſt, for a year or two after it has been laid into graſs; after which they uſually diſappear, and are no longer ſeen till the ground has been again in tillage for ſome time. And it is in this way alone that the farmers, in ſome of the worſt cultivated parts of Scotland, know how to get rid of theſe deſtructive weeds. This is likewiſe the caſe with the common ſmall-leaved ſorrell ‖, mug-wort §, and ſome other plants that are often found in fields, that have been long kept under a bad kind of culture:—But theſe require a longer time to be fully eradicated, than ſome of the former plants. On the other hand, the

* *Triticum repens.* † *Avena elatior.* ‡ *Bunium bulbocaſtanum.* ‖ *Acetoſella.* § *Artemiſia vulgaris.*

common milk-wort, yarrow or mil-foil, ſheeps-feſcue, and ſeveral other kinds of graſs, only appear after the ground has been for ſome conſiderable length of time in graſs.

IX.

Is it always the caſe, that thoſe plants which fatten an animal moſt quickly, promote likewiſe in the higheſt degree the healthineſs and vigour of that animal?—If they do not, Required—A catalogue of ſuch vegetables as tend moſt powerfully to promote the vigour of ſuch animals as are uſually employed by man for hard labour; ſuch as oxen, horſes, &c.

Thoſe who keep running-horſes and fighting-cocks, ſeem to be fully convinced that great muſcular ſtrength, and vigour of ſpirit, are often promoted by certain kinds of food, that do not much increaſe the fat of the animal. In general, dry

food ſeems to be leſs apt to produce fat, than ſuch as is more ſucculent; while it has a greater tendency to produce ſtrength and vigour. Peaſe, and other leguminous * grain, have a greater tendency to increaſe the quantity of fat and juicy fleſh, than oats; although this laſt is, ſeemingly with good reaſon, ſuppoſed to promote muſcular ſtrength in a higher degree.—In Arabia, where the inhabitants beſtow a ſtill greater degree of attention upon their horſes than with us, they are ſaid to feed them with a paſte made of dates and camels-milk, which contributes to make them active and vigorous, without inclining them to grow fat.—In Portugal, it is common to feed their horſes with cheſnuts, as theſe are cheaper than barley or oats, which are found to fatten them very quickly, although it does not inſpire them with ſo much life and vigour as thoſe kinds of grain would have produced.—It is obſerved by Mr. Kalm, that in North America, horſes are very fond of apples; but the inhabitants do not eſteem

* Leguminous grain, is ſuch as is incloſed in a pod or capſule, as peaſe, beans, vetches, tares, &c.

them

them a wholeſome food.—Carrots have of late been propoſed as a valuable feeding for horſes; but it is not as yet well known in what claſs they ought to be ranked, with regard to the invigorating quality; although it is pretty certain that they fatten them readily.—Potatoes likewiſe have been employed on ſome occaſions for the ſame purpoſe, and are ſtill in the ſame ſtate of uncertainty.—Turnips are eaten by ſome horſes; but how far they are either invigorating or wholeſome in other reſpects, is not ſufficiently aſcertained.—Bruiſed whins ſeem greatly to promote the health of this animal, at the ſame time that it fattens, and increaſes its ſtrength.—But experiments are ſtill wanting to aſcertain, with preciſion, the comparative value, in this reſpect, of theſe and many other kinds of food, that may be given to this moſt uſeful animal.

X.

Do ſuch plants as fatten an animal quickly, or tend in a high degree to excite ſtrength and animal vigour, always

and neceſſarily promote its health, ſo as to tend to prolong the life of the animal? If they do not, Required—A catalogue of ſuch plants as would, in the moſt effectual manner, tend to prolong the life of each ſpecies of domeſtic animals.

It would ſeem probable, that plants which tend too much to fatten the animal, would, in many caſes, engender diſeaſes that would ſhorten its natural period of life.—This ſeems to be pretty certainly the caſe with regard to ſheep; as it is found that theſe fatten more quickly in rich vallies, which produce abundance of luxuriant ſucculent graſs, than on higher ground, where the graſs is drier and firmer; although they can be made to live to a much greater age on the latter paſture than on the former. And as it is probable the ſame thing takes place with regard to other animals, it might, on many occaſions, be for the benefit of the farmer, to know with accuracy the diſtinction that takes place in this reſpect.

XI.

XI.

Some plants are noxious to one ſpecies of animals, which are wholeſome and nouriſhing to others. Required—A liſt of plants that are poiſonous to each ſpecies of domeſtic animals, arranged according to their degree of virulence;—diſtinguiſhing thoſe that are more or leſs ſo at any particular ſeaſon, and comparing the effects that each may have upon other domeſtic animals.

Long-leaved water-hemloc* is poiſonous to cows; but wholeſome and grateful to the goat.—Monks-hood† is pernicious to goats; but not at all hurtful to the horſe.—Sheep, horſes, and cattle are poiſoned by the broad-leaved kalmia‡, which affords a grateful food to goats and deer. Parſley is deadly to ſmall birds; while ſwine eat it with ſafety.—Pepper is mortal to ſwine, and wholeſome to poultry; and poultry are killed by common ſalt, which tends to fatten cattle, ſheep, and deer.

**Cicuta viroſa.* †*Aconitum pyramidale.* ‡*Kalmia latifolia.*

Other plants which are not entirely poiſonous, are, nevertheleſs, refuſed by ſome animals, although they are readily eaten by others.—Horſes, cows, and hogs, refuſe to eat the common ragwort*, which is greedily devoured by ſheep, if they have acceſs to it, in the beginning of ſummer, before the ſtalks are hardened.—Cows refuſe to touch the meadow-ſweet†, which is highly reliſhed by goats.—Horſes eat the water-mint‡, muſk-thiſtle‖, and many other aquatic plants, which cattle refuſe to taſte; and, on the contrary, horſes refuſe to eat angelica, looſe-ſtrife¶, geranium, &c. that are freely eaten by cattle.

The roots, the leaves, the ſtalks, the flowers, and ſeeds of the ſame plants, are very often endowed with medical qualities differing very much from one another; ſo that the ſame plant may be wholeſome or pernicious, agreeable or diſagreeble, to the ſame ſpecies of animals, at different periods of its growth. Lettuce, while young, is a mild, agreeable, and whole-

* *Senecio Jacobæa.* † *Spirea ulmaria.*
‡ *Mentha aquatica.* ‖ *Carduus nutans.*
¶ *Lyſimachia vulgaris.*

ſome

ſome ſallad to man: But when it arrives near maturity, its ſtalks contain an acrid milky juice, that approaches to the nature of a poiſon. Young nettles and mug-wort are eaten as agreeable pot-herbs by the country-people, in the ſpring; but, in a ſhort time, they become rank in taſte, and altogether unfit for that purpoſe.—Sheep greedily devour, and are nouriſhed by, the ragweed when young, but reject it when full-grown.

Some plants, although equally noxious to animals when young, as when more advanced in growth, yet being then more tender, and leſs rank in taſte and ſmell than they afterwards become, are ſometimes eaten at that ſeaſon, and prove fatal to the cattle that graze the fields where they abound, although they are rejected with care at other ſeaſons. Linnæus remarks, that the cattle which paſtured in the meadows near Torneo, in Lapland, died in great numbers in the ſpring, in conſequence of eating at that ſeaſon the tender leaves of *the long-leaved water-hemloc**, which they at other ſeaſons care-

* *Cicuta viroſa.*

fully avoided, and that therefore they then found the paſtures ſound and wholeſome.

The Yorkſhire ſanicle * is uſually eſteemed a poiſon for ſheep; on which account, it has obtained its vulgar name, *rot-graſs*. But ſheep never bite the leaves of this plant, as any one may remark, who will carefully obſerve the plant at all ſeaſons, on fields where ſheep are allowed to paſture. But I have ſome reaſon to ſuſpect, that they eat the flower and ſtalk; ſo that *if it is at all* poiſonous to them, it is probably ſo at its flowering ſeaſon. It grows on damp grounds, which uſually produce other plants that are unfriendly to ſheep, which may have helped to give this its name, as its leaves are more conſpicuous than thoſe of moſt other plants.

Numberleſs other plants are more palatable and nouriſhing to one ſpecies of animals than to another, or more or leſs wholeſome or noxious to them at one particular period of their growth than at another. But as the farmer is not as yet in general acquainted with theſe, the loſs

* *Pinguicula vulgaris.*

that

that is thus daily ſuſtained by the public is very great; ſo that it is of much importance to have this ſubject fully inveſtigated*.

XII.

Are there any plants that tend to promote the generative faculty of animals, and render them more prolific than others? If there are, What are the plants that promote this in the higheſt degree, with regard to each particular kind of animals?

It is remarked by all travellers, that the animals in Egypt are in general more prolific than in any other part of the earth; which is by them uſually aſcribed to the influence of the waters of the Nile; although I would rather be diſpoſed to believe, that ſome native plants of the country, joined to the mild temperature of the climate, tended to produce this effect.

* For the means of rendering ſome plants that are naturally noxious to domeſtic animals a nutritious food to them, ſee vol. iii. p. 590.

Are

XIII.

ARE there any plants that have a natural tendency to excite animals to venery at any ſeaſon that they may be eaten?—If there are, What are the plants that produce this effect upon each particular ſpecies of animals?

Many reaſons occur to make it appear probable, that there are ſome plants endowed with this peculiar quality: and although it would be of great importance to the farmer, on many occaſions, to know theſe, yet, if any of them are at all known to ſome individuals, that knowledge is by no means ſo general as it ought to be.

Thoſe farmers in England, who are in the practice of rearing houſe-lambs, are ſaid to have it in their power to make the ewe take the ram at any ſeaſon they may incline, by making them feed upon ſome plants they keep for that purpoſe, commonly ſaid to be thyme, or ſome other aromatic plants. But, as I never had an

opportunity

opportunity of being fully ſatisfied as to this fact, it is, perhaps, neceſſary to ſuſpend our belief of it till it is duly authenticated *.

I have likewiſe been informed, that, in ſeveral parts of Scotland, the inhabitants are in the practice of pulling a certain plant that grows upon uncultivated fields, that they diſtinguiſh by the name of *bulling-graſs*; a handful of which they give to their cows at any time they wiſh them to take the bull; which, it is ſaid, never fails to produce the deſired effect. But as I neither know if this fact can be certainly relied upon, nor the name of the plant, it were to be wiſhed that ſome of thoſe who live in the place where this is practiſed, would take the trouble of informing or undeceiving the public with regard to this circumſtance.

* From facts that have come to my knowledge ſince the above was written, I am inclined to believe that more is to be aſcribed to the *breed* of ſheep, than any peculiarity of management. But this alſo requires to be proved. *Note to the fourth Edition.*

XIV.

THE milk of domeſtic animals is of great importance to man; and, therefore, every particular that relates to it, ought to be examined with attention. And as it is well known, that ſome plants make the animals that feed upon them yield a greater quantity of milk than others would have produced--Required—An exact liſt of ſuch vegetables as are endowed with this quality in the higheſt degree, with regard to each ſpecies of domeſtic animals.

Chickweed * is by many thought to cauſe cows to give an extraordinary quantity of milk.—Spurry, or yarr †, as it is called in ſome parts of Scotland, is thought by ſome to poſſeſs the ſame quality in an eminent degree; on which account, it is ſometimes cultivated in Holland, as an uſeful plant, although it is here found to be a very pernicious weed. Cattle, indeed, prefer it, when green, to almoſt any

* *Alſine media.* † *Spergula.*

other

other plant; and ſheep are exceedingly fond of it.

XV.

It is likewiſe probable, that ſome plants may tend to make the milk thicker, and produce a greater proportion of cream than others do. If this is ſo—Required—A liſt of ſuch plants as produce this effect, compared with thoſe that promote the quantity of milk.

XVI.

Some plants communicate to the milk of the animal which feeds upon them, a very diſagreeable taſte; while others, on the contrary, give it a more pleaſant flavour.—Required—A liſt of ſuch plants as produce the one or the other effect, with regard to each ſpecies of domeſtic animals.

It has been often remarked, that cows which fed upon certain paſtures, afforded butter of a richer and more agreeable taſte

than could be obtained from other paſtures; which would ſeem to be occaſioned by certain plants abounding more in the one of thoſe paſtures than in the other:—Yet I have heard of no accurate experiment that has hitherto been made, to aſcertain, with any degree of certainty, what were the particular plants that either tended to debaſe it in the one caſe, or improve it in the other.

It is, indeed, true, that the taſte communicated to milk and butter by ſome plants, is ſo exceedingly ſtrong and diſagreeable, that no perſon could avoid remarking it. Of this kind are turnips, which communicate to milk a nauſeous taſte, that is extremely diſagreeable to moſt people *.

Wild

* If the milk is to be uſed ſweet, this diſagreeable taſte may be conſiderably diminiſhed by boiling it. Other means of ſweetening milk have been attempted, that are more troubleſome and expenſive, and not more efficacious.

It may be of conſequence to remark, that, in general, that part of the milk which comes firſt from the cow when milked, is much more ſtrongly impregnated with any peculiar flavour than what comes laſt; and as that is alſo the thinneſt and leaſt valuable part of the milk, it may be

taken

Wild garlic, hemloc, and ſome other plants, likewiſe affect the milk with their own diſagreeable flavours.

But

taken away, and applied to any other inferior domeſtic uſe, without diminiſhing, in any ſenſible degree, the products of the dairy.

By thus ſeparating the firſt from the laſt drawn milk, the quality of the butter will be at all times very much improved, and the quantity hardly diminiſhed in any ſenſible degree. For I have found, by experiment, that a ſmall quantity of milk, which comes the laſt from the cow, contains about ſixteen times more cream than an equal quantity that comes the firſt at once milking,—and that the cream is alſo of a much richer quality; the colour ofthe one being of a deep orange, while that of the other is as white as the paper on which I write.

Hence we may infer, by way of corollary, that no method of rearing calves can be ſo beneficial for a dairy, as that uſually practiſed in the Highlands of Scotland, where it is the univerſal cuſtom to allow the calf to ſuck its mother for ſome time, and then drive it away, and milk what remains in the cow's udder. By this means, the expence of milking is much abridged—the calves are ſuckled more kindly than by the hand—and the quantity of butter not much diminiſhed: But the greateſt advantage is, that the butter is thus rendered of the fineſt quality that could poſſibly be deſired. It has, indeed, been often remarked, that well-made Highland butter is of the fineſt quality that can be found any where; but this circumſtance, which contributes ſo much to its perfection, has, I believe, been over-looked.

It

But the moſt uncommon inſtance of this kind, that has come to my knowledge, was a caſe that happened to a widow lady of my acquaintance, whoſe cows, at one particular time, yielded milk that was ſo ſtrongly impregnated with a peculiar kind of bitter taſte, that no perſon could uſe it in any way; which ſurpriſed her a good deal, as the cows had often been allowed to paſture on the ſame field, without having had their milk ſenſibly impregnated with that diſagreeable taſte. Upon examining into what might be the probable cauſe of that ſingular phænomenon, it was diſcovered, that as the cows had been kept upon another field for ſome time before, the graſs upon this field had been allowed to advance pretty far without being cropt. And as it was full of the rough-leaved dandelion*, which was then in full flower, it was imagined the peculiar flavour of the

It deſerves to be noted, that there is not near ſuch a difference between the firſt and laſt drawn milk of an old calved cow, as of one that has but lately calved.

* *Leontodon hiſpidum.* This plant is ſometimes called Hawkweed, and ranked by Botaniſts under the generic name of *Hieracium.*

milk

p 264 Tab. 1



Rough leaved Dandelion

J. Mdt.

milk was occaſioned by the cows' cropping theſe flowers in greater quantities than at any other time; which appeared the more probable, as it was obſerved that this bitter taſte was not perceived in the milk, after the cows had remained in that field for a few days, when the flowers of this plant were almoſt entirely conſumed.

As I have not had an opportunity of trying any experiment, that could aſcertain the truth of this conjecture, I would not deſire that it ſhould be relied upon as an undoubted fact; but from the circumſtances above narrated, it ſeems extremely probable, that the flowers and flower-ſtalks of plants are ſometimes endowed with qualities, in this reſpect, very different from thoſe of the leaves; which ought to afford a leſſon of cautious circumſpection to the experimental farmer.

Although it is by no means certain that plants, in all caſes, communicate the ſame flavour to milk, as that with which they affect our palate in their natural ſtate, yet as we know that this ſometimes

happens, it may, perhaps, in ſome caſes, aſſiſt us a little in diſcovering ſuch plants as may probably affect it, either with an agreeable flavour, or the reverſe,—ſerving, at leaſt, to point them out as proper ſubjects for future experiments, intended to elucidate this point. With this view, having chewed, at different times, many different kinds of graſſes that grow naturally in our fields and meadows, I was particularly ſtruck with the agreeable aromatic flavour of the common vernal graſs*, which ſeemed to approach ſo nearly to the rich almond-like flavour which is always obſervable in the fineſt butter, that I reſolved to gather ſome of the ſeeds, and ſow them by themſelves, with a view to feed a cow for ſome time upon this plant by itſelf, to diſcover what effect it would have upon the flavour of the milk. The ſeeds are ſaved, and are ſowed; but it will neceſſarily be a conſiderable time before the reſult can be with certainty diſcovered †.

* *Anthoxanthum odoratum.*

† After trial, I found that this graſs yielded ſuch a ſcanty crop, as not to afford a proper quantity of provender to make the experiment.

XVII.

Some plants communicate to milk a rich yellow colour, and others render it pale, and almoſt colourleſs.—Required, a liſt of each of theſe claſſes of plants, with reſpect to all the different claſſes of domeſtic animals.

It is commonly imagined, that the butter which is of the deepeſt yellow colour, is alſo the richeſt in taſte:—And although it ſeems probable, that this may be in general the caſe, and that many of the plants that anſwer the one of theſe intentions, may anſwer the other purpoſe alſo, yet it is by no means certain that theſe are not ſometimes disjoined. For I have often met with butter of a very rich flavour, with little colour, and the reverſe; ſo that it would be of conſequence to the farmer, to have a liſt of the plants poſſeſſing theſe two qualities ſeparately made out.

It is a vulgar prejudice, founded upon

very inaccurate obſervations, that plants which produce yellow flowers, in general tinge the butter with their own colour; than which hardly any opinion could be more abſurd. Yet, upon no better foundation reſts the general prejudice in favour of paſtures that abound with the butter-flower*, which has evidently derived its name from that circumſtance; although more accurate obſervations ſhow, that ſo far is it from being beneficial to cows, that they refuſe to taſte the plant, till they are reduced to the greateſt diſtreſs by hunger.

XVIII.

Probably, ſome plants increaſe the richneſs of the milk, but do not produce a proportional quantity of cream;—ſome certainly make it afford cheeſe of a finer quality, and probably in greater quantities, than others. If ſo—Required, a liſt of ſuch plants as produce the fineſt cheeſe, as well as of thoſe that cauſe milk to yield the greateſt quantity of it.

* *Ranunculus repens,—bulboſus.*

It has been often remarked, that if milk be of a very thick conſiſtence, the cream is not ſo perfectly ſeparated from it as if it were thinner:—That is, if water be added to it, more cream will be ſeparated from it, than if it had got no mixture. But in that caſe, both the butter, cream, and whey, are poorer in quality, than if it had not been mixed: And as milk, naturally thin, is nearly in the ſame ſtate, as thick milk when mixed with water, it ſeems probable, that if any plant tends to render the milk thicker, it will not afford an additional quantity of cream proportioned to the richneſs of the milk *.

But if this is converted into cheeſe, we may expect that it would afford a greater

* In the laſt note, I have taken notice of the difference between the firſt and laſt drawn milk. After the whole of the cream was ſeparated from the laſt drawn, the milk that remained was thicker and richer, in every reſpect, than the cream of the firſt drawn. The milk of the firſt drawn reſembled water coloured with milk:—that of the laſt was thick like cream; and the whey of it, when made into cheeſe, was richer than the milk of the other.

proportion of curd, and that of a richer quality: For goat's milk, which ſeparates no cream, yields a very large proportion of curd, as well as the richeſt whey:—Sheep's milk, which is likewiſe thick, and ſeparates little cream, comes next to it in both theſe qualities:—after theſe, in all thoſe reſpects, comes cow's milk; and, laſt of all, the milk of mares and aſſes, which are thinner, and more watery than any of the others.

It may likewiſe happen, that ſome plants, which cauſe butter to have a very diſagreeable taſte, may probably yield cheeſe of an uncommonly agreeable flavour; as we require a more acrid taſte in the laſt than in the firſt. This ought, therefore, to be attended to.

XIX.

It is imagined, that ſome plants may communicate to the fleſh of animals that are fed upon them, a peculiar kind of flavour, which may be in ſome caſes agreeable, and in others the reverſe.—A liſt of the plants that tend to produce the one

or the other of theſe effects, would therefore be a valuable acquiſition to the farmer.

Turnips are uſually thought to communicate a ſlight kind of nauſeous taſte to the beef or mutton that has been fatted by them; and mutton that has been fed upon dry hills abounding with heather*, is commonly ſaid to have a peculiarly agreeable reliſh: But the fleſh of ſheep that have been fed upon mug-wort †, is ſaid to be of a bitter taſte. The hogs that are fed upon the acorns that they gather in the woods of Germany and Poland, are reckoned to yield the fineſt bacon of any in Europe; and it is to this circumſtance that moſt people aſcribe the ſuperior excellence of Weſtphalia hams, which have long retained their celebrity. —But the bacon of Virginia, where the hogs are fatted upon Indian corn, apples, and peaches, is by many deemed ſtill ſuperior to theſe;—and that which is fed

* *Erica communis.* † *Artemiſia vulgaris.*

upon grains or dairy wash, is reckoned much inferior to all of them.—But as it is not altogether certain, whether the difference in the quality of the meat, produced in these different places, is to be entirely attributed to the flavour communicated by the food, or if it may not, in some measure, be owing to the nature of the animal itself, or to some other circumstance not usually attended to; we must here, as in other cases, wish for a course of accurate experiments.

XX.

As many unsuccessful attempts have been made to introduce plants or animals from one country into another, and as some attempts of this sort have succeeded as well as could have been wished for, even when they were brought from very distant countries, it would be of use to the farmer, before he attempted any thing of that sort, to be made acquainted with the nature of the climate from which he intended to bring them, as well as the particular nature and economy of such

ſuch plants or animals as he wiſhed to encourage, that he might be able to give a probable gueſs, before-hand, whether ſuch attempts could be attended with ſucceſs or not.

The ſubject enquired into in this diſquiſition, may perhaps be deemed very unintereſting to the farmer; and yet, upon a nearer inſpection, it will probably be allowed, that had this been duly attended to by philoſophical promoters of agriculture, many improvements might have taken place in this art, with which we are as yet entirely unacquainted; and many unſucceſsful attempts might have been prevented, that have tended to diſtreſs individuals, and, of conſequence, to hurt the community: For, theſe unſucceſsful attempts naturally tend to diſcourage others from trying experiments of the ſame kind, even where there may be a much greater probability of their being attended with ſucceſs. The following hints, therefore, tending in ſome meaſure to remove this difficulty, however imperfect, it is hoped,

will be received with indulgence by the Public.

Nature ſeems to have intended, that every climate ſhould be peculiarly fitted to produce thoſe ſubſtances that were beſt adapted to remove thoſe diſeaſes, or guard againſt the inconveniences, to which it was moſt expoſed. Hence we find, that animals producing fur, chiefly abound in cold regions;—the cloſeneſs and fineneſs of the pile of theſe being always in proportion to the cold of the region they inhabit, or the rigour of the ſeaſon in which they are caught*. Siberia, and the Northern parts of America, abound with animals that afford the fineſt fur, while hardly any of theſe are found in more Southern regions:—And the fur of the hare or rabbit is of much leſs value in the ſummer than winter-ſeaſon, when the cold is more intenſe.—Hence we may in general conclude, that it is highly probable, that an

* I find reaſon now to doubt, if this fact be ſtrictly juſt;—but as it does not much affect the general concluſion, and as it is not yet proved to be entirely unfounded, it is ſuffered to remain as it originally was written. *Note to the fourth edition.*

animal

animal which produces a thick and deep fur, will bear to be tranſported from one temperate region to another, that is a little colder, without ſuffering much injury in its perſon, and probably to the melioration of its fur.

But as countries that are raiſed to a great height above the level of the ſea, are extremely cold in proportion to others that are lower, it may often happen that a particular diſtrict, even in the torrid zone, may be in ſome caſes colder than one in the frigid zone.—The Andes of America, even under the line, are conſtantly covered with ſnow; whereas the heat at Torneo, in Lapland, is ſometimes ſo intenſe, as hardly to be ſufferable by man. Hence it may happen, that if a plant naturally grows, or an animal delights to feed in theſe elevated regions in equatorial climates, it may with good reaſon be ſuppoſed to be capable of being tranſported with ſafety to a much higher latitude, unleſs under particular circumſtances.

To give an example of the uſe that may be made of theſe obſervations by the farmer.—Let it be remembered, that as the

the wool of ſheep is a particular and moſt valuable kind of fur, he has reaſon to ſuppoſe, that, like other animals of the ſame claſs, the ſheep is naturally fitted for cold climates; and that its wool will be meliorated by any degree of cold in which the animal can be made to live, and will be made worſe if it is kept in a warmer climate. Experience ſhows, that although ſheep live in the Weſt-Indies, yet, inſtead of wool, which they formerly carried in Europe, they there only afford a thin coat of long coarſe hair, which again becomes wool after the ſheep is brought back to Europe *.

Again—As the fleece is coarſer that grows in a warm climate, or during the ſeaſon of warm weather, than where it is colder, we may expect, that the fineſt fleeces will be produced upon ſuch ſheep as live all the year round in a cold region, where there is as little variation of climate as poſſible. On the Andes of America, where there is little variation of ſeaſon,

* This fact alſo, though very generally believed to be undeniable, I have now very good reaſon to believe is unfounded. *Note to the fourth Edition.*

the

the wool, both of the ſheep that were carried from Europe, and of their own native ſheep called Lama, and its varieties, is extremely fine.—In Perſia, where they drive their ſheep to the cool mountains in ſummer, and bring them to the vallies only during the winter, and thus keep them during the whole year round in a cool region, their wool is remarkable for its fineneſs, even to a proverb: and in Thibet, a ſtill colder country, the ſpecies of goat called Touz, yields a ſtill finer fleece than the Perſian ſheep. In Spain, where a ſimilar practice prevails as in Perſia, it is well known, that they produce the fineſt wool in Europe. But in the Northern kingdoms of Ruſſia, Sweden, and Denmark, where the ſheep are expoſed to violent heats during the ſummer-ſeaſon, we do not find they have ever had ſuch fine wool, as has been reared in the forementioned places.—But, from our inſular ſituation, which moderates alike the heat of ſummer, and cold of winter, Great Britain and Ireland enjoy a greater equality of climate, than any continential country in the ſame latitude can do; and

are therefore naturally fitted to produce finer wool than any of these, with an equal degree of skill and care in the management of this most useful animal.

From the above induction, it would likewise seem probable, that the Lama, Guanacoe, and Paco, of America, which are never found in the low and warm regions;—the sheep of Persia, which constantly seek the cold mountains;—the goat of Thibet, and other animals of that kind, might be reared with success in the climate of Great Britain;—although it is probable that they might be much hurt by the summer heats of more northern or even continental regions.

On the other hand, these last-named countries are naturally fitted to rear some products that our insular situation would never permit us to cultivate with profit. Many persons who have been in Holland, Germany, or Russia, during the winter-season, where they experience a degree of cold far greater than is ever known in any part of Great Britain, fondly imagine, from this circumstance, that every plant which can be brought to perfection in

these,

theſe, as they think, colder countries, could be equally well reared in Britain ;— never adverting, that in the ſame proportion as their winter colds exceed our's, their ſummer heats are more intenſe. Hence we find, that vines can be reared on the Continent to great perfection, and come to maturity in many latitudes more northern than our's, although the many unſucceſsful attempts that have been made to cultivate that plant in this iſland, afford the ſtrongeſt preſumption that it can never be done here with profit, unleſs on ſome very peculiarly favoured ſpot.

The bee is an inſect, the active induſtry of which hath long been converted by man to his own emolument ;—but with different degrees of profit, according to the nature of the climate that he inhabits.—Endowed with a degree of inſtinct, that, in ſome caſes, ſeems to approach towards reaſon, this little animal, if tranſported to a Tropical region, where no viciſſitude of climate is ever experienced ; as it can there at all times find food in abundance from the flowers that conſtantly ſpring up around its habitation,

is under no neceſſity of laying up ſtores for the winter; and therefore lives from day to day on what it collects from abroad, ſo as to diſappoint the hopes of the poſſeſſor of the hive, if he wiſhes to make profit of the honey that the bees may have provided *. But in Polar regions, where the rigour of the winter is ſo great as to prevent this delicate inſect from obtaining any food at that ſeaſon in the fields; with a wiſe forecaſt, it fills its hive in ſummer with large ſtore of food, to ſupply its wants during that rigorous ſeaſon; —which man greedily ſeizes for his own purpoſe. In vain, therefore, would the inhabitants of equatorial regions hope to make profit of this ſurpriſing inſect, while thoſe in a more northern climate may have a reaſonable proſpect of ſucceſs.

But this is not the only reſpect in which the climate has an effect upon this induſtrious and delicate creature: For, as it is benumbed by a moderate degree of

* I have likewiſe learnt of late that honey of a very fine quality is produced in Jamaica, ſo that this beautiful popular hypotheſis, ſeems, like many others, to have been adopted without ſufficient examination. *Note to the fourth Edition.*

cold,

cold, without being deprived of life; if the country in which it is placed does not experience a degree of cold ſufficient to produce this effect, while at the ſame time it is ſo intenſe as to kill the delicate flowers upon which it might feed, the animal is neceſſarily active too long; in which ſtate it muſt eat: And having thus in a ſhort time conſumed all its ſtores, it muſt inevitably periſh for want of food, before the approach of ſummer. But if the cold of the winter be ſufficiently intenſe and conſtant, it remains during the whole of that ſeaſon, in a ſort of lethargic torpor; in which ſtate it has occaſion for much leſs ſuſtenance of any ſort, than when in a more active ſtate: So that when it is revived by the returning heat of the ſpring, it finds abundance of food, ſtill remaining in the hive, to keep it alive and ſtrong, till the flowers ſpring up, and the ſeaſon becomes mild, when it begins afreſh the labours of the year.

Hence it appears evident, that the climate of the Continent, in which the heat of the ſummer and cold of the winter are alike uninterrupted, is much better adapt-

ed to the rearing this uſeful inſect, than that of an iſland, where the heat in ſummer is leſs conſiderable, and the ſeaſon more variable, and where the cold in winter is often interrupted by ſudden gleams of heat, that frequently excite the bees to become active long before it is ſafe for them to go abroad in ſearch of food. For which reaſon, the inhabitants of Poland and Germany have naturally fallen into the practice of raiſing great quantities of honey and wax, which many in Britain have attempted with far leſs ſucceſs.—Nor can it be expected that in our climate, very great profits can be made of this inſect; although it may be hoped, that in time the Northern colonies in America will avail themſelves of the advantages that their climate will afford them in this reſpect, as ſoon as their country ſhall be ſufficiently cleared of wood.

From not duly attending to the variations that neceſſarily take place between the nature of the climate of an extenſive continent, and that of a ſmall detached iſland, many have been diſappointed in

their

their hopes of rearing ſeveral American trees and ſhrubs in Britain; and have been much ſurpriſed to find them killed by our winter froſts, ſeeing they ſuffer every year, in their own climate, a degree of cold much more intenſe than we ever experience, without ſuſtaining any damage from it.—But although the winter cold be there, indeed, much more intenſe than with us, it is likewiſe more invariable, and the ſeaſon in every reſpect more conſtant; ſo that there, from the time that the vegetation is ſtopped in autumn, till it begins vigorouſly in the ſpring, the ſap is never once put into motion:—whereas in Britain, the mild weather that we frequently experience in the middle of winter, very often ſwells the buds at that ſeaſon, which gives them ſuch a tender ſenſibility, as makes them unable to reſiſt the ſevere froſts that often follow; ſo that they on this account periſh with us entirely, although they were capable of reſiſting a much more intenſe degree of cold in their own native climate.

Many likewiſe have been much diſap-

pointed at finding the roots of certain garden-plants killed by the winter-frosts in Great Britain, which are seldom hurt by the much more intense cold that is experienced in Russia, and many parts of Germany, from whence we have endeavoured to introduce them, by not having sufficiently adverted to the difference of the two climates: For, as in these cold continental countries, the earth is constantly covered with snow, from the beginning of winter, till the genial heat in the spring melts it, the plants are by these means more effectually preserved from the intense cold, than by any other covering that we could give them;—insomuch, that grass advances, and flowers spring up, under its protection, so as to appear in full blossom as soon as the snow is dissolved.

On the other hand, furze, broom, and heath, three plants which flourish in our climate, so as to become in many places a nuisance, cannot be preserved alive in Russia, without artificial cover; hence it is, that in those regions these plants are unknown. Even the hawthorn, which forms our hedges in the bleakest parts of Britain,

is a green-houſe plant in Ruſſia. For theſe ſhrubs, by riſing above the ſnow, are thus expoſed to the rigours of the ſeaſon, and totally killed; while the more tender plants, of humbler growth, are ſo effectually ſkreened by the deep mantling of Nature's robe, ſo liberally produced by the very cold, whoſe rigorous effects it was intended ſo powerfully to counteract, as to be effectually guarded from danger.

From theſe obſervations it appears evident, that we cannot in all caſes promiſe that a plant will not be killed by cold in one country, although it ſhould chance to be a native of one that is colder:—Neither can we always be certain, that a plant which comes to perfection in a temperate, or even polar climate, will meet with warmth ſufficient to ripen its ſeeds, even in an equatorial region.——Thus wheat, barley, and other kinds of grain, that ruſh up with rapidity, and ſoon attain perfection in temperate climates, can hardly at all, or with great difficulty, be brought to ripen their ſeeds in the torrid zone.—For, in theſe laſt regions, although the heat of the day is very intenſe, yet

the length of the night that conſtantly ſucceeds is ſo great, as tends much to retard the maturation of the grain:—at the ſame time the copious dews which theſe long nights always produce in warm climates, is ſo greedily imbibed by the ſucculent leaves of theſe plants, as endows them with uncommon vigour, to advance in length with the heat of the day; ſo that the plants are urged on to grow to a prodigious magnitude. And it is ſo long before the ear begins to be formed, that before ever it can be brought to maturity, the tender ſtem becomes unable to ſupport the vaſt load it has to carry; and the rainy ſeaſon approaches before the ſeeds can be ripened, which effectually deſtroys the whole plant.—But in regions that are placed nearer the Pole, as the day is ſo much lengthened during the ſummer ſeaſon, the night hardly gives any check to the vegetation at that time; and as the dews are neceſſarily leſs abundant, the plant has not ſuch a tendency to an over-luxuriance of growth; and the conſtant action of the ſun ſoon diſpoſes it to puſh out its flower-ſtalks, ſo that the ſeeds attain

tain maturity with a rapidity unknown in theſe warmer climates.

Two countries that lie under the ſame parallel, and are in other reſpects alike, may yet differ from one another with regard to the production of certain vegetables, merely from the different form or poſition of theſe countries.—For if, from this circumſtance, one of theſe places that may be compared together, ſhould be more or leſs expoſed to ſevere winds from any particular point of the compaſs, accompanied with rains, or the reverſe, at certain ſeaſons of the year, ſome particular vegetables may be benefited by this peculiarity, while others may be hurt or totally deſtroyed by it: Therefore ſome plants may be found to thrive very well in the one country, which would periſh entirely, or languiſh in the other.

From this circumſtance chiefly it has been remarked, that the climates of China, and of North America, reſemble one another very much; and that the plants which flouriſh in the one, proſper equally well in the other;--theſe two countries being ſubjected to the ſame winds at the ſame

ſeaſons of the year, and to rains, cold, and heat, nearly at the ſame periods throughout the whole year.

From this cauſe likewiſe it happens, that the eaſt and weſt coaſts of Britain are not equally fitted for rearing the ſame kinds of plants to perfection. For as eaſterly winds prevail much during the ſpring months,—bringing violent rains, accompanied with ſharp cold blaſts, or thick muggy fogs, the vegetables that ſpring early, are ſo much affected by theſe on the eaſt coaſt, eſpecially in the northern parts of the iſland, as to languiſh or periſh entirely;—while the ſame kind of plants, on the weſt coaſt proſper abundantly.

Hence, it is found, by experience, that the eaſtern parts of Britain, eſpecially Scotland, are far worſe calculated for producing fruit of any ſort, than the weſtern parts of the iſland: for, the tender bloſſom in the ſpring, is often nipped by theſe cold eaſtern blaſts, or ſuffocated by thick fogs, when they eſcape on the oppoſite ſide of the iſland.—For the ſame reaſon, trees of any ſort, or hedges, proſper better

in

in general, near the weſt, than the eaſtern ſhore.

On the other hand,—from the violent and almoſt continued rains, that fall during the ſummer and autumn, on the weſtern coaſt, while that of the eaſt enjoys a clearer ſky and warmer ſun, the firſt is much leſs fitted for rearing abundant crops of corn than the laſt.—Their harveſts are later, and more precarious.—Their fruit, although more abundant, is leſs perfectly ripened; and the country is better calculated, in every reſpect, for graſs or wood, than for crops of grain.

Their winters are alſo leſs ſevere,—the ſnow lies for a ſhorter time,—the ſummers more moderate in their heat; and the variations between the different ſeaſons are far leſs perceptible, for reaſons that are ſo obvious as need not be particularly pointed out.

By properly attending to theſe peculiarities of different climates, and to the nature and particular economy of the plants or animals that he wiſhes to rear, a man may have a tolerable gueſs whether or not he may hope for ſucceſs in rearing

plants

plants in one country that are brought from another.—Thus, it will readily occur to any perſon in the leaſt converſant in this ſubject, that it would be in vain to expect to be able to rear any of the trees peculiar to equatorial regions in the open air, within or near the Polar circle: Becauſe, as there is little variation in the heat of different ſeaſons in the firſt-named regions, it is probable that ſuch perennial plants as are natives of them, would be incapable of bearing any conſiderable degree of cold, which they cannot fail to meet with in the laſt-named regions; ſo that there is the greateſt reaſon to think they would all be killed at the very firſt approach of winter.

But there is not ſo much reaſon to deſpair of being able to rear to perfection, in high latitudes, ſome annual plants that may be natives of equatorial countries. For, if theſe plants require but a ſhort time to attain perfection in their native climate, it is not at all impoſſible but they may ripen in the other, during the ſummer-ſeaſon, before the cold weather of autumn approach to kill them. And accordingly

cordingly we find, that ſeveral annual flowers from theſe regions have been introduced with ſucceſs into our gardens; and probably other uſeful plants, if equally attended to, might have been cultivated by us with equal ſucceſs.

The potatoe, which has of late been reared with ſuch happy ſucceſs in all the northern parts of Europe, ſufficiently evinces the juſtneſs of this remark; for, it is a native of a very warm climate, and is as impatient of cold as almoſt any plant we know:—Yet, as the length of our ſummer ſufficeth to bring it to perfection before the froſts approach, we are enabled to cultivate it with the greateſt advantage. Whether the yam, another Weſt-Indian root, nearly approaching to the nature of the potatoe, could be reared with the ſame facility in Europe, ſeems to me a little doubtful, as it requires a longer time to arrive at perfection in the Weſt Indies than the potatoe. But it is probable, that many plants whoſe value conſiſts in their leaves, and not a few whoſe roots or ſeeds are moſt eſteemed, could on, ſome occaſions, be introduced, with

with ſucceſs into Europe, or the American continent, were the peculiarities of their growth duly pointed out, and ſufficiently attended to.

But it is not in all caſes enough for the farmer to know, that plants will live in the country he inhabits. Before he attempts to rear them, it is likewiſe neceſſary that he ſhould know, if his ſituation is ſuch as, with an ordinary degree of care, puts it within his power to attain all thoſe peculiarities that ſeem to be neceſſary for the well-being of that particular plant he means to cultivate. For a diverſity of climate often produces a much greater variation in this reſpect, than moſt people ſeem to be ſufficiently aware of.

Thus, in warm countries, ſuch as Portugal, Spain, and Italy, the heat of the ſun becomes ſo intenſe during the ſummer-months, that all the common ſuperficial fibrous-rooted graſſes are totally deſtroyed, ſo that the common paſture-graſſes are withered, and the fields become bare and parched up at that ſeaſon, unleſs where artificially watered; inſomuch that

that the inhabitants are often, from this cauſe, ſubjected to great inconveniencies for want of food to their beſtial. It was therefore an object of the utmoſt importance to them, to diſcover a plant, that could be made to live and thrive at that particular ſeaſon, and furniſh an abundant and wholeſome food to their domeſtic animals.

Such a plant they have happily diſcovered in the Lucerne; which, by ſending its roots to a great depth in the ſoil, continues to find there, moiſture ſufficient to preſerve it in a degree of vigorous vegetation, when all the common graſſes are totally deſtroyed. No wonder, therefore, that the inhabitants of theſe countries ſhould conſider this as one of the moſt valuable bleſſings that Heaven, in its abundant bounty, hath beſtowed upon them, and never have done with its praiſes. —But, in our more temperate climate,— as we do not ſtand in ſuch need of a plant of this ſort, ſo neither do we find ourſelves in a ſituation that admits of the culture of it with ſo much advantage. For here the moderate heat of our ſummers,

mers, and the frequent gentle ſhowers that we then have, are ſo exceedingly favourable to the growth of the common fibrous-rooted graſſes, that every unoccupied ſpot becomes quickly covered with them; and they ſpring up ſo cloſe upon one another, as to choak every other plant that is not ſo hardy and luxuriant as to overtop and deſtroy them.—Now, although it is found that the Lucerne plant will live and thrive extremely well in our ſoil and climate, if it be kept free from theſe numerous weeds; yet it is by no means capable of deſtroying, without aſſiſtance, that immenſe quantity of graſſy plants which conſtantly ſpring up around it here, ſtint it in its growth, and at length totally deſtroy it, unleſs we are at pains to free it from this its moſt deſtructive enemy. This adds very much to the trouble and expence of cultivating the plant in our climate, and prevents us from having it in our power to rear it with ſucceſs, in that eaſy promiſcuous way of ſowing it, which may with ſafety be practiſed in thoſe climates where Nature performs the part of the gardener, and frees it

more

more effectually from this particular weed, than any care or trouble with us could ever effect.

XXI.

Is there any method of preparing the food of animals, ſo as that it may be made to afford them a better or more abundant nouriſhment than in its native ſtate?—If there be, What are the rules that ought to be obſerved in this reſpect, with regard to every ſpecies of aliment that may be thus improved, as applied to each ſpecies of domeſtic animals?

As ſeveral plants that might be employed as food for domeſtic animals, are of a texture too firm to admit of being eaſily chewed by them; whatever tends to reduce them to a finer ſtate, may probably be of uſe.—Thus, before furze can be properly given either to horſes or cattle, it is neceſſary to reduce them to a ſort of pulpy ſtate, by bruiſing them.—Straw, on account

count of its toughneſs, is the better for being cut;—and probably it is chiefly on account of the facility with which the animal can chew it, that it affords a more abundant nouriſhment in this condition than in its native ſtate.—Oats are firm and ſmooth, and are therefore in danger of being ſwallowed whole, if given by themſelves, and thus paſſing through the animal without benefiting it in the leaſt; to prevent which, ſome mix them with chopt ſtraw, and think they derive very great profit from this practice:—But others have of late fallen upon perhaps a better method of effecting this purpoſe, by making the oats paſs between two ſmooth rollers ſet cloſe upon one another, like thoſe employed for bruiſing malt; which reduces them to ſuch a ſtate, that, with very little manducation, allows the whole of the nouriſhment that theſe can afford to be extracted in the ſtomach of the animal.—Slicing of turnips may likewiſe be of uſe in this reſpect; but maſhing or bruiſing them, ſo as to reduce them to a kind of pulp, would anſwer this purpoſe

poſe much more effectually, and could be performed with much greater eaſe.

But beſides this mechanical ſort of comminution, which may be attended with ſome advantages, on many occaſions, it is probable, that many kinds of food might, by other operations, be rendered more wholeſome or nutritive to particular animals. The experience of man, with regard to his own food, ſufficiently demonſtrates, that the qualities of almoſt every ſpecies of vegetable aliment are conſiderably altered by coction, or otherwiſe readying by means of fire; and as their qualities are thus changed from what they were in their native ſtate, it is to be ſuppoſed they might, on ſome occaſions, be rendered more nutritive for certain animals, after having undergone ſome culinary proceſs *, than in their crude ſtate. Accordingly, we find, that many farmers adopt this practice with regard to particular ſubſtances.—Beans and peaſe are oftener boiled, than given raw to horſes;—and when

* Culinary proceſs is a general term, for denoting any operation performed upon aliments by the aſſiſtance of common fire.

cattle are fatted with this grain, they are almoſt always given in this ſtate. Hay, when maſhed with warm water, or ſlightly boiled, is reckoned much better for cows, than in its dry ſtate.—Potatoes, when given to horſes, are uſually boiled; —and it has been alledged, of late, that hogs are fatted much more quickly, and to greater perfection, on this root, if roaſted, than if it were either boiled, or given in its crude ſtate.—But in all theſe caſes, different perſons are of different opinions; —nor do we as yet know that any *deciſive* experiments have been tried, ſo as to aſcertain, *in a ſatisfactory manner*, whether theſe practices are really beneficial to the farmer or not; or the exact degree of profit or loſs that he would in any caſe ſuſtain, by following the one or the other of theſe practices.

It is likewiſe poſſible, that certain plants may, on ſome occaſions, be meliorated by other proceſſes. The caſſava root, by being ſteeped in water, and afterwards hard preſſed, is changed from a very poiſonous ſubſtance, into a very nouriſhing food for man.

man. All farinaceous* kinds of grain, by malting, are converted into a ſaccharine ſubſtance, capable of being fermented, which they were utterly unfit for before:—And as it is well known that nothing is ſo nouriſhing or fattening to animals in general as ſaccharine juices, it is not impoſſible but that by this operation ſome of theſe might be conſiderably improved as a food for ſome of the domeſtic animals.—Other methods of improving vegetables, in this reſpect, may, perhaps, be diſcovered, that have not as yet been thought of.

XXII.

Is there any way of compounding different kinds of food for domeſtic animals, ſo as that their effect, when thus compounded, ſhall be greater than if they had been adminiſtered ſeparately?—If there is,—What are the kinds of food that may be in this manner improved, or have their

* Farinaceous is a general term denoting all ſuch vegetables as afford a meally-like ſubſtance; as wheat, oats, barley, rye, peaſe, &c.

virtues increaſed, by being given to an animal along with others?—The manner in which they ought in theſe caſes to be adminiſtered?—Whether they ought to be mixed together, or given ſeparately?—What are the moſt advantageous proportions of each; or, in what order of ſucceſſion ought they to be adminiſtered to each ſpecies of animal, ſo as to produce the greateſt effect?—or, are there any kinds of food, that, by being given to any domeſtic animal mixed together, or in immediate ſucceſſion, tend to produce a contrary effect, by yielding to the animal, in this manner, leſs nouriſhment than if they had been given ſeparately?—What are they?

Phyſicians affirm, that the effects of different kinds of medicines upon the human frame, are increaſed or diminiſhed if given along with others:—Nor is it at all improbable, that this may be the caſe with different kinds of food upon brute animals; although our obſervations have not yet been ſufficiently accurate with regard to

them, as to have enabled us to remark, with any degree of certainty, if this really is or is not the caſe.—Yet it is generally imagined, that oats given to horſes along with graſs or any other green food, are leſs beneficial to them than at other ſeaſons. —Experiments here are much wanted.

After theſe remarks had been publiſhed more than twenty years, I learned that the leaves of the yew-tree, which is a ſtrong poiſon to horſes and cattle, by being mixed with oats, becomes perfectly innoxious, and that in the province of Heſſe, in Germany, the peaſants actually feed their cattle on the leaves and twigs of the yew-tree through the winter; its noxious quality being deſtroyed by having a proportion of dry food adminiſtered along with it. See vol. iii. p. 590.

XXIII.

Are there any ſubſtances, which by being employed by way of condiment along with the food of animals, would tend to make that food produce a greater effect than if

it had been given alone?—If ſo, what are they,—and how ought they to be moſt efficaciouſly employed, with regard to each ſpecies of animals?

It is pretty certain, that common ſalt is, on many occaſions, agreeable to animals in the ſtate of nature;—nor is there much doubt but that it may be often adminiſtered to domeſtic animals with ſucceſs; which, probably, acts in no other way but as an agreeable condiment, that may prepare the body to receive the full effect of the food that is given along with it, help the digeſtion thereof, or make it be eaten with a more agreeable reliſh.—In North America, there are found, in many places, ſtrata of earth impregnated with ſaline matter, which the deer and other wild animals diſcover of themſelves; to which they frequently reſort, to lick the ſaline earth with their tongue. If a huntſman diſcovers one of theſe *licks*, as they are there called, he never fails to make profit of it, by concealing himſelf near the place, and ſhooting the animals that come ſucceſſively

ſucceſſively to gratify their palate with this agreeable refreſhment.—In Spain, and many parts of France, they give to their ſheep a conſiderable quantity of ſalt, which they imagine tends both to fatten and preſerve them in good health; but it is ſaid, they do not find it neceſſary where the ſheep feed upon chalky or lime-ſtone paſtures.—In England, it is well known, that animals fatten more quickly on ſalt marſhes than any where elſe.—From all theſe circumſtances, it would ſeem probable, that common ſalt is, in general, an uſeful condiment, and might poſſibly be employed, on many occaſions, with profit, in feeding domeſtic animals.

Other ſubſtances that promiſe to be equally efficacious in this reſpect, have not as yet been attended to.—Nor have the effects of this ſubſtance been aſcertained with any degree of preciſion *.

XXIV.

Is there any method of treating animals, in general, ſo as to diſpoſe their bodies to

* See this ſubject more fully illuſtrated, vol. iii. p. 551.

imbibe a greater degree of nouriſhment from the food that is given them, than they would have done if managed in a different manner?—If there is, what is the moſt proper method of treating each ſpecies of domeſtic animals, conſidered in this point of view?

It is in general allowed, that frequent and moderate bleeding of any animal, put up to feed, diſpoſes it to fatten more quickly than it would do if that were omitted. It has been likewiſe often obſerved, that keeping cattle dry in winter, and in a moderately dark place, tended much to produce the like effect: But it ſeems to be of ſtill greater conſequence to keep them in an equal temperate warmth, which, on many occaſions, will operate as much as a conſiderable quantity of food would do without it.—But what is the moſt proper degree of heat for each ſpecies of animals, has not as yet been attempted to be aſcertained. — Currying or combing ſome animals, likewiſe tends greatly to promote their health, and bring them forward

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in feeding, particularly the horſe; but how far it might be beneficial to others, hath not yet been enquired into; though an opinion now begins to prevail pretty generally, that it is highly beneficial for cattle. Caſtration of males tends to ameliorate their fleſh, and to make them fatten more quickly: And it is in general obſerved, that females when young, fatten more quickly than at other time; but how far they may be allowed to advance in their pregnancy before it becomes detrimental, requires as yet to be enquired into. It is a fact alſo, that is pretty well aſcertained, that ſheep which are infected with the diſeaſe called *the rot*, are diſpoſed to fatten more quickly than others, during the fore part of winter; but unleſs they be killed before the ſpring approaches, they are infallibly loſt.

XXV.

Does that mode of treating any animal which tends to make it fatten quickly, at the ſame time tend to increaſe the quantity of milk?—If there is any difference

rence in this reſpect, wherein does it conſiſt, as applied principally to cows and other domeſtic animals, that are chiefly of uſe to us on account of their milk?

It would ſeem probable, that the ſame mode of treatment would often anſwer both of theſe purpoſes, although there is ſome reaſon to think they may not in all caſes coincide.—Warmth in winter, cauſeth cows to give more milk, as well as fatten more quickly, than they would do if deprived of it.—The ſame may be ſaid of proper dryneſs, cleaning, &c. But it is univerſally allowed, that bleeding a milch-cow, tends to diminiſh the quantity of milk, though it is thought rather to forward its fattening; the milk alſo gradually decreaſes in quantity as their pregnancy advances, till they are very near the calving.

Whether ſalt promotes the quantity of milk, in the ſame proportion that it tends to fatten, will probably be known by thoſe who have had the experience of ſalt-marſhes.

XXVI.

XXVI.

Does a difference in the nature of the paſture or food of the animal, produce any change upon the *quality* of the wool of ſheep, or the hair of other animals, independent of other circumſtances?—If it does, what are the changes produced by this means?

It is in general believed, that particular paſtures are peculiarly favourable for producing fine wool; and that improvements by clover and other artificial graſſes, tend to improve the quality of this valuable commodity;—although it ſeems to me by no means certain, that this fact is ſo well eſtabliſhed by experience, as to deſerve to be implicitly relied on.—The countries which produce the fineſt wool, do not always afford the richeſt paſtures.—Neither the mountains of Perſia, nor thoſe of Spain, produce graſs nearly ſo rich as many parts of Europe, which afford wool of a much inferior quality.—In England, the paſtures of Southdown and Leominſter, have

have nothing peculiar to themſelves that may not be met with in many other parts of this iſland; ſo that we may juſtly doubt if it is owing to this circumſtance, that the wool of thoſe places has been ſo long diſtinguiſhed for its ſuperior quality above that of other parts of the country.—It is not more than a hundred years, ſince it became common to cultivate clover and other artificial graſſes in Britain; and we have no reaſon to think, that the quality of our wool has improved ſince that time, but rather the reverſe.

Neither does it ſeem at all probable, that richneſs of paſture tends to debaſe the quality of the wool,—ſeeing the ſheep of Lincolnſhire, of the Iſle of Wight, and of Romney-marſh, which feed upon rich deep graſs, yield fleeces of an exceedingly fine quality; although the fine ſheep of Buckinghamſhire, that feed upon equally rich paſtures, and become as fat as any of theſe, always afford wool of a much coarſer quality.—But, whatever effect the nature of the paſture may have in altering the fineneſs of the pile of the wool, there ſeems to be little doubt but that a-

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bundance of food is neceſſary to give it its full ſtrength and firmneſs; as it ſeems to be univerſally allowed, that a very lean ſheep never yielded a fleece of wool of the very beſt quality, with reſpect to ſtrength and ſoftneſs, whatever may be the caſe with regard to fineneſs of the ſtaple. This ſubject is of much importance, and deſerves to be fully inveſtigated.

XXVII.

Does the nature of the climate alter the quality of the wool of ſheep?—If it does, What are the changes produced by this means?

It is a prevailing opinion with many, that fine wool can only be produced in mild climates, rather approaching to warmth than the oppoſite extreme; which has, in like manner, in all probability, been adopted precipitately, before the ſubject was duly inveſtigated.—Reaſon would make us rather expect that the contrary would be the caſe; and experience ſeems to

to confirm it, as appears No. XX. p. 72, to which I refer the reader. The ſubject is of great importance, and, therefore, ought to be diſcuſſed with all the coolneſs and circumſpection imaginable.

XXVIII.

Does the fineneſs, or any other quality of the wool, vary with the age of the ſheep?—Or, is the weight of the fleece increaſed or diminiſhed by a difference in this reſpect?

The price of wool is ſo low in Britain, and the value of the fleece here, bears ſuch a ſmall proportion to that of the carcaſe, that leſs attention has been beſtowed to the circumſtances that may vary it, than the importance of it, to the country in general, would ſeem to deſerve;—we have, therefore, ſo few opportunities of ſeeing old ſheep, that our experience can only furniſh grounds for ſlight conjectures on this head.—Probably, more ſatiſfaction could be obtained from Spain than

any

any other country at preſent, with regard to this and the other diſquiſitions relating to wool, as it has been long a ſtaple commodity with them, and almoſt the only vendible produce of their flocks; ſo that it muſt neceſſarily have claimed a great ſhare of their attention.—It ſeems, however, to be, in general, allowed, that the weight of the fleece diminiſhes with the age of the ſheep, after a certain period.

XXIX.

Is there any mode of management that would tend to make a greater *quantity* of wool be produced upon the body of the ſame ſheep, than there would have been if it had been treated in another manner? —If there is, what is it?

The French have of late beſtowed a very particular degree of attention upon their woollen manufactures, and have ſpared no pains to meliorate their wool, and improve their breed of ſheep. By an experiment,

experiment, conducted under the direction of the Intendant of Normandy, with this view, it appears, that ſheep which are kept all the year in the open air, yield fleeces about one-fourth part more weighty than the ſame kind of ſheep which were kept at night, and in bad weather, under a covered fold; and the wool of the firſt was likewiſe of a much better quality in every reſpect.—Whether any other mode of treatment tends to produce a ſimilar effect, deſerves to be enquired into.

XXX.

Can the quantity or *quality* of the wool be improved or debaſed by any particular mode of managing the ſheep, or by applying any particular ſubſtances to the ſkin of the animal, while the wool is growing?—If it can, what are the circumſtances, or the ſubſtances, that produce this effect?

In every ſheep-country, there are many *noſtrums* and particular recipes handed about, or generally adopted, which are believed to contribute to the improve-

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ment of the wool in ſome of the ways above mentioned. But theſe are, in many caſes, ſo evidently uſeleſs, and ſeem, in general, to have been adopted with ſo little reaſon, that an enumeration of ſuch of them as may have come to my knowledge would be only tireſome to the reader; for which reaſon they are here omitted.—A judicious experimental philoſopher, however, who would inveſtigate this matter in a proper manner, and elucidate the ſubject by deciſive experiments, would do an eſſential ſervice to his country; as, in all probability, our future ſucceſs in the woollen manufacture will depend upon our attending more particularly to the article of wool, than we have done for more than a hundred years paſt; during which period, there is very great reaſon to ſuſpect, that the quality of the wool in England, inſtead of growing better, has become ſenſibly worſe, while that of our neighbours on the Continent has been greatly improved*.

* See Obſervations on the means of exciting a Spirit of National Induſtry, Lett. IV, V, VI, VII, and VIII, where all the above queſtions relating to ſheep and wool are particularly illuſtrated.

XXXI.

AT what age can animals of each particular claſs be fattened, with the greateſt facility? and at what period of life is the meat of each kind in the higheſt perfection, ſuppoſing it to be equally fattened?

While animals are young, and growing vigorouſly, as a great proportion of the food they eat goes towards increaſing the ſize of the body, it is natural to expect that theſe will be with more difficulty brought into full fatneſs, than thoſe which have previouſly attained their full ſtature; but if the fleſh of theſe young animals is much eſteemed, it may often happen, that the owner of them may have more profit by feeding them even under this diſadvantage, than by keeping them till they attain their full maturity. It, therefore, becomes a queſtion in rural economics, in what caſes the one or the other of theſe modes of feeding ought to be adopted? which

which could be the eaſier ſolved, did we know exactly what was the proportional difference of the expence of feeding different claſſes of animals in each of theſe caſes.

With regard to the laſt part of the query—It is ſufficiently well known, that young mutton is never ſo agreeable to the palate, as that which hath attained to full maturity; but how long it continues to improve, does not ſeem, as yet, to have been ſo fully aſcertained as it ought to be. There does not ſeem to be nearly ſuch a difference between young and old beef or pork; and therefore the farmer is, or ought to be, under leſs reſtraint with regard to theſe.

XXXII.

Do different claſſes of animals require an equal quantity of food in proportion to their ſize?—If there is any difference in this reſpect, what is the exact amount thereof, with reſpect to each particular ſpecies of domeſtic animals, when compared with others?

It is certain, that if we compare very different orders of animals with one another, we will diſcover a prodigious difference in this reſpect.—A caterpillar will conſume in a day more than double its own weight of food, while the chamelion would be ſuſtained for months upon a like proportion of food: The camel is likewiſe believed to require a much ſmaller quantity of food, in proportion to its ſize, than almoſt any other quadruped.

But, to come to thoſe in which we are more nearly intereſted, it is univerſally believed, that a horſe requires a greater quantity of food to ſuſtain it, than an ox of the ſame weight: But I have never yet heard of any experiment that has accurately determined what is the exact proportion in this reſpect. Common opinion ſeems to place it at different proportions; ſometimes rating the horſe at double the ox, and ſometimes at only one-third more. For, in many parts of the country, the price of the ſummer-food of an ox, is preciſely

ciſely one-half of that of the horſe; but, in other places, the difference is only as four to ſix. Whether either of theſe is exact, or which of them is neareſt the truth, deſerves to be aſcertained with preciſion: But, as the opinion is ſo univerſally prevalent, that the horſe requires a greater quantity of food in proportion to his ſize than the ox,—the probability is, that he really does ſo.

As the other kinds of domeſtic animals differ more in ſize from one another than theſe do, it is not ſo eaſy to make a compariſon between them; but as it is poſſible they may vary conſiderably from one another in this reſpect, the farmer muſt remain very much in the dark with regard to a very eſſential branch of his buſineſs, till this be determined with preciſion.

XXXIII.

We obſerve, that there are a great many varieties of each particular ſpecies of animals, that are diſtinguiſhed from others of the ſame ſpecies, by certain peculiarities

which are, on many occaſions, eaſily perceptible. Theſe varieties among the brute animals, have been uſually diſtinguiſhed, among farmers, by the appellation of different *breeds*, as they have ſuppoſed that their diſtinguiſhable qualities are at leaſt in a certain degree tranſmiſſible to their deſcendants; although Naturaliſts, overlooking theſe diſtinctions, conſider each of theſe breeds as only an accidental variety of the individual, which hath little or no influence upon their progeny.—Query, therefore, whether theſe different *breeds*, as they are called, of any one claſs of domeſtic animals, is really a diſtinct tribe, endowed with the power of tranſmitting to its poſterity all its diſtinguiſhing properties, ſo long as it is prevented from intermixing by copulation with other breeds?—or, are the varieties that we perceive, in this reſpect, to be attributed to accidental cauſes alone, and not immediately depending upon the nature of the parent animal?

We would imagine, that in a caſe of ſo much importance as this we now treat of,

of, with regard to which, mankind have had ſo many opportunities of trying experiments, and making particular obſervations, there could have remained no room to doubt, long before this time. But although ſcience, in general, tends to improve knowledge, on ſome occaſions it rather confounds and perplexes the underſtanding. For when we find that the ſyſtems we have invented, are incapable of explaining all the phænomena that occur, we are but too ready to deſpiſe, with a faſtidious pride of mind, thoſe phænomena that would perplex our ſyſtem, and haſtily to ſay, they owe their exiſtence to inaccurate obſervations alone.

This ſeems, in a particular manner, to have been the caſe in the preſent inſtance. And although it is impoſſible for any reaſoning to get the better of daily experience, ſo far as to make a man believe directly the reverſe of what he ſees with his own eyes; ſo as that nothing can convince the farmer that the nature of the animal from which he breeds will not have ſome influence upon its progeny;—yet it has ſo far prevailed, as to induce

almoſt every farmer to believe, that, unleſs in the particular caſes which have occurred to himſelf, all the other varieties obſervable in the breeds of animals, are either entirely occaſioned, or much influenced, by peculiarities of ſoil, food, or climate. So that in no inſtance do we meet with ſuch an unaccountable diſcordance between general opinion and particular practice, as in this very caſe.

That all the qualities which ſerve to diſtinguiſh particular breeds of animals from one another, can, in ſome caſes, be tranſmitted without alteration to their poſterity, for ever, if they are carefully kept from copulating with other breeds of the ſame kind, ſeems to be fully demonſtrated by what we obſerve with regard to dogs; the different varieties of which are endowed with ſuch remarkable peculiarities, as to ſerve to point out the particular breed with ſo much certainty and facility, as makes it impoſſible for any one not to perceive at once if the breed has been debaſed: And our experience with regard to them is ſo univerſal, as to leave no room for the moſt ignorant to doubt, that

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all the varieties of theſe that we meet with, inherit from their parents, the peculiar diſtinguiſhing natural talents that they poſſeſs; and that theſe are in no caſe to be attributed to any diverſity of food, or any other circumſtance whatever.

The ſame thing is alſo, in a great meaſure, remarked with regard to the horſe; —although the different varieties of this animal are not ſo diſtinctly marked as thoſe of the dog-tribe; and, therefore, the proofs of the fact in diſpute, are not ſo palpably evident as in the other caſe. Yet we would ſurely laugh at the abſurdity of that man, who ſhould hope to rear a large-boned weighty dray-horſe, by breeding with a fine Arabian mare and ſtallion; or, who would expect to have a light-running horſe from a father and mother of the dray-breed, let him feed them in whatever manner he may incline. And although the different breeds of horſes are almoſt infinite, and few of them ſo much different from each other, as in the above example; yet, it is obſervable, that the prevailing breed in any one diſtrict, always continues of the ſame kind, ſo long as

as the inhabitants of that diſtrict continue to breed from them, whatever alterations they may make in the general culture of the country, and nature of the paſtures. Nor do theſe horſes ever alter their qualities, if they are carried to another diſtrict, where another breed, of very oppoſite qualities, in general, prevails, but each retains its diſtinguiſhing qualities to the laſt, although they ſhould continue to eat the ſame food, and be treated, in every reſpect, alike, to the lateſt hour of their lives.

Nor is the caſe in the leaſt different with regard to cattle, ſheep, and hogs,—and perhaps all other animals. For, let a hundred different breeds of either of theſe kinds of animals be brought from as many different places, and fed upon one common paſture as long as you incline, each of theſe will continue to preſerve every mark of diſtinction from all the others, ſo long as it lives.—But if they are allowed to breed promiſcuouſly, the progeny would neceſſarily be a mongrel breed, participating of the nature of each

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of the parents who ſhould have contributed to produce them.

Many other arguments might be adduced to ſhow that we have the greateſt reaſon to believe, that each particular breed of other animals propagates its own kind with as little variation as is acknowledged to be the caſe with dogs, ſo long as they remain unmixed with others. But theſe, to avoid prolixity, I omit.—I could not, however, avoid throwing out theſe obſervations on a ſubject of ſo much importance; as the erroneous opinions that have ſo long prevailed with regard to it have been in ſome caſes attended with conſequences highly detrimental to the community*.—If theſe hints ſhall induce others to examine the ſubject with attention, I ſhall be perfectly ſatisfied.

* See this ſubject more particularly illuſtrated, in the firſt appendix to Dr. Pallas's account of Ruſſian ſheep, publiſhed by the author; and in Obſervations on the Means of exciting a Spirit of National Induſtry, p. 123,—130. *Note to the fourth Edition.*

XXXIV.

If different *breeds* of domeſtic animals do, on many occaſions, poſſeſs particular qualities, that differ very eſſentially from thoſe poſſeſſed by other breeds of the ſame claſs of animals; and if theſe qualities are tranſmiſſible to their poſterity, without alteration, ſo long as the breed remains unadulterated by an admixture with others; it will be a matter of the utmoſt conſequence to the farmer, to be well acquainted with the nature and diſtinguiſhing qualites of every particular breed of all thoſe animals that he may have it in his power to rear, that he may thus be enabled to chooſe only that particular breed which poſſeſſes, in the higheſt degree, thoſe qualities of which he means chiefly to avail himſelf.—Wanted, therefore, an exact liſt of all the various breeds of domeſtic animals, with a particular ſpecification of all thoſe qualities for which each breed is peculiarly remarkable.

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There ſeems to be great reaſon to believe, that the ſeveral breeds of domeſtic animals differ more from one another with reſpect to ſome of thoſe qualities that may make them more or leſs valuable to the farmer, than is in general apprehended at preſent. The gentlemen of the *turf* and *menage* talk with the utmoſt confidence of different degrees of vigour, perſevering ſtrength, hardineſs, and even mental qualifications, if I may uſe that expreſſion, of the different breeds of horſes. Thoſe of Spain are much prized, as well for their external beauty, as for their judgment and memory. The barbe is deemed naturally more indolent; although he is capable of as high exertions either of body or mind, when obliged to it, as almoſt any other:—being, in an eſpecial manner, capable of continuing in any violent exertion much longer than moſt other horſes, although the Arabian courſer is by ſome thought to poſſeſs theſe ſame qualities in a ſtill higher degree.— All of

theſe

theſe require to be nouriſhed with care, and treated with the utmoſt circumſpection. On the contrary, the horſes of Denmark and Frieſland are ſaid to be ſtronger and more hardy,—live upon any fare, and are hurt by no ſort of bad treatment.— The Neapolitan horſes are large and ſhowy; but are incapable of any violent exertion, and are ſoon exhauſted if they are much put to it.—The ſame qualities are remarked in many of the large-boned ſhowy horſes in England; on which account, thoſe only are by the connoiſſeurs deemed capable of undergoing the violent fatigue of hunting, racing, &c. which have, in the jocky ſtyle at leaſt, *ſome blood* in their veins. By which is underſtood, that they are deſcended, either by the father or mother, from an Arabian, Perſian, Turkiſh, Spaniſh, or Barbary horſe or mare: All of which are ſuppoſed, in an eminent degree, to poſſeſs great muſcular ſtrength and length of wind.

But, beſides theſe more remarkable diſtinctions, there are many other varieties of this uſeful animal, reared in different parts

parts of this iſland, and only employed for draught and other uſeful ſervices, that are well known to differ from one another as much in their degree of hardineſs, or *mettle*, as it is ſometimes called, as in their external form and appearance. —Some of theſe are of ſuch enormous bulk and ſtrength, as to drag ſlowly after them the load of an elephant, but are utterly incapable of any violent quickneſs of motion.—Others are naturally endowed with greater agility, and leſs bodily ſtrength as to carrying burdens; but are poſſeſſed of great hardineſs, ſo as to be capable of enduring fatigue for a long time, without being hurt by it.—Some attain their full degree of ſtrength and bodily vigour, at a very early period of life, while others continue long extremely weak, and incapable of great exertions; but after they arive at ſix or eight years of age, become hardy, and capable of exerting their ſtrength for a very long time without being hurt.—Some are naturally cool and perſevering; while others are more fiery and fretful, and can never be brought to yield that ſteady exertion of ſtrength that

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the others naturally do.—In ſhort, the varieties in this reſpect, are ſo many and great, that it would require a very extenſive experience, to be able to point them out with any degree of preciſion.—But were it once done, it would be of the utmoſt utility to the farmer; as he would then know exactly, what breed would beſt anſwer the particular purpoſe that he, on any occaſion, might wiſh to accompliſh.

It would, perhaps, be of ſtill greater utility to the farmer, to have all the peculiar and diſtinguiſhing qualities of each of the different breeds of *cattle* pointed out with preciſion; which probably do not differ leſs from one another than horſes do.

Many attempts have of late been made by improving farmers in different parts of Britain, to better the breed of their cattle. But as the particular breeds of cattle that have on theſe occaſions been tranſported from one part of the country to another, have been uſually ſelected on account of qualities that they were only *ſuppoſed* to poſſeſs, rather than in conſequence of any

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full inveſtigation of the ſubject, by which their real good or bad qualities have been pointed out with accuracy; it may be much doubted, if theſe attempts have been, in many caſes, attended with any beneficial conſequences at all. For, ſo long as we are guided in this caſe, by any other rule than that certainty which reſults from accurate experiments, it may be naturally ſuppoſed, that the mind of the ſanguine improver will be apt to magnify every excellent quality, that he may think he perceives in his favourite breed; while it as naturally diminiſhes the good qualities of ſuch as may be out of favour at the time.

Thus, at one time, the large Dutch breed of cows were much in vogue, and were much more valued than any other kind:—But, in a few years, it was diſcovered that they did not poſſeſs all the qualities for which they were at firſt cried up; and they gradually fell into diſeſteem. —Theſe were ſucceeded by the Yorkſhire, which in their turn were ſucceeded by the Lancaſhire breed; which is at preſent more eſteemed than any other ſort,

and will probably continue to be ſo for a few years; when they, in their turn, will be neglected, and give place to ſome other favourite breed, which accident may recommend to public favour.

In this manner, it may be expected that things will go on, till mankind ſhall become ſo ſober-minded, as to be firmly perſuaded, that, perhaps, no one breed of cattle is poſſeſſed of all the different qualities which could be deſired on different occaſions, and therefore ſet themſelves ſeriouſly to diſtinguiſh from one another the different qualities that may render this animal, on any particular occaſion, more or leſs valuable, and then endeavour to diſcover which particular breed poſſeſſes that one quality in the higheſt degree.—Thus, one man, perhaps, requires, above all other qualities, that his cattle be poſſeſſed of great bodily ſtrength, and a power of exerting the nerves and muſcles for a great length of time, without being fatigued.—Another, perhaps, diſregards this quality, and only wiſhes for an ox that will admit of being fattened quickly, and carry a great weight of beef.—A third,

perhaps,

perhaps, requires that weight ſhould be chiefly in ſome particular part of the body.—A fourth, values only the quantity of the milk.—A fifth, is chiefly anxious about its quality;—while a ſixth is, perhaps, more anxious to obtain the beef of a peculiarly fine quality than any of theſe, or values his cattle for ſome other peculiarity, different from any of thoſe above enumerated.

But, were we to know with certainty which particular breed poſſeſſed, in the higheſt degree, that peculiar quality we moſt wiſhed for, and the other peculiarities that it poſſeſſed along with this, we ſhould be enabled to pick out, with preciſion, that particular breed which beſt ſuited our particular purpoſe, or the circumſtances we were in at the time; leaving others to make choice of ſome other breed, that might be ſtill more profitable to them.

Hitherto, we have been ſo little accuſtomed to conſider the ſubject in this point of view, that it would be in vain to look for facts which could be relied upon, with regard to it, from the writings or conver-

ſation of ſuch improvers as have endeavoured to introduce any particular breed into any diſtrict: For, theſe kinds of cattle are ſo much praiſed for every excellence when they are in vogue, and ſo indiſcriminately decried after that period, that it is next to impoſſible to diſtinguiſh the qualities for which they are truly eſtimable, from thoſe for which they are by no means remarkable.—It ſeems, however, to be pretty certain, that the large Dutch breed of cows, do uſually yield a very large quantity of milk, although it is but of an inferior quality; while, on the contrary, the ſmall delicate Alderney breed of cows are as remarkable for the richneſs of the milk, and the delicacy of the butter it affords.—And although the Lancaſhire breed is juſt now in favour, and thought in general to poſſeſs almoſt every quality in the higheſt degree; yet the ingenious Mr. Young has ventured to aſſert, that cows of this breed do not yield near ſo much milk, in proportion to their ſize, as the Suffolk cows; and the Devonſhire breed, is by many deemed preferable to them for draught.

As

As to other qualities, there is ſo much room for the imagination to magnify or diminiſh them, as prejudice may ſuggeſt, that we can hope for nothing deciſive with regard to them, without fair and accurate comparative trials, made under the direction of ſome man of probity and diſcernment.

But if it would be of ſome uſe to the farmer, to know with accuracy the diſtinguiſhing characteriſtics of each particular breed of cattle, it would be of ſtill greater conſequence for him to know with certainty, all the varieties that take place with regard to ſheep, which, perhaps, admit of a much greater diverſity; and, on account of the value of the fleece, it is probable that it would be of much greater national conſequence to have theſe accurately pointed out.—As no attempt hath as yet been made to aſcertain, with any degree of preciſion, the diſtinguiſhing qualities of each of the different varieties of this ſpecies of animals, it is in vain to hope for any-thing like certainty on this head for ſome time to come.—The following hints, however, intended to ſerve

as a ſlight beginning for ſuch an inveſtigation, it is hoped, will be received with indulgence by the public, on account of the great importance of the ſubject.

Many of the peculiarities by which different breeds of ſheep are diſtinguiſhed from one another, are obvious to the ſenſes, and therefore afford an eaſy criterion for diſtinguiſhing them; although it is alſo probable, that they may on ſome occaſions differ in ſome leſs obvious, although not leſs eſſential reſpects.—The following are a few of the moſt remarkable peculiarities in reſpect of which different breeds of ſheep vary from one another *:

1ſt,

* At the time this Eſſay was firſt written, the author entertained no doubt but that the ſheep was univerſally a *wool-bearing* animal; wool he conſidered as a diſtinctive peculiarity of the whole genus; and the remarks in the text were all written under the impreſſion of this idea. He has reaſon, however, now to be fully ſatisfied that in this reſpect he laboured under a miſtake, having had the moſt deciſive proofs that there are many breeds of ſheep which never produce one pile of wool, but ſhort ſtiff hair only, exactly ſuch as is produced on horſes. Other kinds of ſheep carry fleeces extremely different from theſe, and from each other, as well as from what we commonly expreſs by the word *wool*. But as

theſe

1*ſt*, A very great variation is perceptible in different breeds of ſheep with regard to *ſhape*.—The Dorſetſhire ſheep are tall and light of body, much reſembling the camel, in ſhape and proportions: and the breed that is moſt eſteemed and recommended by Mr. Bakewell, of Leiceſterſhire, are large-bodied and ſhort-legged, more reſembling the figure of the beaver. —The other varieties of ſhape and proportions are almoſt infinite. And the ſame may be ſaid of all the peculiarities under mentioned.

2*d*, Some breeds of ſheep have horns, and others have none at all.—In Lincolnſhire, a horned ſheep is a rarity;—and, on the contrary, in Dorſetſhire, and ſome parts of Wales, a ſmooth-headed ſheep would be looked upon as a ſort of wonder. —In ſome other places, four, ſix, or even eight horns, are not uncommon.—The horns of ſheep are uſually twiſted; but ſome breeds have long horns, bending a

theſe varieties are little known in Europe, what is ſaid in the text cannot be affected by theſe facts. *Note to the fourth Edition.*

little backward, but not twiſted, like thoſe of the goat.

3*d*, Different breeds may be ſometimes diſtinguiſhed from one another by the colour of their faces. In Lincolnſhire, all the ſheep have white faces; and in Norfolk, they are as univerſally black.

4*th*, Different breeds vary in reſpect of the length or ſhortneſs of the wool.—The fine combing wool of Lincolnſhire, Romney-marſh, &c. ſometimes meaſures half a yard in length *;—the wool of Spain exceeds not two inches; and that of Dorſetſhire, Cotſwold, and Leominſter, is little longer.

5*th*, They likewiſe vary from one another with regard to the manner in which the wool grows upon the ſheep.—Sometimes the whole body is uniformly covered with a coat of wool, the hairs of which are ſlightly interwoven with one another

* I have ſome wool in my poſſeſſion that meaſures twenty-one inches in length. It was ſent to me by Sir Joſeph Banks, Bart. It was taken from the fleece of a Lincolnſhire ram, which when new ſhorn, weighed twenty-five pounds. *Note to the fourth edition.*

as if they had been frizzled by art;—as in the Dorſetſhire, and in ſome meaſure the Lincolnſhire ſheep.—Sometimes it divides into ſeparate locks, which on ſome occaſions hang down long and lank, in ſome meaſure like combed hair; as is the caſe with a breed of ſheep common in the South of Scotland. And ſometimes theſe meſhes are done up into ſeparate ſmall cloſe curls, like a wig of baked hair; as is peculiarly remarked in a breed of ſheep in Sologne (a diſtrict in France) inſomuch that it has there become a common proverb, that the wool of Sologne has been curled by the bill of the larks*, the meſhes are ſo ſmall, and the curls ſo exceedingly cloſe.

6th, They alſo differ from one another in reſpect of the fineneſs of the pile of the wool.—The wool of Perſia, Segovia, Leominſter, and ſeveral other parts of Britain, are well known to be as remarkable for their uncommon degree of fineneſs, as that of Cornwall—and of Norway, is for the exceeding coarſeneſs thereof; theſe

* *La vrai laine de Sologne eſt celle qui a été friſée par les alouettes.*

being

being ſaid to approach nearer to the nature of hair than wool *.

7*th*,

* It has been already remarked, that the climate has ſome effect upon the quality of the wool of ſheep, the fineſt wool being moſt naturally produced in the coldeſt regions; from whence ſome may be diſpoſed too haſtily to conclude, that the ſeveral variations we meet with in this reſpect, ought to be attributed to that cauſe alone. But, that diſtinct breeds of ſheep, differ very much from one another in this reſpect, independent of the influence of climate, is ſufficiently obvious from this circumſtance, that we find, in different diſtricts of the ſame country, which enjoy an equal temperature of climate, wool of very unequal degrees of fineneſs; and frequently we meet with ſheep, in cold countries, that carry wool of a much coarſer quality than what is found in regions conſiderably warmer than they are. Hence, therefore, we ought to conclude, that although warmth of climate invariably tends to make the wool that grows upon any ſheep, coarſer than it would have been upon the ſame ſheep, if it had been in a colder climate, yet that this has no influence on altering the nature of its progeny, nor even of producing any change upon the animal itſelf, longer than it is immediately under the influence of that heat. A Britiſh ſheep that has been carried to the Weſt-Indies, is generally ſuppoſed either to loſe its wool, which I hold to be a doubtful fact; or to acquire a fleece that is coarſer in quality than it originally had (a fact more probable, though ſtill it is not proved)—when it returns to Europe again, affords a fleece of as fine a wool, as before it went out to that warm

7*th*, They likewiſe differ from one another in colour.—In Europe, white ſheep are

warm region: It is, however, certain, that in temperate climates, the points of the wool,—that is to ſay, that part of of the fleece which ſprings out from the the ſheep's body during the warm weather in ſummer,—is always much coarſer than that part which grows during the cold weather in winter; the difference between the top or bottom of the fleece being always in proportion to the difference between the heat and cold that the ſheep has experienced at theſe different ſeaſons, and conſequently is ſmaller where ſheep perambulate, as in Perſia and Spain, than in countries where they never change place at all: and, in this laſt caſe, it is always greater in northern continental countries, than in iſlands, as has been already remarked.—A variation with regard to the climate, therefore, produces only a temporary change upon the fineneſs of the wool of that individual ſheep, which is immediately expoſed to its influence; but the difference in this reſpect, that ariſes from a variation of the breed of ſheep, is of a more permanent and invariable nature; as any two ſheep, originally of different breeds, not only retain the ſame difference between one another, if they are at the ſame time carried through any diverſity of climates, but their deſcendants alſo retain, at all times, if in equal circumſtances, the ſame difference that was obſerved to take place at firſt. Hence, therefore, it may happen, that a particular breed of ſheep, may carry, at all times, coarſer wool in a cold climate, than another breed which always lives in a warmer region; the influence of the climate not

are moſt common; and, next to theſe, black are moſt frequently ſeen. — In Perſia,

not being ſo great as to counteract the ſuperior influence that is derived from the parent ſtock. In fact, I now find, that there is a native breed of ſheep in the Iſland of Jamaica, which carries finer wool than perhaps any that can be found in Europe.

It is of much conſequence that the reader ſhould accurately diſtinguiſh between theſe two different circumſtances that influence the quality of the wool of ſheep; becauſe, if this is not done, he will be embarraſſed and perplexed by ſeeming contradictions, that it will be impoſſible for him to explain; ſo that he will be apt to remain irreſolute and undetermined in his conduct. For, if, without this knowledge, he ſhould have attempted to improve his wool by bringing ſome fine ſheep from a colder region to his own, and ſhould afterwards find, that, inſtead of very fine wool, which they yielded in their native country, they produced to him no finer wool than his own ſheep formerly afforded him, he would be apt to imagine, that the nature of his climate over-ruled every other circumſtance ſo much, as to bring the fleece of every different kind of ſheep into one quality, which he would look upon as the ſtandard of his climate or ſituation, and therefore might think that it would be in vain for him to attempt improving it.—And if at the ſame time he ſhould have chanced to bring from a warmer climate another breed, that in their native county yielded wool of a coarſer quality than his own, and ſhould afterwards find that the wool produced from theſe ſheep, was of the ſame fineneſs with that of his own ſheep, he would

be

Perſia, they have wool of three colours; white, reddiſh, and ſilver-grey.—In the province

be ſtill farther confirmed in his opinion of the overruling influence of his climate, and reſt ſatisfied, that as he could not hope to improve the quality of his wool, ſo he need not fear that it could ever be debaſed; and that of courſe, he needs give himſelf no ſort of trouble upon that head.

But if the foregoing caſe were juſt reverſed:—Had the farmer firſt chanced to take a fancy for ſome fine-woolled ſheep that were natives of a warmer region, and tranſported ſome of them to his own country, where he found the wool become much finer than it formerly was; and ſhould afterwards, in his travels, meet with another breed in a colder country, that produced ſtill finer wool than the other afforded, and, hoping that a ſimilar change would reſult from a change of place in this caſe as in the former, ſhould get ſome of theſe alſo tranſported to his own country:—How great would his amazement be, when he afterwards found, that theſe ſheep, inſtead of being improved by that change as formerly, had degenerated ſo far as to produce wool of a coarſer quality than either of the former!—Without having known or attended to the foregoing diſtinction, this phænomenon would have appeared inexplicable. But it would not have been attended with ſuch fatal conſequences as the liſtleſs indolence occaſioned by the ſeeming natural concluſion that was drawn from the former experiment.

Before I conclude this note, it may be proper to remark, that although, the change produced upon the quality of the wool by a *great* variation of climate is very

province of Andaluſia, in Spain, there is a race of ſheep, that are brindled, and ſpotted black and white; and, in the Iſle of Man, there is ſaid to be another breed that carries wool of a light buff-colour. To theſe may be added, wool of a bright golden-colour, a ſpecimen of which, I have lately (March, 1797) received from India, of a fine ſilky-gloſs, and delicate texture; but we know not yet, exactly, where the animal which produced this fleece was bred, or of what kind it is, with abſolute preciſion.

8th, They likewiſe differ from one another with reſpect to the purity of their wool.—Some breeds have their fleece per-

very conſiderable, yet a *ſmall* variation in that reſpect produces no ſenſible change; ſo that the farmer may in general diſregard this circumſtance in the changes that he may think it proper to make, by tranſporting the ſheep of one diſtrict of the ſame country into another diſtrict—the variation of the breed, in this caſe, being almoſt the only circumſtance worth attending to.

I now farther add (fourth edition) that I have reaſon to ſuſpect, that there are ſome breeds of ſheep, which carry wool that is not affected by a variation of climate in the ſame manner with that of the breed of ſheep which is commonly reared in Scotland, as deſcribed in the foregoing part of this note.

fectly

fectly free of any mixture whatever, while others have a greater or ſmaller proportion of a particular kind of hair intermixed therewith, that is known in ſome parts of of England, by the name of *Stichel* hair; and in the Northern counties, by that of *Kemps*; and in France, by the appellation of *Jarre*.—This is a kind of ſhort opaque white-like hair, which grows up among the fleeces of ſome kinds of ſheep, that may be eaſily diſtinguiſhed from wool by its dead-like colour, and by being always thicker at the roots than towards the points (which is the reverſe with wool) and by having no degree of elaſticity.—As no wool that has any mixture of this can be properly dyed, or wrought into any valuable manufacture, it ought to be guarded againſt with the moſt ſcrupulous attention. I now alſo know (anno 1797) that there are ſheep which afford a kind of hair, among their wool, totally different from that above deſcribed, being invariably finer at the points than the roots, and longer than the wool. Other varieties there are beſides this alſo.

9*th*, Different races of ſheep likewiſe

vary very much from one another in reſpect of ſize. In Shetland, there is a breed of ſheep, ſo ſmall, that when full grown and fat, will not weigh above three or four pounds per quarter;—and another, nearly as ſmall as this, is kept as a curioſity, in ſome parts of Normandy, in France: whereas, in Flanders, and ſome parts of England, it is not uncommon, for a quarter of mutton to weigh forty or fifty pounds*.

10*th*,

* We have ſeen, that although different breeds of ſheep vary from one another very much, with regard to the fineneſs of their wool, and that this difference between them, ſo long as they remain in equal circumſtances, is permanent and invariable, yet that a variation of the heat of the climate does produce a ſenſible effect upon the quality of the wool of ſome kinds of ſheep; and, in like manner, although there can be no doubt but that there are different breeds of ſheep and other animals, differing eſſentially from one another with regard to ſize, yet it is equally certain, that ſome variation may be produced in this reſpect by the nature, abundance, or deficiency of their food. Thus, ſuppoſing that all the different breeds of ſheep were fed upon paſture where they had, at all times, as much good food as they were able to deſtroy, and were treated properly in other reſpects, there ſeems to be little doubt, but that ſome of theſe would be of a much larger ſize than others; whoſe

deſcendants

10*th*, They alſo differ from one another by the length of their tails.—In Scotland, the

deſcendants, in theſe circumſtances, would continue to retain the ſame difference for ever, if they were ſuffered to copulate with one another: Yet, if any of theſe are carried to another place, where they find a more ſcanty ſubſiſtence, their progeny will gradually diminiſh in ſize, ſo as never to reach the ſtature of their original progenitors, ſo long as they remain in that half-ſtarved condition. But if, at ſome diſtant period, ſome individuals of this unnaturally ſmall breed of animals ſhould chance to be carried to another diſtrict, where they ſhould have more abundant food and warmth when young, their progeny would gradually out-grow their parents, till at length they ſhould attain the full ſize of the original parents of their race; after which they would remain ſtationary, ſo long as they ſhould enjoy this abundance of food and other requiſites. It is from this cauſe that animals in Alpine countries, in which their young are uſually ſtinted in their growth, for want of abundant nouriſhment and genial warmth, are almoſt always ſmaller than in low and fertile countries, where they more uſually attain their natural ſize. Thoſe, therefore, who allege that it is in vain to hope to alter the ſize of the animals bred in any country, becauſe the paſtures, &c. in each place will either raiſe or diminiſh theſe, till the animals attain the ſize that it is naturally fitted to produce, have ſome reaſon for what they allege, although it is not ſtrictly true. Want of abundant food, or an unnatural degree of cold, will always retard the growth of a young animal, and make it ſtop, before it

the tail of the common breed of ſheep does not reach lower than the knees; the tails of Engliſh ſheep, uſually reach the heels, in their natural ſtate.—I take no notice here of the broad-tailed Aſiatic and African ſheep, as they are not natives of this part of the world.

The variations that take place with regard to the above-mentioned particulars, are ſo eaſily diſtinguiſhable, that the moſt inattentive obſerver cannot fail to have remarked them on many occaſions. Thoſe that follow, are not perhaps, leſs certain and permanent, although they do not ſo ſenſibly attract the attention:

11*th*, Certain parts of the fleece of every ſheep are finer than other parts of the ſame fleece; but the difference in this reſpect, in different races of ſheep, is very great.

hath attained its natural ſize; ſo that a large breed may thus become, in certain circumſtances, no bigger than one that was naturally of a much ſmaller ſize. But no treatment could ever bring a breed naturally ſmall, to equal the ſize of one that was originally large, if it is reared where it can have food and warmth in abundance. The different breeds of dogs afford a ſatisfactory illuſtration of this poſition. A maſtiff and a lap-dog, though equally well fed, ſtill retain their diſtinctive ſize.

great.—-Sometimes the wool about the neck and ſhoulders will be remarkably fine and ſilky, and that on the buttocks of the ſame ſheep be exceedingly hard and coarſe; and, on the other hand, ſome kinds of ſheep afford a fleece in which the difference in this reſpect is far leſs conſiderable.

12*th*, In the ſame manner, as we obſerve that ſome individuals of the human ſpecies have the hair of their heads much thicker and cloſer than others, ſo it may be obſerved with regard to different breeds of ſheep, that ſome of them yield a much thicker and more weighty fleece, in proportion to the bulk of the animal, than others do. It would, therefore, be of great uſe to the farmer, to be able to know, with accuracy, the exact difference in this reſpect, between any two varieties of this ſpecies of animal, that he might have it in his power to rear.

13*th*, Some kinds of ſheep give a much greater quantity of milk in proportion to their ſize, than others do, and therefore make much better and fatter lambs than theſe, upon paſtures equally good.—This

is a diſtinction ſeldom attended to, although it might be, on many occaſions, of the utmoſt conſequence to the farmer.

14*th*, It is well known, that certain breeds of ſheep are more diſpoſed to produce twins than others.—There is in Holland, a large breed of ſheep, that ſeldom have leſs than two, often three, and ſometimes four lambs at a time.—In Lincolnſhire, and ſome other parts of England, the ewes almoſt univerſally produce two lambs; and in other parts, where the ſheep are equally well fed, this is a ſort of rarity.

15*th*, It is likewiſe in general believed, that ſome particular kinds of ſheep are more eaſily diſpoſed to carry lambs twice a year, or bring them at different times of the year, than others are.—The Dorſetſhire ſheep have been ſaid to poſſeſs that quality in a peculiar degree;—and although this could ſeldom be of much utility, yet, as it might on ſome occaſions be of uſe, it would be an advantage to the farmer to know all theſe*.

16*th*,

* It is commonly ſaid, that, in Egypt, ſheep yean twice a year. Poſſibly, in that warm climate, this may not

16*th*, It is alſo in general believed, and with good reaſon, that ſome particular breeds of ſheep are naturally more hardy, and leſs ſubject to diſeaſes or accidents of any ſort than others; although the farmer has not yet the ſatisfaction of knowing experimentally if this be really the caſe or not.—Or, if it is,—What are the particular breeds that are eminently diſtinguiſhable for this valuable property?

17*th*, It does not ſeem in the leaſt con-

not be ſuch an exaggeration as the ſame hyperbolical expreſſion is, when applied to more northern climates; although ſome modern travellers have denied that this is the caſe, even in Egypt. An ewe goes with lamb five months; ſo that, ſuppoſing ſhe either did not ſuckle her lamb, or that ſhe again took the ram while giving ſuck, within one month after yeaning (which is a thing that I believe rarely if ever happens with regard to this ſpecies of animals) it would be barely poſſible that they ſhould regularly produce lambs twice a year. But as this is a thing that cannot be expected to turn out to any valuable account, in a climate like that of Britain, we may look upon it rather as a matter of curioſity than otherwiſe. As to their bringing a lamb, perhaps, very early in one ſeaſon, and another ſo late, as that both are brought forth within the courſe of one year, I conſider it as an abuſe of language, to call that having lambs twice a year, and, therefore, as deſerving no farther notice.

trary to reaſon, to believe, that there may be ſome particular breeds of ſheep, and other domeſtic animals, that may, perhaps, by nature require leſs food to ſuſtain them, than others of their own ſpecies, of an equal ſize with themſelves, may require. Yet I know of no experiment, that has been made with a view to determine this important queſtion, from which we could draw any uſeful concluſion.—But as it is of much importance to have this fact aſcertained with preciſion, it ſurely merits the ſpecial attention of thoſe who may have it their power to proſecute experiments of this ſort.—The reaſons that induce me to think that this might probably be the caſe, are as follow:—

We have already ſeen, p. 116, that ſome animals of one genus require a greater quantity of food, than thoſe of another, although of an equal ſize: From which we may be led at leaſt to enquire, if this may not, on ſome occaſions, happen to be the caſe with regard to different varieties of the ſame ſpecies?—Some horſes will thrive upon harder fare than others; and ſome kinds of cows are more eaſily

kept

kept up in winter than others; which would ſeem, in ſome meaſure, to corroborate this conjecture.

And that ſomething of this kind does actually take place with regard to the different varieties of dogs, ſeems to be in general allowed;—as I never heard it diſputed by thoſe who had attended to this circumſtance, as to this claſs of animals, that that particular breed of dogs, called Pointers, require a much larger proportion of food to keep them properly than grey-hounds do; and that maſtiffs take ſtill leſs food, in proportion to their ſize, than grey-hounds *.—I would be far, however, from aſſerting theſe as undoubted facts;—but popular opinions have for the moſt part ſome foundation in truth, and therefore, deſerve to be confuted by experience, or indiſputable arguments, before they are fairly rejected.

If this difficulty were ſolved, it would

* This obſervation ſeems to be confirmed by the experiments of Mr. Arthur Young, who finds that ſom kinds of cattle require one-third of their weight *per* day to feed them, and others only one-fifth. Exp. Agr. Vol. II. Art. *Cattle*.

enable us to deviſe proper experiments for determining another, that has been often propoſed, and debated with much warmth, although it can admit of no final ſolution, till this previous doubt be diſcuſſed, *viz.* Whether it is moſt profitable for the farmer to rear animals of a large breed, or ſuch as are ſmaller? that is to ſay, Whether a large breed of ſheep or cattle require food of a better quality, or in greater quantity, in proportion to their ſize, than ſuch as are ſmaller?—Or, in other words, Whether the ſame field of graſs would rear a greater weight of beef or mutton, if it were depaſtured with a breed of large, or another of ſmall cattle or ſheep?

A large animal is ſo beautiful to look at, and conveys ſuch an idea of plenty and luxuriance to the imagination, that it is apt to catch the fancy, and impoſe upon the judgment ſo much as not to allow us to attend to all the circumſtances which might produce ſome effect, with that cautious circumſpection, which is neceſſary in in economical diſquiſitions of this ſort. Hence it has uſually happened, that thoſe improving farmers, who have endeavour-

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ed to better the breed of theſe two uſeful kinds of animals in any one diſtrict, have attempted to do it by introducing a larger inſtead of a ſmaller kind: which circumſtance alone they have always conſidered as a capital improvement.—But it has as generally happened, that the greater part of the inhabitants in every country, imagining that large animals of any ſort, require a greater quantity of food in proportion to their bulk than ſmaller ones, as well as a more careful management, have always looked upon theſe attempts to introduce a larger breed among them rather as hurtful than beneficial, and have therefore oppoſed ſuch innovations with all their might.—Now, if it ſhould be found, upon a proper examination, that ſome varieties, either of the ox or ſheep, require a greater or ſmaller proportion of food than ſome other varieties of theſe do, it would be poſſible, that each of theſe two oppoſite opinions might, in different circumſtances, be juſt. For, it might ſo happen, that of two varieties that ſhould be compared with one another in one corner, the ſmalleſt might be the moſt

hardy breed, and that which required leaſt food in proportion to its ſize,—while, in another diſtrict, where the ſame experiment ſhould chance to be tried, the largeſt of the two might poſſeſs theſe valuable qualities in a more eminent degree: So that till the firſt difficulty is finally determined, we can draw no general concluſion from any particular experiments that might be made with a view to elucidate the ſecond.

The above catalogue comprehends almoſt all the particulars that occur to me, as contributing to occaſion any variation between the different races or breeds of ſheep.—And if it be conſidered, that not only each of the oppoſite qualities above enumerated may be poſſeſſed by different breeds in all the intermediate ſtages between the one extreme and the other, but alſo that any one or more of the other peculiarities may be blended with theſe in all poſſible proportions, we will eaſily perceive that the varieties produced by this means may be almoſt infinite;—ſo that it is perhaps impoſſible to form any adequate idea of the improvements that might be

made

made in this particular branch of rural economics, ſhould the general attention be properly directed towards it, and the judicious efforts of individuals be long enough continued.—But as many opinions prevail on this ſubject, that ſeem to have been derived from the limited obſervations of private individuals, who have not had an opportunity of being better informed, which tend very much to diſcourage the attempts that might be made towards improvement in this reſpect; it may not perhaps be improper, before we leave this head, to examine, with ſome degree of attention, a few of theſe popular opinions, with a view to diſcover if they are founded on reaſon, or the reverſe.

It ſeems to be an opinion rather too univerſally prevalent, that that breed of animals which is found in any one diſtrict, is more peculiarly adapted to the nature of the climate, and other circumſtances relating thereto, than any other that could be introduced into it; and that, of conſequence, any attempts that may be made towards any improvement in this reſpect, will not be attended with the expected ſucceſs.—But although it ſhould

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be allowed, that the beneficent Creator of this Univerſe, hath, in general, provided every country with thoſe productions, whether of the animal or vegetable kingdom, that are moſt eſſentially neceſſary to the exiſtence of the inhabitants thereof; yet, as daily experience proves, beyond a poſſibility of doubt, that peculiar animals, as well as vegetables, are ſometimes found in one country, and not in another, which is exactly ſimilar to it in every reſpect; and that theſe animals or vegetables do thrive when tranſplanted to it, as well as in their native country; it would ſeem that this partial deficiency had been wiſely ſo ordained, to ſerve as a ſpur to human ingenuity and induſtry,—as a moſt powerful means of promoting that ſocial intercourſe between different nations, which hath ſuch a direct tendency to correct local prejudices, and humanize the ſoul, rather than to repreſs thoſe vigorous exertions of the mental powers in which the principal happineſs of man ſo evidently conſiſts.—And the ſucceſs that has attended many attempts of this kind, and the benefits that reſult

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from thence to ſociety in general, ſufficiently confirm the obſervation. — The ſilk-worm was long confined to a particular diſtrict of Aſia alone, although it has been reared for hundreds of years paſt, to as great perfection in many parts of Europe as in its original native country; and the breed of horſes in Britain, which are now ſuppoſed to exceed in ſwiftneſs thoſe of all other nations, are all known to be deſcended from parents that have been imported from diſtant regions. — Pears, cherries, peaches, apricots, and all the other fine fruits of our gardens, are natives of other diſtant countries, and were utterly unknown, not only to our anceſtors in Britain, but to every European nation: — Even cabbages, coleworts, and colliflowers, with almoſt all the numerous train of garden-roots and pot-herbs, were only of late introduced into Britain, where they are now reared in greater perfection than on any other part of the globe.— Horſes, cows, and ſheep, were not known in America before the Europeans ſettled there;—peaches, which now grow wild in every corner of America, and flouriſh with

with a luxuriance unknown in every other country, were only introduced into theſe regions by the firſt ſettlers from hence :— And it is but of yeſterday that the firſt handful of rice was accidentally brought into Carolina; where it has ſince proſpered ſo exceedingly, as to enable the inhabitants of that country to ſupply almoſt all the markets of Europe and the Weſt Indies, with that uſeful grain.—In ſhort, the benefits that ſociety hath reaped from judiciouſly tranſporting the animals or vegetables of one country into another, that might ſtand in need of them, are ſo many and great as might fill whole volumes barely to enumerate; and ought to ſerve as a ſtrong incitement to us, to attempt ſuch farther improvements in this reſpect, as well-informed reaſon may point out as uſeful.

It likewiſe happens to be too univerſally believed, that the peculiar qualities of any breed of domeſtic animals, that may have continued long in any one diſtrict, are chiefly to be attributed to the nature of the paſture, or ſome other peculiarities of the ſoil or climate of that diſtrict, and not

to

to any difference in the primitive qualities of the original breed of animals.—Thus, an inhabitant of Lincolnſhire fondly imagines, that the length of the wool that his ſheep produces, is owing to the peculiar temperature of the air, which that county enjoys, or the nature of the paſture that there abounds.—A native of Cornwall as ſincerely believes, that the very coarſe fleeces which his flocks afford, are to be attributed to ſimilar cauſes. In this opinion, each of them is ſtrongly confirmed, by obſerving, that if any ſheep that carry wool of a different quality from that of their own, are introduced into either of theſe counties from any other diſtrict, their progeny in a ſhort time loſe all thoſe original marks of diſtinction, and can no longer be perceived to differ in any reſpect from their own original breed. From this obſervation, they, with ſeeming good reaſon, conclude, that it is in vain for them, in the one caſe, to hope to improve the breed of the county; and that it is equally fooliſh, in the other caſe, to give themſelves any uneaſineſs leſt their's ſhould degenerate; ſeeing the paſtures or climate

of

of each county will quickly bring any ſtrange breed of ſheep to a perfect equality with their own. And thus each party ſits down contented with his own flock, thinking it is out of his power to make it better or worſe than it happens to be at the beginning.

I do not, however, know a more fallacious experiment than this, nor one that is attended with more pernicious conſequences to the public; and, therefore, it deſerves to be examined with the moſt ſcrupulous attention.

The fact is undoubtedly true; but the inference that has been drawn from it, is probably extremely erroneous; as there ſeems to be the ſtrongeſt reaſon to believe, that the change produced upon the progeny of theſe ſtrange ſheep is to be entirely attributed to the mixture of the blood of theſe, with the native ſheep of the country; and, perhaps, not at all to the influence either of the ſoil or climate. —For, as it is next to impoſſible, to keep a few ſheep diſtinct by themſelves in any country during the rutting-ſeaſon, it is not to be doubted, but that the lambs produc-

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ed by this promiſcuous copulation, will participate of the nature both of the father and mother. And as this mongrel breed likewiſe intercopulate in their turn with the native ſheep of the country around them, their deſcendants more nearly approximate to the nature of theſe; and their progeny coming ſtill nearer and more near, to the native ſheep of the country, in a geometrical progreſſion, it muſt neceſſarily happen, that in a ſhort time, the qualities which diſtinguiſhed theſe ſtrange ſheep at firſt, being ſo much divided among their deſcendants, become altogether imperceptible to the ſenſes.——In the ſame manner, a drop of milk mixed with an equal portion of water, becomes ſenſibly diluted; and if that compound is mixed with a larger quantity of water, it becomes ſtill more and more colourleſs; and if the ſame operation be repeated ſeveral times, the ſingle drop of milk, diſperſed through a whole bucket of water, ſeems to be totally annihilated, and does not ſenſibly diminiſh the tranſparency of that limpid fluid; although there is no doubt, but that the milk is ſtill there preſent, and

is no farther altered than by being divided into ſuch minute parts as to elude our ſenſes.

That the change produced upon the deſcendants of theſe ſtrange ſheep, is to be attributed to the cauſe above mentioned, and not to the influence of the paſture or climate, ſeems highly probable from this circumſtance, that we frequently meet with diſtinct breeds of ſheep in two neighbouring diſtricts, that vary very little from one another, either with reſpect to climate or paſtures; as is the caſe with the neighbouring counties of Lincoln and Norfolk, —each of which hath poſſeſſed, for hundreds of years paſt, their own particular breed of ſheep, that are very eaſily diſtinguiſhable from one another; the ſheep in this caſe, being more effectually kept from intermingling with one another, than can uſually happen in two neighbouring counties, by the fens and the waſh that ſeparate them.

But what proves, beyond a poſſibility of doubt, that theſe changes are not to be attributed either to the ſoil or climate, but merely to the intermixture of blood, is, that

that the original ſheep which come from one diſtrict into another, may remain there as long as you incline, without undergoing any change;—the alteration being only obſerved to take place with regard to their deſcendants.

It is probable that any one of the diſtinguiſhing properties above enumerated, may be united with any other of theſe, in the ſame animal, in any proportion: Nor does it appear, that we are as yet poſſeſſed of any facts that ſhould induce us to believe, that any two of theſe qualities are more uſually connected with one another, than with any other two or more of them; although popular prejudice has on ſome occaſions ſuppoſed, that ſome of theſe peculiarities are more naturally connected with one another, than they are with ſome of the other qualities.—Thus, many perſons are diſpoſed to connect, in their own minds, the idea of fineneſs of quality of the wool, with ſmallneſs of ſize in the animal, although it does not appear that we are poſſeſſed of facts ſufficient to confirm this conjecture.—The ſheep of Lincolnſhire and Romney-marſh are among

the largeſt in England, and carry much finer wool than thoſe of Derbyſhire and Northumberland, which are of a much ſmaller ſize.—Neither are we to conclude, that largeneſs of ſize neceſſarily produces fine wool. For the Tees-water ſheep are as large as any of theſe, and afford a wool of a very coarſe quality.

Others are diſpoſed to imagine, that the length of the wool is in ſome meaſure connected with the ſize of the ſheep; thinking that ſmall ſheep have always ſhorter wool, than thoſe that are larger.—But neither is this confirmed by experience.—The Dorſetſhire ſheep, which yield ſhort carding wool, have a much larger body than a ſmall breed of black-faced ſheep, in the South of Scotland, that carry wool almoſt as long as any in England;—and the ſheep that produce the fineſt ſhort Segovian wool, in Spain, I am aſſured from good authority, are nearly of as large a ſize, as the beſt breed of ſheep in Lincolnſhire.—The laſt-named ſheep afford a proof, that the largeneſs of ſize does not obſtruct the length of the wool; although the Tees-water ſheep, which are much larger,

larger, do not produce wool of near ſuch length of ſtaple as theſe do.

Others again are more diſpoſed to think, that fineneſs of ſtaple, is in a great meaſure connected with the ſhortneſs thereof: —But neither do we here meet with the facts neceſſary to confirm their hypotheſis. —Lincolnſhire wool is much longer than that of Durham, Derbyſhire, or Cornwall, and it is at the ſame time of a much finer ſtaple.—The longeſt wool upon the ſame fleece, is indeed, uſually the coarſeſt part of it; from whence, in all probability, this opinion has been derived.

Others think, that fineneſs of wool is connected with delicacy of conſtitution in the animal.—But this we have no reaſon to imagine from experience: For, we do not find that the fine-woolled ſheep of Shropſhire, Somerſet, Hampſhire, Kent, or Surrey, are more tenderly treated, or ſubject to more accidents, than the other coarſer-woolled ſheep in the kingdom. And if I might venture to ſpeak from my own private experience, I could ſafely affirm, that after having kept in the ſame

flock for ſome years, ſeveral diſtinct breeds of ſheep, ſome of which yielded much coarſer wool than others, it has ſo happened that the fineſt-woolled ſheep have been at all ſeaſons in the beſt order.—From which, however, I would by no means infer, that this is always the caſe; as I make no doubt but theſe two qualities, fineneſs of wool, and delicacy of conſtitution, may be ſometimes united in the ſame breed, as well as any other two qualities.

Others think, thoſe ſheep that carry fine wool, have neceſſarily a thinner fleece, and conſequently leſs wool in proportion to their ſize, than ſuch as yield coarſer wool. But neither have I met with any facts that would induce me to believe that this is always the caſe. The ſheep in my own flock which have the fineſt wool, yield likewiſe the moſt weighty fleeces in proportion to their ſize, in the *ratio* at leaſt of three to two; and it is now well known that the fleece of the fine-woolled Spaniſh ſheep is much cloſer in the pile than that of any breed of ſheep reared in Britain.

I might go on, and enumerate ſeveral other

other qualities that have, with as little reaſon as the above, been ſuppoſed to be neceſſarily connected with one another; but, to avoid prolixity, I decline going any farther in this inveſtigation at preſent;—hoping I ſhall not be accuſed of precipitancy, if, from the above examples, I ſhould infer, that we have much reaſon to think, that ſometimes one or more of theſe diſtinguiſhing qualities may be found united with ſome other of theſe in one particular breed of ſheep, while theſe ſame qualities may be united with ſome other diſtinguiſhing peculiarities in ſome other breed: and as this may be varied almoſt to infinity, it ought to put us much upon our guard againſt drawing general concluſions from any particular experiments.

It would ſeem likewiſe that we might naturally infer from the above induction, that ſeeing there may be ſuch an infinite diverſity in this reſpect, no one needs ever to deſpair of being able to improve his own particular breed, ſo long as it is not poſſeſſed of all the valuable qualities that he would wiſh for; as it is poſſible he

may meet with another breed that poſſeſſes theſe qualities he wants, or may get them communicated to his own, by properly croſſing with others: And that, therefore, inſtead of ſitting down in liſtleſs indolence, truſting entirely to Providence for the meliorating his flock, he may have his eyes always open, to mark every advantage that fortune may throw in his way, and his reaſoning faculty alive and active, ſo as to diſtinguiſh with accuracy how far any propoſed alteration may be attended with any eſſential improvement, or the reverſe.—If the Corniſh farmer, and others who, like himſelf, are poſſeſſed of a breed of ſheep yielding very coarſe wool, or ſuch as is mixed with *ſtitchel hair* (kemps) inſtead of ſitting down contented with theſe as the beſt that his ſituation would admit of*, had, with a diſcerning attention, ſtudied to better his breed, he might have reaped from thence, long ere now, ſome very eſſential benefits.

* I have been informed, and have good reaſon to believe, that the Corniſh hair, as it is uſually called, has been ſomewhat improved of late, by an attention to improve their breed of ſheep.

But

But if, from the above induction, we have room to hope for high degrees of improvement, we likewiſe from thence ſee great reaſon to induce us to proceed in our attempts of this ſort with the moſt cautious circumſpection: Becauſe, if we do not attend to all the collateral qualities, if I may ſo expreſs myſelf, that any particular breed of ſheep may poſſeſs, united with that particular one we wiſh to obtain, it may ſo happen, that for the ſake of that eſtimable quality, we may ſacrifice ſeveral others, of much greater value *.—But if we have all theſe important objects in view, and beſtow upon each its proper degree of attention, it is impoſſible but our attempts muſt be attended

* Thoſe ſpirited farmers who wiſh to improve the quality of their wool, by introducing fine ſheep from other countries, ought to be on their guard, leſt they thus introduce diſeaſes into their flocks that are not eaſily eradicated.—Of late, an alarming diſeaſe has made its appearance among the ſheep in Lincolnſhire,—improperly called the *rickets*.—It is not infectious by contact—but runs in the blood, and ſeems to be always hereditary.—It never fails to be fatal to all the ſheep that are affected by it, as no ſort of cure has yet been diſcovered for it.

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with ſucceſs *. And as nothing could ſo much tend to facilitate any attempt for an improvement of this ſort, as an exact enumeration of all the particular breeds of ſheep that can be found in this or any other country, with a ſpecial deſcription of all the diſtinguiſhing peculiarities of each, it is very much to be wiſhed that ſuch a thing could be acompliſhed.

Goats are, in general, much leſs eſteemed than ſheep: Yet, as theſe may be properly kept in ſome ſituations where no other animal could live ſo well, it might be alſo of uſe to have a ſpecial enumeration of the various breeds of this ſpecies of animals, with a particular enumeration of the peculiar qualities of each.—On the mountain called *Sierra de Strella*, near Almeida, in the province of Beira, in Por-

* The very great improvements that have been made upon the breed of horſes in Britain, in the courſe of ſome centuries paſt, ought to encourage us to hope, that with an equal degree of attention, we might be able to make a ſtill higher improvement on the nature of our ſheep, as the climate is more favourable to this animal than the horſe.

tugal,

tugal, I have been aſſured, that there is a breed of large fine goats remarkable for yielding a very great quantity of milk;—a gallon, or a gallon and a half Engliſh (two or three pints Scots) per day.—Theſe would probably be of great uſe for being taken into ſhips for long voyages, were they introduced into Britain.

Whether the goat of Angora, that affords the fine ſilky hair called Mo-hair, be only a variety of the common goat, as Dr. Haſlequiſt imagines, or a diſtinct ſpecies by itſelf, ſeems not as yet to have been aſcertained with certainty.—But of this, and ſome others of the ſame claſs of animals, I ſhall have occaſion to ſpeak hereafter.

The peculiar properties of the different breeds of hogs are as little known as of the other domeſtic animals, and therefore deſerve to be enquired into.—The ſmall Chineſe hog, is vaſtly different from the large Engliſh breed, in ſize and appearance.—But we have as yet no accurate experiments on which we can with certainty rely, for aſcertaining the peculiar qualities,

qualities, either of theſe, or of the different breeds known in Europe.

XXXV.

It is in general believed, that old paſtures are much more valuable than new. Is this really the caſe?—If it is, to what cauſes ought this to be aſcribed?—or, are there any means of obviating this inconvenience?—What are they?

That ſome old paſtures may be found, which afford a greater abundance of excellent food for quadrupeds than any that are new, is a fact ſo univerſally acknowledged, as hardly to admit of a diſpute; but there is as little room to doubt, that the opinion which in many places ſo much prevails that every paſture-field that is old, is neceſſarily better and more profitable to the community, than if it were ploughed up, and again judiciouſly laid down to graſs, with the ſyſtem of farming that has been engrafted upon it, of abſolutely

abſolutely reſtricting the poſſeſſors of ſuch fields in any caſe from ploughing them up, has been attended with very pernicious conſequences. It is therefore of much importance, that the falſe principles upon which this opinion is founded, ſhould be expoſed, and the erroneous tenets that have been adopted in conſequence thereof exploded.

It is but about a hundred years ſince the practice of ſowing any kinds of graſs-ſeeds was firſt introduced into Britain. And as before that period, every field, when allowed to remain unploughed, became in time covered with ſuch graſſes as chanced to have their ſeeds or roots in the field without any effort of the farmer, theſe were called natural graſſes, in oppoſition to thoſe that have been ſince that time propagated by ſowing, which have been called artificial graſſes.—And although theſe laſt are in many caſes indigenous plants, and as much natives of the ſoil as any others, yet this inaccurate diſtinction ſtill prevails, and, along with it, an opinion, that as thoſe plants that are found to ſpring up ſpontaneouſly in the

ſoil,

ſoil, are evidently better adapted to it than thoſe that are thus, as they imagine, contrary to the intention of Nature, forced upon it; ſo, of conſequence, it is better to allow theſe quietly to eſtabliſh themſelves, than to force them to give way to ſtrangers.

This mode of reaſonning has probably induced many to imagine, that every attempt to improve our paſtures, by ſowing what they call artificial graſs-ſeeds, will be without ſucceſs:—In which opinion they are farther confirmed, by remarking, that thoſe fields which have been attempted to be laid out for paſture, and have been ſowed with the ſeeds of theſe artificial graſſes, have hardly in any caſe produced a pile ſo cloſe or ſo fine, as what is frequently remarked in thoſe old paſtures which bountiful Nature hath clothed with her moſt valuable robe.

It will not, however, be alleged, that our fields, if left to themſelves, will furniſh ſuch abundant crops of cutting-graſs or valuable hay, as may with certainty be obtained from them by cultivating ſome of theſe artificial graſſes; ſo that we have

have the fulleſt proof that Nature may in this caſe be improved upon. And although it is probable, that none of the graſſes that have been hitherto cultivated by the farmer, are of the moſt proper kind for paſturage; yet, there is little reaſon to doubt, but that many of the moſt valuable kinds for this purpoſe, would admit of being cultivated with the ſame eaſe as ſome of thoſe are with which we are well acquainted, if they were properly ſeparated from others, and cultivated with equal care.

But ſo long as we ſhall remain ignorant of the peculiar qualities of each kind of graſs, ſo as not to be able to diſtinguiſh the good from the bad, it is not ſurpriſing that we ſhould remain firmly perſuaded that Nature alone can provide valuable paſtures, and that age is ſo eſſentially neceſſary for bringing them to their ultimate perfection.—For if we allow our fields to remain uncultivated, without having ſowed them with any kind of graſs-ſeeds, it muſt ever happen, that the ſeeds of ſuch graſſes as are brought by the wind or otherwiſe, from the neighbouring

fields, will there take root, and in time eſtabliſh themſelves. — And as it may ſometimes happen, that ſome of the moſt valuable paſture-graſſes may there abound; the field, in theſe caſes, will become filled with their ſeeds, and in due time may afford the moſt valuable paſture. But if bad kinds of graſſes ſhould abound in the neighbourhood more than the good, the field will as naturally become filled with the ſeeds of theſe uſeleſs plants.—And as a number of theſe are hardy and abiding plants, if the field is once filled with them, the paſture will be, of conſequence, always of little value, if it ſhould be allowed to remain undiſturbed for any length of time.

Thus we ſee that the only difference between natural and artificial graſſes, is, that, in the laſt caſe, the ſeeds are ſown in ſuch quantities by the huſbandman, and ſo properly diſpoſed for vegetating, that they come up at once in ſuch abundance as to fill the whole field entirely, without allowing room for other graſſes to ſpring, in any conſiderable proportion, among them;—whereas, in the firſt, the ſeeds

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are only ſlowly and ſcantily brought by the winds, and expoſed unprotected to all the viciſſitudes of weather: ſo that it is long before the field becomes fully ſtocked with them, and muſt at laſt be filled with ſuch hardy ſorts as may chance to be in the neighbourhood, whether they be good or bad.

And as in theſe circumſtances, the roots of ſhort-lived plants, ſuch as couch-graſs, knot-graſs, narrow-leaved ſorrel, wild-mint, and others of that ſort, that are uſually found in looſe cultivated ground, are allowed to ſpread without interruption; and as they have in this caſe no other plants to contend with, they advance for a year or two after the field is laid into graſs, with the greateſt luxuriance; ſo that the firſt two or three crops of graſs on ſuch fields, conſiſt almoſt entirely of theſe, together with a few annual weeds that ſpring up in ſuch uncultivated fields. And it is only after theſe plants gradually die away, that the weaker and more valuable perennial graſſes begin to eſtabliſh themſelves, and the paſture becomes gradually better, if circumſtances ſhould have

concurred to eſtabliſh the ſeeds of valuable graſſes in that field.

Thus we diſcover the reaſon why natural paſtures never can be ſo good when they are new, as they may become afterwards.—Whether the ſame objections lie againſt artificial paſtures, is not ſo certain.

The above will be acknowledged to be a fair and genuine account of the eſtabliſhment and progreſs of a field of natural graſs, and well demands the ſerious attention of the reader.—Let him conſider how numerous the circumſtances are that muſt accidentally concur together before it is poſſible to expect a very fine field of paſture-graſs, if left to Nature, and then he will perceive how improbable it is that all theſe ſhould concur to produce their full effect in any one field whatever.—There muſt be no roots of bad graſſes, nor ſeeds of robuſt annuals in the ſoil when it is left out from tillage; and the ſeeds of the moſt valuable kinds of graſſes muſt be in the neighbourhood in ſuch abundance as to fill the whole field ſufficiently at once. Nor is this all.—For as there are, no doubt,

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a conſiderable variety of valuable kinds of graſs, ſome of which are naturally fitted to grow to perfection on one kind of ſoil, or upon that ſoil when in certain circumſtances, while others would thrive beſt upon another ſoil, or upon that ſoil only in certain peculiar circumſtancs; it muſt ſo happen, that theſe very plants which are beſt adapted to the ſoil in the ſtate it may be in at the time, ſhould be found in abundance in the neighbourhood of the field. Neither muſt there be found near that, any ſort of robuſt quick-growing plant, the ſeeds of which, by being blown upon that field, might ſuddenly ruſh up, and ſuffocate, in their infancy, theſe tender and valuable plants.—Nor muſt there be found any bad kinds of graſs, that, by being eſtabliſhed along with the good in any proportion, might tend to diminiſh the value of the paſture. —Now, let any one reflect on the infinite diverſity theſe few particulars may admit of, and think how utterly impoſſible it is that all the favourable circumſtances, without any of thoſe that are unfavourable, ſhould concur in any one caſe, and

he will acknowledge, that thoſe who found their hope of obtaining the moſt valuable paſtures only upon the fortuitous concurrence of all theſe circumſtances, or who imagine that every paſture which is old muſt, on that account, of neceſſity be good, act in direct contradiction to the plaineſt dictates of reaſon and common ſenſe.—For, although it ſhould be allowed that the graſſes hitherto cultivated are not of the moſt proper ſort for forming good paſtures, and that therefore, on ſome occaſions, much better natural paſtures may be met with than could be formed by means of any of theſe; yet it by no means follows from thence, that if the farmer were perfectly acquainted with the value and diſtinguiſhing qualities of each kind of natural graſs, and knew the ſoil and culture that beſt agreed with it, the moſt proper manner of rearing it, and every other particular relating to the economy thereof, he might not perhaps have it in his power to form artificial paſtures as much excelling the natural as theſe laſt at preſent uſually exceed the former.—For, were he poſſeſſed of the knowledge

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above ſuppoſed, he could at once fill his ſoil with the ſeeds of thoſe valuable graſſes which he knew were beſt adapted to it, and thus effectually exclude the admiſſion of every uſeleſs plant, or pernicious kind of graſs, that might be brought from the neighbouring fields by the wind, or other accidental cauſes *.

Thus

* I cannot, on this occaſion, omit taking notice of a circumſtance that produces many diſagreeable conſequences, and therefore deſerves a more particular degree of attention, than it has hitherto obtained among modern improvers, *viz.* an inattention to the nature of the plants that grow in the margin of ploughed fields, and other waſte corners of the farm. Theſe places are often filled with docks—ragwort—thiſtles—and other uſeleſs or pernicious plants, which are allowed to remain undiſturbed till the ſeeds are brought to perfection, and diſperſed by the wind through every corner of the farm, where they ſpring up in abundance, to the infinite prejudice of every uſeful crop, and the ruin of the farmer, whoſe attempts to clean and enrich his fields, are thus perpetually fruſtrated; for the richer and cleaner his ground is, it is the fitter for rearing theſe pernicious weeds with the greater luxuriance. Every man, therefore, who hopes to be benefited by his labours, ought to be peculiarly attentive to ſee that every bad plant be cut down before it comes to flower, in every part of his farm.—One thiſtle—or ragwood, that eſcapes in a neglected corner, may produce ſeeds enough

Thus it appears, that the very beſt ſoils, if allowed to run into natural graſs, may, from

to ſtock a whole field; and the ſeeds are ſo light, that they are diſperſed to an amazing diſtance around; ſo that it is of the utmoſt conſequence that none of them eſcape.

This is a ſort of attention that no man ought to neglect:—But the farmer who wiſhes to reap the full value of his grounds, may go one ſtep farther, and make theſe borders of his fields prove beneficial, inſtead of hurtful. With this view, he ought to dig, manure, and lay perfectly level, the borders round all his incloſures, and ſow it down with proper graſs-ſeeds once for all. If it is made ſmooth, it will ſerve for a proper and agreeable walk:—if it is made rich, the graſs will become ſo luxuriant, as to admit of being cut by the ſcythe while the field is in corn; and if it is filled with proper kinds of graſs, it may help to ſtock his fields with valuable plants, inſtead of pernicious weeds.

To make the farmer underſtand the full import of this laſt hint, it is neceſſary he ſhould be informed, that there are many valuable plants and graſſes, whoſe ſeeds cannot be ſaved without ſome trouble, that might be readily diſſeminated through the fields, if the borders were filled with theſe.—Of this ſort is the ſoft graſs, *(poa pratenſis)* already taken notice of, and the yarrow plant, whoſe ſeeds may, indeed, be collected by hand, but which would be more eaſily diſſeminated by the wind, if allowed to ripen in the borders—for it is as light and chaffy as the ragwort ſeeds. If theſe were allowed to ripen and ſhed their ſeeds that ſeaſon that the field

from accidental cauſes, become ſtocked with a variety of bad and unprofitable plants,

field was to be laid out for graſs, it is not to be doubted, but many of the plants would ſpring up in the fields while under paſture.

There are many other plants, whoſe ſeeds can hardly be at all collected by the hand in ſufficient quantities, that might on many occaſions be planted in our fields by this means, if duly attended to.

On the ſubject of extirpating hurtful plants, I ſhall here take notice of one fact, that may on many occaſions be of uſe, if adverted to. Few plants are more hurtful to paſture fields, than the common ragwort *(ſenecio jacobæa)* which, if once eſtabliſhed in a field, can hardly ever be entirely extirpated; and when it has once ſpread through a large diſtrict of country, can ſcarcely be baniſhed from a particular field: But nothing is more eaſy than to eradicate it entirely, when it firſt makes its appearance in any part of the country where it did not formerly abound, as I once experienced, in the following manner:

I poſſeſſed a farm in a part of the country where this plant did not abound; but ſome of the ſeeds of it had been brought by accident among the graſs-ſeeds, with which I ſowed a field on that farm. The ſecond year after ſowing, that field was paſtured, and it was very much choaked up with ragweed. I took care, however, to cauſe every plant of it to be cut over, when it began to ſhow its flower; and was attentive myſelf to obſerve, from time to time, that not one plant eſcaped: the conſequence was, that next year only two or three plants appeared,

plants, ſo as to remain for ever a coarſe and diſagreeable paſture: In which caſe, an abſolute reſtriction from ploughing, and thus giving it at leaſt another chance of being ſtocked with better plants, or producing other more profitable crops, muſt be conſidered as an eſſential detriment to the public.

But this may be looked upon as a favourable caſe, in compariſon of many others that daily occur, from an injudicious attachment to this erroneous principle.—For although it is uſually admitted as an indiſputable axiom in agriculture, that ſo long as ground remains in paſture-graſs, it is always in an improving ſtate, the ſoil neceſſarily becoming richer and

peared, in place of as many hundreds, perhaps thouſands, the year before. Theſe few were carefully cut over, and the field ever afterwards was quite free of this deſtructive weed. It is obvious, however, that if it had abounded in the adjoining fields, the ſame effects would not have reſulted from this operation, as the ſeeds would have been blown from thence into my field. It is a biennial plant —the ſeeds that are ſown this ſeaſon, only come into flower the next year, and if the plant be cut over when in bloſſom, the root dies down during the enſuing winter, before it can produce any ſeeds.

richer

richer every year, which is not ſuppoſed to be in general the caſe, with regard to ploughed grounds; and although it be from hence inferred, that thoſe who abſolutely prohibit the converting any of their graſs-grounds into tillage, act a wiſe and patriotic part, as they thus tranſmit to their poſterity, a ſubject richer and more valuable than they received: Yet, I imagine, there will be found much reaſon to apprehend, that the truth of the axiom may be juſtly diſputed, and that the inference which has been drawn from it may be erroneous.

That a ſoil which is naturally fertile, and in good order, may be meliorated by being allowed to remain long in paſture, if it be ſtocked with valuable kinds of graſſes, will be readily allowed: But if it is naturally unfertile, or diſpoſed to produce ſeveral kinds of bad and unprofitable plants, inſtead of becoming richer by remaining long in graſs, I am well ſatisfied, from numberleſs obſervations, that in many caſes it gradually grows worſe than at firſt, and not only affords leſs food for animals than at ſome former period, but

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even becomes leſs fitted for producing abundant crops of grain at any time to come, than it would have been if it had been ſooner converted into corn ground.

Thoſe who are diſpoſed to be ſtartled at the ſeeming novelty of this opinion, will pleaſe to recollect, that if ground muſt neceſſarily be improved by being allowed to remain in graſs, without any regard to the ſtate that it might be in at the time that it was firſt allowed to remain undiſturbed by the plough, it would of neceſſity follow, that all waſtes, commons, and other barren patches of ground that have ever ſince the creation been allowed to produce the plants which naturally ſpring up on them, muſt be conſtantly improving, and becoming gradually richer and richer every day:—a circumſtance that I believe no man, in his ſober ſenſes, will take upon him ſeriouſly to affirm.

But that theſe, in many caſes, not only do not improve, but actually grow worſe and worſe, if certain plants are allowed to grow upon them, ſeems to be prètty evident from the preſent ſtate of many parts of Scotland, that were deſerted

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about the beginning of this century, in conſequence of a ſevere famine which then prevailed in the land, and have been allowed to remain uncultivated ever ſince; in conſequence of which, they have become gradually covered with heath, and not only afford very little graſs for paſture, but have become in a great meaſure unfit for bearing corn of any ſort.—For wherever heath abounds, there is generated, by the rotting of the leaves and roots of this plant, a peculiar kind of black earth, that is not only of itſelf ſteril, but has alſo a powerful tendency to render any ſoil with which it may be mixed unfertile; inſomuch, that the moſt effectual way to improve ground upon which this plant has grown, is to bury that earth entirely, by trenching, which, on many other occaſions, would be rather hurtful than beneficial *.—Now, as it ſeems to be pretty certain

* The reader is deſired to attend to this diſtinction.—If he is an inhabitant of a rich corn country, he will be convinced, from experience, that trenching corn-ground, is in general hurtful.—If he lives in a barren mooriſh country, he will as naturally be inclined to believe, that trenching is, almoſt in all caſes, a capital improvement.

certain that this plant naturally tends to deteriorate the ſoil upon which it grows, what

provement.—Ought not this to teach farmers who have been confined to one diſtrict, to be cautious how they criticiſe, with contemptuous aſperity, the general conduct of thoſe of another diſtrict, poſſeſſing a ſoil of a different nature, or in a different ſtate from their own?—I hardly know a more helpleſs creature, or one who would deſerve more to be pitied, than a mere practical farmer, who ſhould move from a rich highly improved ſoil, in a good climate, to poſſeſs a farm in an unimproved country, where the ſoil and climate were naturally bad, and manures without his reach.—If this obſervation be well founded, ought it not to make us entertain a doubt, if the practice lately introduced into ſome of the unimproved parts of Scotland, of gentlemen ſending their ſons to the moſt improved counties in England, to learn the practice of agriculture, will be attended with all the beneficial conſequences that are at firſt expected to ariſe from it?—In an unimproved country, a farmer has numberleſs difficulties to encounter, that are not known or dreamed of in one where agriculture has been long practiſed with ſucceſs.—And is it in the lap of eaſe, and in the midſt of abundance, that one learns beſt to ſuffer hardſhips with fortitude, and overcome difficulties by perſeverance? Is it within the walls of a garriſon, that a general may beſt learn the art of war? or, is it not rather in the field, where dangers ſurround him on every hand, while oppoſed by a vigilant and active commander, that he learns the much prized art of deſtruction?—It is nearly

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what proof have we that there is no other plant that may be poſſeſſed of a ſimilar deſtructive

the ſame with a farmer in an unimproved country.—He is ſurrounded with ſo many difficulties—meets with ſuch powerful interruptions at every ſtep—and muſt proceed ſo ſlowly and cautiouſly in all his operations, as would totally overcome the ſpirit of one who had been accuſtomed to live in a happier ſituation.—If one hopes to practiſe farming in theſe circumſtances with the ſmalleſt proſpect of ſucceſs, he muſt not only be poſſeſſed of a ſagacious penetration, in diſtinguiſhing, with preciſion, the nature of the different ſoils he may meet with, and the crops that each of theſe will beſt carry, but a ſolidity of judgment, and an unbiaſſed impartiality of mind, that may enable him to vary his practice ſo as to ſuit the nature of that ſoil, and make it produce perhaps, the only crop that it is fitted to rear:—A ſpecies of knowledge that muſt be ſelf-taught—as neither the experience of his anceſtors—his neighbours—nor the beſt farmers, in another ſituation, can avail him any thing.—He muſt likewiſe be poſſeſſed of a coolneſs of temper, that is not apt to be ſtartled at meeting with unforeſeen obſtructions, and an obſtinate induſtry that perſiſts till theſe are overcome, however great and numerous they may be—a verſatility of genius, fitted to adapt itſelf at once to the circumſtances that may occur, ſo as to ſeize every advantage that fortune may throw in his way—a patient forbearance, and vigilant foreſight, that may perceive difficulties at a diſtance, ſo as to guard againſt them before they come

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deſtructive quality?—And as it is found that in many parts of the country where the

to preſs with irreſiſtible power—and a moderation in his deſires, that can be contented with little on all occaſions.

With all theſe qualities, a man, in many ſituations, may be reckoned fortunate, if, after a long life ſpent in the moſt vigorous exertions, and perſevering induſtry, he can bring his fields into ſuch order, as barely to admit of beginning to introduce ſome of thoſe modes of culture that were fully eſtabliſhed in the improved diſtrict, which was propoſed as a model to him in his early years. Is it proper to ſend a young man, who has ſuch a rugged ſcene to encounter, to the ſmooth and fertile fields of plenty?—Is it fit to inſpire his youthful mind with a taſte of thoſe ſweets which he is doomed never to enjoy?—Is it wiſe to ſend one to learn to overcome difficulties, to a place where none of theſe difficulteis ever occur?—Is not ſuch a plan apt to inſpire the youthful mind with a vain and preſumptuous confidence of ſucceſs, that is in danger of making it engage in chimerical plans of improvement which can never be realiſed—which end in diſappointment and chagrin—perhaps in utter ruin and miſery?

I have been induced to delineate this faithful picture, from having ſeen it too fatally realiſed in more inſtances than one;——and from having obſerved that ſome writers of late have exerted themſelves to the utmoſt, to endeavour to promote ſuch chimerical projects.—It is painful to ſee individuals hurt, by improper

the ſoil is naturally unfertile, the graſs, in a few years after the field has been allowed

per ideas getting poſſeſſion of their mind—but it is ſtill more painful to ſee a whole nation labouring under inconveniences that are produced by this means, and not endeavour to remove them.—Thouſands in Scotland are at this moment groaning in miſery, in a great meaſure from this cauſe.

Thoſe who have been accuſtomed to live in the regions of plenty—of induſtry and knowledge—who have been uſed to ſee abundant crops waving in luxuriance on their fields—who look with contempt on the unſkilfulneſs, and laugh at what they deem the puny attempts at improvement of thoſe who live in barren countries, will, no doubt, accuſe me of prejudice, ſhould I give it as my opinion, that, with half the genius—half the application and induſtry—half the knowledge—half the money, and one-tenth of the time, a farmer who lives in a rich country, already forward in culture, may bring all his fields into ſuch order as to carry onions, or any other garden-crop, before one who, in certain circumſtances, undertakes to improve barren and uncultivated ground, will be able to bring it to bear tolerable crops of any kind of corn or graſs.—Yet, if I can truſt to my own moſt attentive obſervation and experience, this is undoubtedly the caſe. See this ſubject farther illuſtrated, vol. iii. Eſſay Second.

Let it not, however, be imagined, I mean to inſinuate that a farmer can gain no advantage by travelling into a country where there are more improvements than in that

lowed to remain untilled, becomes gradually more ſcanty than it was; and that the fields are not rendered more fit for producing corn, by being allowed to remain a long time in that ſtate after that period, it would ſeem that we have ſufficient reaſon to conclude, that thoſe only who poſſeſs a ſoil naturally fertile, can expect that it will be meliorated merely by being allowed to remain for a great length of time without culture; and that thoſe who poſſeſs paſtures which are naturally not very rich, or ſuch as do not abound with the moſt valuable kinds of graſs, are not only guilty of great want of economy with reſpect to themſelves and families,

that were he reſides.—Nothing can be farther from my intention.—I would only wiſh to inculcate this uſeful maxim, which might with juſtice be applied to all kinds of travelling,—That it is not the young and inexperienced who can be properly inſtructed by this means—but thoſe who have already made ſome progreſs in thoſe arts or ſciences they wiſh to be inſtructed in—whoſe experience has taught them caution, and whoſe habit of attention has enabled them to ſelect with judgment, and adopt with a wiſe diſcrimination, ſuch particulars only as they know can be applied to their own particular purpoſes—and reject the others as uſeleſs or pernicious.

but

but essentially hurt the interest of the state, by either neglecting to improve these fields by tillage themselves, or by depriving others of the liberty of doing it. The reader who refers to the case of what has been called *hide-bound* soils, in the foregoing Essay on Draining, will perceive, that the evils produced by that restriction are sometimes of immense magnitude.—Nor are those less excuseable, who, possessing fields perhaps naturally of very great value, suffer them to be over-run with a most destructive vermin, that soon convert the finest pasture into a most desert waste, and yet refuse to grant liberty to plough up these fields, which is the only certain and most economical way of totally clearing a field of ants, where the situation does not admit of laying it totally under water till they be all destroyed *.

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* Scotland is not, in general, so much pestered with ants as England is; but, in some places there, this insect is so exceedingly pernicious, as to prove a most grievous pest to society;—nor are the palliative methods of eradicating these insects, usually practised by improving farmers, by any means efficacious.

Let us, therefore, inſtead of contenting ourſelves on all occaſions with ſuch paſtures

Much ingenuity has been diſplayed in inventing inſtruments for cutting up the ſurface of the hills, and ſmoothing the fields; and they have, in ſome caſes, been brought to ſuch perfection as to effectuate this very well, at a moderate expence: But after the farmer has ſmoothed his field, and burnt the hills, and thus, as he imagines, effectually deſtroyed all the vermin and their eggs, he has the mortification to find, that, in a very ſhort time, his field becomes uneven; and before it is ſufficiently ſtocked with graſs, the ſame operation needs to be repeated.

This operation, for many reaſons, is ordered to be performed in winter, and early in the ſpring; for few perſons chooſe, if poſſible, to loſe the whole produce of the ſeaſon by doing it in ſummer. It is likewiſe imagined, that by cutting up the hills during the ſevere weather in winter, the intenſeneſs of the cold freezes theſe tender creatures to death: on which account, winter is thought to be by far the moſt propitious ſeaſon.

But the experienced Naturaliſt, who has ſtudied the economy of this *little people*, knows, that at that ſeaſon of the year, they have retired ſo far below the ſurface as to be in no danger of being diſturbed by theſe operations; and have their houſes too well ſecured, to be much incommoded by the removal of their hills, which at that time are of no ſort of uſe to them.

A very few of the inſects, indeed, may be ſcorched by burning the hills, if that is long delayed in the ſpring; but, as this is an active animal, and can ſuddenly retreat from

tures as Nature may afford, rather ſtudy to improve thoſe that are indifferent, by endeavouring to obtain a knowledge of

from danger to its inmoſt receſſes, where it cannot be incommoded by the heat of the fires upon the ſurface, ſmall is the benefit produced by this operation. The fires are no ſooner extinguiſhed, than they begin their labours afreſh with re-doubled aſſiduity, and thus fruſtrate the aim of the improver.

Thus it appears, that the ſeaſon uſually choſen for performing this operation is the moſt unpropitious.—If ever they are to be deſtroyed by cutting up the hills, the operation muſt be performed in ſummer, when the hills are their place of abode, and when many of them muſt be deſtroyed by this operation. But as they are ſo numerous, many muſt, even then, make their retreat to the bottom of their holes, and be preſerved. If this operation, however, was performed about the end of June, or beginning of July, when the young of this animal are in their vermicular and aurelia ſtate, and near the ſurface, the greateſt part of theſe young ones would be deſtroyed;—which would be doing ſomething. But when it is conſidered, that this creature multiplies ſo faſt—that ſome of the vermicles and aurelias would be ſaved by the aſſiduous care of the working ants,—and that, of the living ants, perhaps, not one hundredth part could be by this means deſtroyed, it will be allowed, that even this operation, expenſive as it muſt appear to be, is only a ſlight palliative at beſt; and that no effectual cure remains ſo adviſeable, as ploughing the field up, or ſpreading a ſtream of water over the ſurface of it, which will, in all caſes, deſtroy them moſt effectually.

ſuch plants as might afford the moſt valuable paſture, and cultivating theſe with aſſiduity and care.

The inattention of the improving farmers in Great Britain to this ſubject, has been truly amazing. But it is hoped the attempt that has been made by the ingenious Mr. Stillingfleet, will be in time attended with the deſirable effect of turning their attention to a ſubject of ſuch great importance; with regard to which, they will then doubtleſs make many valuable improvements *. It is, however, to be feared, that till ſome attempt ſhall be made to aſcertain the particular qualities and peculiarities of the different kinds of graſſes, as is pointed out in the firſt and following Diſquiſitions in this Eſſay, the Public will be often impoſed upon by ſpecious accounts of new graſſes, which

* Since the firſt publication of this Eſſay, the ingenious Mr. Marſhall, Mr. Curtis, and ſeveral others, have adverted to this ſubject, and, no doubt, much benefit will be derived from their united labours. Many notions that were current at the time this Eſſay was originally written, are now thereby exploded, and improvements in this department are in the train of advancing. *Note to the fourth Edition.*

may

may be really poſſeſſed of few valuable qualities, and may very much tend to diſcourage the enquirer. This ought not, however, to prevent ſuch as may have had an opportunity of making any obſervations on this ſubject, from communicating them to the public, as they may always be of ſome uſe in helping to augment, in a ſmall degree, the general ſtock of knowledge.

For this reaſon, I ſcruple not to communicate the following remarks relating to this ſubject, that have occurred to myſelf. At the ſame time, I beg leave to caution the reader, as well with regard to myſelf, as every other perſon who may write on this ſubject, to attend to what is ſaid with ſome degree of diffidence; and not at once to indulge, without reſtraint, the pleaſing ideas that may preſent themſelves to his imagination on peruſing theſe accounts: For, although the writer may be as ingenuous as poſſible, yet the mind is ſo apt to be hurried forward with too much precipitancy when it contemplates proſpects of this ſort, that it is next to impoſſible he ſhould avoid falling into ſome

miſtakes, which time, and a more enlarged experience, will afterwards diſcover and correct.

In the mean time, it were much to be wiſhed, that both the writer and reader would ſtrenuouſly endeavour to diſcover what are the particular purpoſes for which any one plant could be deemed valuable, and in what reſpects it might be looked upon as of no value at all: For, as there is no plant that can be alike uſeful on all occaſions, if we loſe ſight of this moſt neceſſary diſtinction, it may often happen, that we may attempt to rear a particular plant for purpoſes which it was never fitted to anſwer; and our want of ſucceſs in theſe trials may make it be entirely rejected, even in caſes for which it was extremely proper.

But this we may rather wiſh for, than hope to ſee faithfully put in practice at once: For the human mind is ſo apt to be dazzled with novelty, that when a new plant is introduced into Agriculture, like a new-diſcovered mineral-well, it is cried up as poſſeſſing every valuable quality. Every one is eager to experience its ſalu-

tary

tary virtues. It is applied in all caſes, and to all conſtitutions: But as ſoon as the rage for novelty is ſubſided, experience ſoon ſatisfies the greateſt part of thoſe who have tried it, that they have received no benefit from it; on which account, it is cried down, as poſſeſſing no virtues at all, and becomes entirely neglected, except by the few whoſe diſeaſes it was fitted to relieve, who, in humble obſcurity, reap the benefits thereof, and after a courſe of many years, perhaps, recommend it to the public notice for thoſe real qualities alone that it indeed poſſeſſes.

Such has been evidently the caſe with regard to ſome plants that have been of late recommended to the attention of the public, in too ſanguine a manner:—And ſuch, I doubt not, may be the caſe with ſome of thoſe that I here take notice of, although I have, at leaſt, endeavoured to guard againſt it.

Rye-graſs has been long cultivated in our fields; and it is now, in general, held to be but a very indifferent graſs for paſture, on account of the tendency it has to ſend out numerous ſeed-ſtalks very early

in the ſeaſon, after which no animal will taſte it; ſo that, unleſs it be for a very ſhort while in the ſpring, when the leaves are tender and ſucculent, it is no longer fit for paſturage,——the ſtalks, after the month of May, becoming withered;—ſo that after that period, the field is uſually covered entirely with theſe dead ſtalks; and remains, during the remainder of the ſeaſon, with very few ſigns of vegetation of any ſort. It is, moreover, but a ſhort-lived graſs, uſually dying out entirely in five or ſix years. On both which accounts, it is by no means to be recommended, in general, as a proper graſs for paſturage, unleſs under a careful management, and in circumſtances which will be afterwards more particularly ſpecified.

All graſſes that run chiefly to ſeed-ſtalks, would ſeem to be, for the ſame reaſons, in ſome degree, improper for that purpoſe; ſo that our reſearches ought to be directed principally to diſcover ſuch graſſes as run chiefly to leaves, and produce but few flower-ſtalks.

It was this quality that firſt recommended

p. 392. Tab. 2.



J. A. del. Ryegras. vulgo

mended the purple feſcue-graſs to the notice of the Writer of this Eſſay, and induced him to try ſome experiments with regard to it.

Botaniſts will readily know this plant. But, for the ſatisfaction of the farmer, it will not be improper to obſerve, that although this graſs is very often found in old paſtures, yet as it has but few flower-ſtalks, and as it is eaten greedily by all domeſtic animals, theſe flower-ſtems are ſeldom ſuffered to appear, ſo that it uſually remains there unperceived. But it ſeems to be better able to endure the peculiar acrimony of the dung of dogs than almoſt any other plant, and is therefore often to be met with in dog-hills, as I call the little hills by road-ſides, where dogs uſually piſs and dung; and as it is allowed to grow there undiſturbed, the farmer may have an opportunity of examining the plant, and becoming acquainted with its appearance.

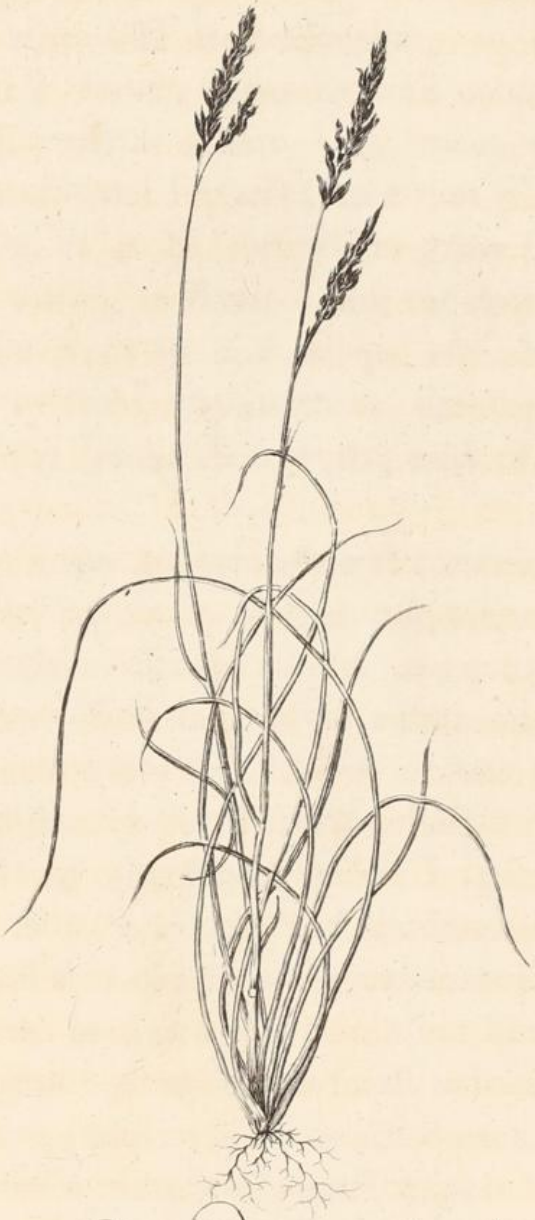
The leaves are long and ſmall, and appear to be roundiſh, ſomething like a wire. But upon examination, they are found not to be tubulated like a reed or

ruſh,

ruſh, the ſides of the leaf being only folded together from the midle rib, exactly like the ſtrong bent-graſs upon the ſea-ſhore. — The flower-ſtalk is tall, and branches out in the head a little reſembling the wild oat; only the grains are much ſmaller, and the ear does not ſpread full open, but lies bending a little to one ſide. The ſtalks are often ſpotted with reddiſh freckles, and the top of the roots are uſually tinged with the ſame colour; from whence it has probably obtained its diſtinctive name of *Feſtuca rubra*, or red (purple) feſcue.

It is often to be met with in old garden-walks; and as its leaves advance very quickly after cutting, it may uſually be diſcovered above the other graſſes about a week or fortnight after the walks are cut. —Nor do they ſeem only to advance at one ſeaſon, and then ſtop and decay, but continue to advance during the whole of the ſummer, even where they are not cut, ſo that they ſometimes attain a very great length. I ſome time ago meaſured a leaf of this graſs that ſprung up in a neglected corner, which was four feet and four inches

p. 398. Tab. 3.



Purple Fescue Grass

J. A. Del.r

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in length, although not thicker than a ſmall wire.—It is unneceſſary to add, that theſe leaves naturally trail upon the ground, unleſs where they meet with ſome accidental ſupport; and that if any quantity of it be ſuffered to grow for a whole ſeaſon, without being eat down or cut, the roots of the leaves are almoſt rotted by the overſhading of the tops of the other leaves before the end of the ſeaſon.

This is the appearance and condition of the plant when in its native ſituation, as it is ſeldom diſcovered but in pretty old paſtures.—And as it, in that ſtate, carries only a very few ſeed-ſtalks, it was with ſome difficulty that I could collect a ſmall handful of the ſeed, which I carefully ſowed in a ſmall patch of garden-mould, to try if it could be eaſily cultivated.—It came up as quickly as any other kind of graſs, but was at firſt as ſmall as hairs:—the leaves, however, advanced a-pace, and were, before autumn, when the grain along with which they had been ſowed was cut down, about ſixteen or eighteen inches in length; but having been ſowed very thin,

it

it was neceſſary to pick out ſome other kinds of graſs that came up amongſt it, leſt it might have been choaked by them. Early next ſpring, it advanced with prodigious vigour, and the tufts that were formed from every ſeed became exceedingly large, ſo that it quickly filled the whole ground. But now the leaves were almoſt as broad as thoſe of common rye-graſs, and the two ſides only inclined a little towards one another from the mid-rib, without any appearance of roundneſs.— In due time, a great many ſeed-ſtalks ſprung out, which attained very nearly to the height of four feet, and produced ſeeds in abundance, which may be as eaſily ſaved as thoſe of common rye-graſs.

The prodigious difference between the appearance of this plant in its native and cultivated ſtate, amazed me; but it was with a good deal of ſatisfaction that I found there would be no difficulty in procuring ſeeds from it, which I had much doubted of at firſt. It would ſeem that Nature hath endowed this plant with a ſtrong generative power during its youth, which it gradually loſes as it advances

vances in age (for the difference perceived in this caſe could not be attributed to the richneſs of the ſoil); and that, on the contrary, when it was old, the leaves advanced with an aditional vigour, in proportion to the declining ſtrength of the flower-ſtalks. For the leaves of the young plant ſeldom exceed two feet, whereas numbers of the old leaves were near four feet in length.

From theſe peculiarities in the growth of this plant, it would ſeem to promiſe to be of great uſe to the farmer, as he could reap from a field of it, for the firſt two or three years, as great a weight of hay as he could obtain from any of the culmiferous graſſes; and if he meant afterwards to paſture it, he would ſuffer no inconveniences from the flower-ſtalks; and the ſucculent leaves that continue to vegetate with vigour during the whole ſummer, would at all times furniſh his cattle with abundance of wholeſome food. It has been already remarked, that this graſs riſes as early in the ſpring as rye-graſs, and continues green for the greateſt part of winter, which the other does not.

—It

—It is, moreover, an abiding plant, as it ſeems never to wear out of the ground where it has been once eſtabliſhed. On all which accounts, it appears to me, highly to merit the attention of the farmer; and well deſerves to have its ſeveral qualities, and the culture that beſt agrees with it, aſcertained by accurate experiments*.

I have likewiſe taken ſome notice, on a former occaſion, of another kind of native graſs of this country, that has a juſt claim to a more particular ſhare of the farmer's attention, than it has ever yet obtained among us, *viz.* the ſheep's feſ-

* Since the above was written, I find little reaſon to alter any thing that has been here ſaid. In a few years, I found that this graſs, where it had been ſowed, produced but few ſeed-ſtalks; the pile of graſs became extremely cloſe, and the plants advanced in height with leſs luxuriance, and were drier and leſs ſucculent, than during the firſt two or three years. It appears to me, that in conſequence of its great increaſe by the roots, it will have a tendency to become, in time, too thick, ſo as to ſtint the plants in their growth; ſo that harrowing from time to time with very weighty harrows, or ſome other practice, by which a good many of the plants might be eradicated, would prove of uſe to renew the vigour of the graſs.

cue-

cue-graſs *(Feſtuca ovina)* ſo much praiſed by the Swediſh naturaliſts, for its ſingular value as a paſture-graſs for ſheep; this animal being repreſented as fonder of it than any other graſs, and fattening upon it more quickly than on any other kind of food whatever. And, indeed, the general appearance of the plant, and its peculiar manner of growth, ſeem very much to favour the accounts that they have given us of it.

This plant is of the ſame family with the former, and agrees with it in ſeveral reſpects; although they may be eaſily diſtinguiſhed from one another.—Its leaves, like the former, in its natural ſtate, are always rounded, but much ſmaller, being little bigger than large horſe-hairs, or ſwine-briſtles, and ſeldom exceed ſix or ſeven inches in length. But theſe ſpring out of the root in tufts ſo cloſe upon one another, that they reſemble in this reſpect a cloſe hair-bruſh, more than anything elſe that I know; ſo that it would ſeem naturally adapted to form that thick ſhort pile of graſs, in which ſheep are well known chiefly to delight.—Its flower-

ſtalks

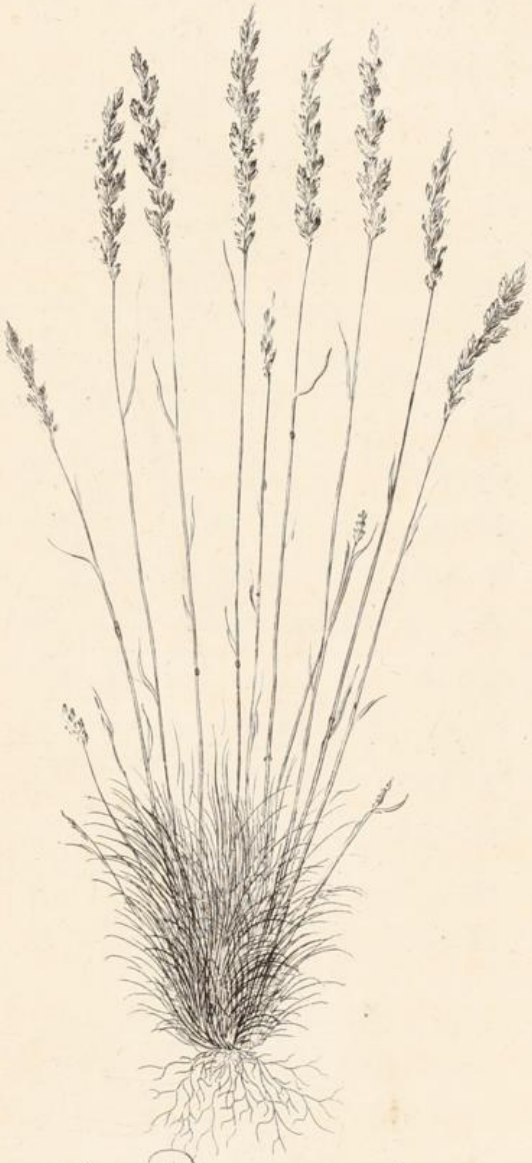
ſtalks are numerous, and ſometimes attain the height of two feet; but more uſually about twelve or fifteen inches high.

Upon gathering the ſeeds of this plant, and ſowing them as the former, it was found, that they ſprung up as quickly as any other kind of graſs; but the leaves are at firſt no bigger than a human hair. —From each ſeed, ſprings up one or two of theſe hair-like filaments, that in a ſhort time ſend out new off-ſets, ſo as quickly to form a ſort of tuft, which grows larger and larger, till at length it attains a very large ſize, or till all the intervals are cloſed up; and then it forms the cloſeſt pile of graſs that it is poſſible to imagine.—In April and May, it puſhed forth an innumerable quantity of flower-ſtalks, that afforded an immenſe quantity of hay; it being ſo cloſe throughout, that the ſcythe could ſcarcely penetrate it. This was allowed to ſtand till the ſeeds ripened; but the bottom of the ſtalks were quite blanched, and almoſt rotted for want of air, before that period.

This was the appearance that it made

the

p. 400. Tab. 4



Sheeps Fescue Grass

J. A del.

the firſt year after it was ſowed: But, I have reaſon to think, that after a few years, *it* likewiſe produces fewer ſeed-ſtalks, and a greater quantity of leaves, than at firſt. However that may be, it is certain that if theſe ſtalks are eaten down in the ſpring, it does not, like rye-graſs, perſiſt in a continual tendency to run to ſeed; but is at once determined to puſh forth an abundance of leaves, without almoſt any ſtalks at all*. And as all domeſtic animals, but more eſpecially ſheep, are extremely fond of this graſs, if they have liberty to paſture where it grows, they bite it ſo cloſe as never to ſuffer almoſt a ſingle ſeed-ſtalk to eſcape them; ſo that the botaniſt will often ſearch in vain for it, when he is treading upon it with his feet.—The beſt way to diſcover it in any paſture, is, to ſearch for it in winter, when the tufts of it may be

* From this peculiarity, it neceſſarily happens, that if ſheep are allowed to paſture on this graſs in the ſpring, few or no ſeeds can be expected from it that ſeaſon: Plants intended for ſeeds ought, therefore, to be preſerved carefully from cattle or ſheep in the winter or ſpring.

eaſily diſtinguiſhed from every other kind of graſs, by their extraordinary cloſeneſs, and the deep green colour of the leaves.

It ſeems to grow in almoſt any ſoil, although it is imagined that it would flouriſh beſt in a light ſpungy ſoil, as it can evidently live with leſs moiſture than almoſt any other kind of graſs, being often ſeen to remain in the ſods that have been employed for coping ſtone dykes, after all the other graſſes that grew in them have diſappeared. It is likewiſe frequently found on poor barren ſoils, where hardly any other plant can be made to grow at all; and on the ſurface of dry worn-out peat-moſs, where no moiſture remains ſufficient to ſupport any other plant whatever.—But in neither of theſe ſituations does it thrive; as it is there only a weak and unſightly plant, very unlike what it is when it has the good fortune to be eſtabliſhed upon a good ſoil, although it is ſeldomer met with in this laſt than in the former.

From this laſt circumſtance, it appears, that thoſe who imagine that a plant is

always found naturally on that ſoil in which it moſt delights, and where it will grow to the utmoſt perfection, may be very often deceived;—as ſome particular circumſtance relating to the economy of the plant, may prevent it from being able to eſtabliſh itſelf in the ſoil in which it would thrive better than any where elſe, if it could have overcome thoſe obſtacles that prevent its eſtabliſhment there;—and that, on the contrary, it may naturally appear on other leſs favourable ſoils, merely becauſe it does not in theſe meet with the ſame obſtructions to prevent its eſtabliſhment there.—This, I am ſatisfied, is exactly the caſe, with regard to the ſheep's feſcue. For, as its firſt ſhoots are extremely weak, it is then eaſily ſurmounted by almoſt every other kind of plant.—And as the ſeeds of other kinds of graſs that may chance to be lodged in a rich ſoil, ruſh up with vigour, and ſoon cover the whole ſurface of the ground, the few ſeeds of this kind of graſs that may chance to be carried into theſe fields, are hardly allowed to vegetate, before

they are entirely ſmothered by the other ſtronger graſſes.

But upon ſuch barren ſoils as are unfit to rear any other kinds of graſs, the ſeeds of this plant are allowed to come up, and the plants to grow, without meeting with the ſame obſtruction; and there they eſtabliſh themſelves, from this cauſe, although the ſoil is incapable of affording them afterwards that abundant nouriſhment which is neceſſary to rear the plant to perfection.

I choſe to remark this peculiarity relating to this particular kind of graſs, not only to ſatisfy the reader of the neceſſity of attending to many ſeemingly trifling circumſtances relating to the œconomy of particular plants, but alſo to guard againſt a prejudice that might ariſe in the minds of ſome people, who might chance to take notice of this plant in the ſituation that I have now deſcribed; where, finding it ſo unlike that thriving ſtate in which I have repreſented it in other paſſages of this article, they might be diſpoſed to doubt the truth of what I have alleged. —But if they wiſh to ſatisfy themſelves

in

in this reſpect, let them either tranſplant a few tufts from theſe barren ſoils into a good garden-mould, or ſow the ſeeds there, and guard againſt their being choaked with others, and they will ſoon ſee how different the one plant is from the other.

From this fact, we may likewiſe draw the following very uſeful corollary:—That ſeeing it is ſo difficult to meet with a good rich ſoil in ſuch circumſtances as to permit this plant naturally to eſtabliſh itſelf in it,—and ſeeing we have very great reaſon to imagine that this is one of the moſt valuable graſſes our country produces, we have, from this ſingle inſtance, the cleareſt proof that could be wiſhed for, of the impoſſibility of obtaining, on all occaſions, the fineſt paſture, by allowing Nature to operate without any aſſiſtance. —Heaven has endowed man with reaſon, that by the exerciſe thereof, he may promote his own felicity; and hath ſubjected many of thoſe objects that may miniſter to his wants, to particular natural inconveniences, which it is in his power to remove, and thus render them more eminently uſeful to him;—of which, this may

be looked upon as one conſpicuous example:—For, by ſaving the ſeeds of this plant, and ſowing them in ſufficient quantities, on a rich ſoil, properly prepared, the great number of plants that are thus eſtabliſhed before the ſeeds of others can be brought to the field, and made to vegetate, effectually cover the whole ſurface, and exclude the admiſſion of others; ſo that we may thus have a full crop of this valuable plant upon a ſoil in which Nature could hardly ever have eſtabliſhed it, and in which alone it can ever arrive at its ultimate perfection.

It may not, however, be improper to remark, as one of the excellences of this plant, that it will grow upon ſuch ſoils as hardly any other good kinds of graſs could live upon. And although the farmer cannot from theſe expect a crop nearly equal to what he will reap from his richer fields, yet it is no ſmall convenience for him to have a plant with which he can at once cover his moſt barren ſpots, which, without this care, might have remained bare for many years.

I will not here repeat what has been already

already ſaid, about the particular property that this plant poſſeſſes of continuing green all winter, nor point out the benefits that the farmer may reap from this valuable quality.—He need, not, however, expect to find any verdure in winter, on ſuch plants as grow upon the looſe moſſy ſoil above mentioned: For, as the froſt in winter always hoves up the ſurface of this ſoil, the roots of the plants are ſo lacerated thereby, as to make them remain for ſome time in the ſpring to all appearance dead.—Nor will he often perceive much verdure in winter, upon thoſe plants that grow upon poor hungry ſoils, which cannot afford abundant nouriſhment to keep them in a proper ſtate of vegetation at all times.—But ſuch plants as grow on earthen dikes, which uſually begin to vegetate with vigour, when the autumnal rains come on, for the moſt part, retain their verdure at that ſeaſon, almoſt as well as if they were in good garden-mould.

I have been very particular with regard to this plant; becauſe, in ſo far as my obſervations have yet gone, it promiſes, on many accounts, to make a moſt valuable

acquiſition to the farmer, and, therefore, juſtly demands a very particular ſhare of his attention*.—

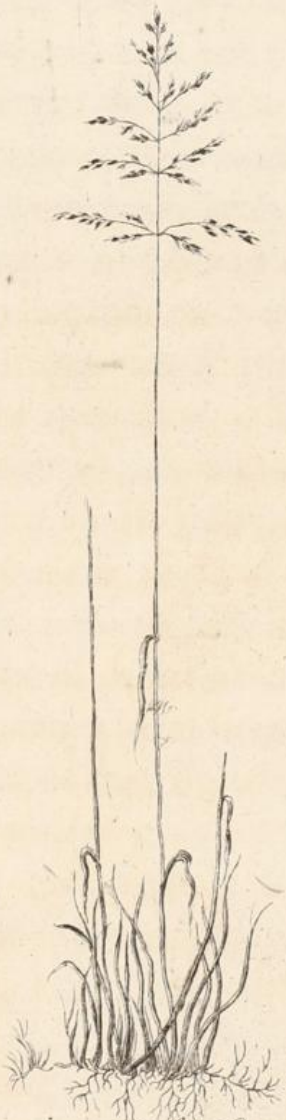
Another very valuable paſture-graſs, is what I would call the vernal ſoft-graſs,—the *poa trivialis*, or creeping meadow-graſs.—No graſs makes a more beautiful appearance in the ſpring than this does.—The lively verdure and cloſeneſs of the pile, and the ſoftneſs and ſucculent richneſs of the leaf, convey the moſt pleaſing idea to the mind that could be deſired, and ſeem to give it a juſt title to be conſidered as one of the moſt valuable kinds of meadow-graſſes.

It delights ſo much in moiſture, that it is ſeldom found on dry ground, unleſs the ſoil is exceedingly rich.—It is often found upon thoſe patches near ſprings, over which the water frequently flows, and may be eaſily known by the uncommon ſoftneſs and ſucculence of the blade, the lively

* I find, that, even in a rich ſoil, this plant, after a few years, does not advance with very great luxuriancy, the pile becoming ſo cloſe as to check its growth. For this reaſon, it is always a dry paſture, much fitter for ſheep than cattle.

light-

p. 410. Tab. 5.



Creeping Soft Grass

T. A del. A. Ib. Sc.

light-green colour of the leaves, and the matted intertexture of its roots. But, though its firſt leaves be very ſoft, when the ſeed-ſtalks advance, they are rough to the touch, ſo that the plant then aſſumes a very different appearance from what we would have expected.—The ear is branched out into a great number of fine ramifications, ſomewhat like the oat, but infinitely ſmaller; and when the ſeeds are ripe, they are inveloped in a ſoft kind of membrane, that makes them adhere to the ſtalk, and to one another after they are ſeparated from it, as if they were intermixed with cobweb. Some of theſe ſeeds were ſaved, and ſowed by themſelves, which came up extremely well:—but on account of that filamentous membrane which makes them adhere to one another, it is extremely difficult to get them to ſpread readily in ſowing; and as the ſeed is ſmall, and adheres very cloſely to the ſtalk, it is difficult to get it ſeparated from thence. On both which accounts, it ſeemed to me, that it would not be eaſy to cultivate it artificially.—But if any contrivance could be got to clean the ſeeds, at

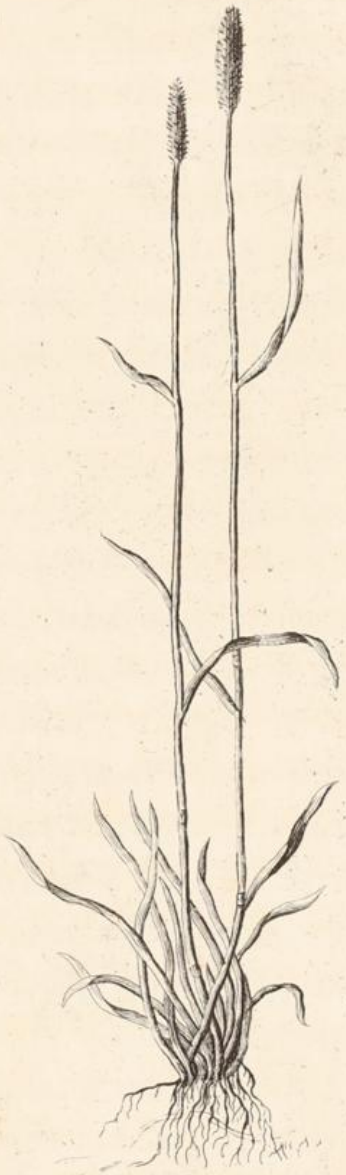
a moderate

a moderate expence, a very ſmall quantity of theſe would probably be ſufficient to ſtock a rich meadow with it: For, although it were ſowed very thin, it ſpreads ſo faſt by its running roots, as would in a ſhort time ſtock the field abundantly.

Another plant, that promiſes, on ſome occaſions, to afford a valuable paſture-graſs, is the bulbous foxtail-graſs,—the *Alopecurus bulboſus*.—Its leaves are broad, ſoft, and ſucculent, and feel a little woolly to the touch. Theſe ſpring out in great abundance from a ſtrong, firm, matted kind of root; and if they are cut over at any time during ſummer, they very quickly advance again, ſo as to get above almoſt all the other kinds of graſſes.—The ſeed-ſtalk is long, and very ſtrong, being between four and five feet high, and is crowned with a round bruſh-like ſoft head, which conſiſts almoſt entirely of light ſcaly-like ſeeds.—But, like the purple feſcue, it ſends out but very few flower-ſtalks; ſo that a crop of it allowed to come to ſeed, aſſumes but a very thin, ſtraggling, and unſightly appearance.—In other reſpects, it much reſembles the whole plant

lately

p. 412. Tab. 6.



J.A.Del^t Bulbous Foxtail grass

lately introduced from America, known by the name of Timothy-graſs,—only its leaves are ſofter, and of a darker green colour;—and the head is likewiſe ſoft and ſcaly, inſtead of being hard, and in ſome degree prickly, as is the caſe with Timothy-graſs. The ſeeds alſo are exceedingly ſoft and chaffy, very unlike the firm round ſeeds of Timothy-graſs.

It ſeems to delight chiefly in a moiſt ſoil, and therefore promiſes to be only fit for a meadow paſture-graſs. The quality that firſt recommended it to my notice, was the unuſual firmneſs that its matted roots gave to the ſurface of the ground, naturally ſoft and moiſt, in which it grew; which ſeemed to promiſe that it might be of uſe upon ſuch ſoils, chiefly in preventing them from being much poached by the feet of cattle which may paſture upon them.—Moſſy ſoils * eſpecially are ſo much hurt by poaching, that any thing which promiſes to be of uſe in preventing it, deſerves to be attended to.

* By moſſy ſoils is here meant ſuch as contain turf or peat. The Iriſh would call theſe bogs.

The

The ſeeds were ſowed in garden-mould, and came up very well; but I have not yet obtained a ſufficient quantity of theſe, to try how it would anſwer for the purpoſe that I had chiefly in view when I thought of cultivating it. I have remarked, that the ſtalks of this plant are extremely tough and flexible when made into hay, ſo as to be better fitted for making ropes for faſtening thatch with, than any other plant I have yet ſeen.

If my experience with regard to Timothy-graſs had been ſufficiently extenſive to enable me to ſpeak of its qualities with certainty, I would have here enumerated them. But having found no reaſon, from the trials that I made of it, to think that it promiſed to be of very great value; and being ſenſible that the attention of the public was already directed towards it, I left others to make the neceſſary experiments with regard to it.—And I only mention it here, leſt ſome might have thought it an omiſſion.

The great meadow-graſs,—the *Poa pratenſis*, ſeems to approach, in many reſpects, to the nature of the purple-

p. 418 Tab. 7.



Great Meadow Grass

R. Reddin del.

feſcue, only that its leaves are broader, and not near ſo long, being only about a foot or ſixteen inches at their greateſt length. —Like it, it produces few ſeed-ſtalks, and many leaves, and is an abiding plant: But I have not yet had an opportunity of trying the effects of culture upon it, having only ſaved the ſeeds of it, for the firſt time, laſt ſeaſon.

The creeping meadow-graſs, the *Poa repens*, ſeems to be the moſt valuable graſs of any of this genus. Its leaves are firm and ſucculent—of a dark Saxon-green colour, and grow ſo cloſe upon one another as to form the richeſt pile of paſture-graſs.—The flower-ſtalks, if ſuffered to grow, appear in ſufficient quantities; but the growth of theſe does not prevent the growth of the leaves, both advancing together during the whole ſummer; and when the ſtalks fade, the leaves continue as green as before*.—Its leaves are much larger,

* Culmiferous graſſes might be divided into two general claſſes, for the purpoſes of the farmer, that it might be of uſe for him to attend to, *viz.* 1*ſt*. Thoſe which, like the common annual kinds of corn, run chiefly

larger, and more abundant than the common meadow-graſs, *Poa trivialis*, and therefore it deſerves to be cultivated.—This deſcription is taken from the plant in its native ſtate.—How it may be altered by culture, I know not.

I have attempted to ſave ſome ſeeds of this plant for two years ſucceſſively; but have never been able to get them in any other way than by gathering with the hand, which is a troubleſome and tedious operation: And if the ſeaſon is rainy, or the ground on which the graſs grows is very rich, it is difficult to obtain the ſeeds even in this way: for, as in theſe caſes the leaves continue to grow with luxuriance,

chiefly to ſeed-ſtalks; the leaves gradually decaying as theſe advance towards perfection, and become totally withered, or fall off entirely, when the ſeeds are ripe. Rye-graſs belongs to this claſs, in the ſtricteſt ſenſe: to it likewiſe may be aſſigned, the vernal graſs, dogs-tail-graſs, and fine bent-graſs.—2*d*, Thoſe whoſe leaves continue to advance even after the ſeed-ſtalks are formed, and retain their verdure and ſucculence during the whole ſeaſon, as is the caſe with the Feſcue and Poa tribe of graſſes, whoſe leaves are as green and ſucculent when the ſeeds are ripe, and the flower-ſtalks fading, as at any other time.

they

p. 416. Tab. 8.



Creeping Meadow Grass

I A del A.B. scup

they ſoon overtop the ſeed-ſtalks, and, of conſequence, the leaves being ſo cloſe upon one another, both the leaves and ſtalks are often rotted before the ſeeds come to perfection.

This is perhaps one of the moſt valuable kinds of paſture-graſs, and therefore merits a more than ordinary degree of attention, to try if the ſeeds can be obtained in ſuch quantities as to be uſeful to the farmer.—It appears to me, that the only probable way of ſucceeding in this attempt, will be, to ſow ſome of the ſeeds upon a clean ſharp piece of ground, naturally dry, and not very rich at the time. If it were once eſtabliſhed on ſuch a ſoil, it would carry abundance of ſeeds every ſeaſon, and there would be little probability that it would be rotted before the ſeeds were ripe: But as the leaves are for the moſt part higher than the ſtalks before the time of cutting, and as theſe leaves are extremely ſucculent when cut, it will be proper to make the whole of this ſcanty crop into hay,—put it up in a rick till the ſpring, and then threſh it out. The ſeeds are light and chaffy, and are neither eaſily

ſeparated

ſeparated from the ſtalk, nor diſentangled from the hay; ſo that care muſt be taken that the threſhing and ſhaking are carefully performed. Or, what would be better—cut the hay, by means of a chaff-cutter, as ſmall as it can be done, and ſtrew the whole thinly over the field. As it is an abiding graſs, it is worth being at ſome expence and trouble, to get it once firmly eſtabliſhed.

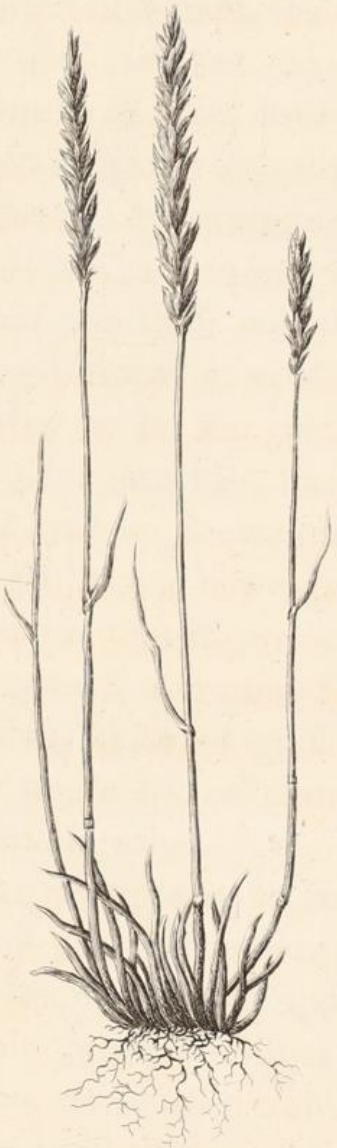
Theſe obſervations are, in ſome meaſure, applicable to all the graſſes of the *Poa* tribe*.

I have already mentioned the vernal-graſs, and the uſe that I apprehended it might be of for giving a rich flavour to milk or butter:—But if, upon trial, it ſhall not be found to poſſeſs that quality, it does not, on any other account that I have as yet obſerved, much deſerve the attention of the farmer.—As a paſture-graſs, it ſeems to be ſubjected to all the

* The leaves of all the ſpecies of *Poa* graſſes are remarkably tender and ſucculent, which renders them peculiarly proper food for *cattle*, as this claſs of animals delight as much in ſucculent food, as ſheep do in dry paſtures. The ſeeds of the whole tribe are entangled together, by the cobweb-like filaments already noticed.

inconveniences

p. 417. Tab. 9.



Vernal Grass

A. delin.

inconveniences of the common rye-graſs; becauſe, like that, it runs almoſt entirely to flower-ſtalks, very early in the ſeaſon, during the formation of which, the leaves are totally exhauſted, ſo that the cattle muſt either eat theſe, or want entirely.—Its leaves do, indeed, ſpring up after it is cut over, or eaten down by cattle, and remain green pretty late in autumn: but it does not ſeem that ever theſe will yield a very abundant crop; ſo that it would probably require either to be cut and conſumed green, or made into hay, like rye-graſs, if it ſhould ever be deemed worth the cultivating.—It may, however, be remarked, in its praiſe, that it grows with luxuriance upon a much more indifferent ſoil than many other kinds of graſs; on which account, it might be, on ſome occaſions, of conſiderable value.

Nearly the ſame thing may be ſaid of the creſted dogs-tail-graſs *(Cynoſurus cryſtatus)* commonly known, in Scotland, by the name of Windleſtraw-graſs, excepting that it poſſeſſes no uncommon taſte or ſmell; but, like the former, it runs chiefly to ſtalks, and has but few leaves, which

are ſhort, and remain green pretty late in Winter.—I have gathered ſome of the ſeeds of both theſe, and ſhall ſoon be able to ſpeak of them with a greater degree of certainty*.

I am well acquainted with the fine bent-graſs†, ſo much recommended by Mr. Stillingfleet, in his Eſſays; but think it is, by no means, of ſuch uncommon value, as he ſeems to imagine.—Cattle and horſes will eat it, when pinched for food; but it is with difficulty they can be kept upon a field where this graſs chiefly abounds; ſo that they will leave it if they can, and go to other fields, much barer, that contain more palatable graſſes; nor do they almoſt ever grow fat upon it; and therefore, I would not recommend it to the improving farmer. Nor does it appear to me, that the flote-feſcue is of half the value that he has been made to believe.

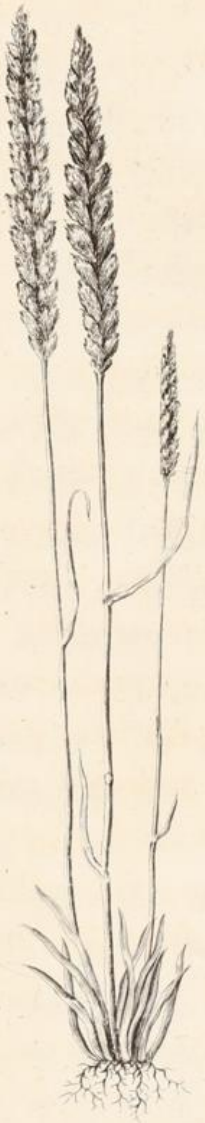
I was alſo at pains to get ſome ſeeds of

* From a peculiarity of circumſtances, not neceſſary to be here enumerated, the author found it impoſſible to proſecute his experiments on theſe graſſes.

† *Agroſtis Tenuiſſima.*

the

p. 418 Tab. 10



Crested Dogstail Grass

J. A. delin.t

A.B. sculp.t

the American Cocks-foot-graſs* that was lately advertiſed, as of ineſtimable value. Like all the other graſſes of this tribe, it is a ſtrong robuſt plant.—Its leaves are broad, firm, and roughiſh, of a light green colour, but neither are very long nor cloſe upon one another:—its ſtalks riſe thin and ſtraggling;—are ſtrong, and feel rough to the touch,—riſing to the height of near four feet, on a good ſoil.—It does not promiſe either to yield an abundant crop of hay, nor a cloſe pile for paſture;—nor does its appearance ſeem to indicate that it would be of the moſt palatable ſort for cattle.—The quantity I have is too ſmall to permit me to ſpeak with great certainty.—It ſeems to be a plant that would require a dampiſh ſoil.

All theſe belong to the claſs of culmiferous plants, and are what Botaniſts call *Gramina*, or graſſes properly ſo called. But as there are many other plants that may be employed by the farmer for the ſame uſes as theſe, it is by no means neceſſary that he ſhould confine himſelf to

* *Dactylus Americanus.*

this claſs of plants alone, or be directed in his reſearches by any other rule excepting that of utility.—The following plants, therefore, are pointed out to him, as promiſing to be of ſome uſe on particular occaſions.

Milkwort, as it is called in ſome parts of this country, the *Coronilla Corniculata* of Hudſon, is a plant common in every part of the iſland, although it has never yet, that I have heard of, been attempted to be cultivated.

The general appearance of this humble plant, is, in ſome reſpects, very like that of the common white clover, although its leaves, upon a nearer examination, are not exactly ſimilar to thoſe of this plant. —From the top of the root, there comes out, in the ſpring, a great number of ſmall ſhoots, that ſpread along the ſurface of the ground, every way around it; from which ariſe a great many cluſters of bright yellow flowers, exactly reſembling thoſe of common broom, in ſhape, ſize, and colour; which are ſucceeded by hard round pods, filled with ſmall kidney-ſhaped ſeeds. And as three or four of theſe pods

uſually

p 420 Tab. II.



T.A. del.ᵗ Milkwort A Bell Sculp.ᵗ

uſually adhere to one foot-ſtalk, from which they ſpread open at the points, a little reſembling the fingers of an open hand, they have, from this circumſtance, been, by the vulgar, in ſome places, called Ladies-fingers*; while others, more ſtruck with the reſemblance that theſe pods bear to the foot of a bird, have diſtinguiſhed it by the name of Crow-toes†; and others, from the appearance of the bloſſom and the part where the plant is found, have called it *feal*‡, or, by corruption, *fell*-broom.

It is found plentifully almoſt every-where in old graſs-fields; but as every

* The reader will pleaſe to obſerve, that this is not the plant which properly bears the Engliſh name of Ladies-fingers—the *Anthyllis* of Botaniſts.

† Neither is this the plant that bears the name of Crow-foot, properly, in Engliſh—which is the *Ranunculus* of Botaniſts.

‡ If any ſod is dug from the ſurface of the ground, in which a root of this plant chances to be, and it be put upon the top of a ſunk-fence wall, or in any other place that is not entirely deſtitute of moiſture, the plant does not die, but ſends out annually great tufts of flowers, which were not, perhaps, obſerved on the paſture from which the ſod (feal) was dug, which probably firſt ſuggeſted the idea of that name.

ſpecies of domeſtic animal eats it almoſt in preference to every other plant, it is ſeldom allowed to come to the flower in paſture-grounds, unleſs where they have been accidentally ſaved from the cattle for ſome time; ſo that it is only about the borders of corn-fields, or the ſides of incloſures to which cattle have not acceſs, that we have an opportunity of obſerving it. As it has been imagined that the cows which feed on thoſe paſtures where this abounds, yield a great quantity of rich milk, the plant has, from that circumſtance, obtained its moſt proper Engliſh name of milk-vetch.

But the circumſtance that firſt recommended it to my notice, was, the having obſerved that it grows and flouriſhes in poor barren ground, where ſcarcely any other plant can be made to live. I have ſeen it in the midſt of a barren moor, where the ſoil was ſo poor, that even heath, or ling *(erica communis)* could hardly grow; and upon bare obdurate clays, where no other plant could be made to vegetate; inſomuch, that the ſurface remained entirely uncovered, unleſs where

a plant

a plant of this kind chanced to be eſtabliſhed: yet, even in theſe unfavourable circumſtances, it flouriſhed with an uncommon degree of luxuriance, and yielded as tender and ſucculent, though not ſuch abundant ſhoots, as if they had been reared in the richeſt-manured fields.—I have likewiſe ſeen it in dry and barren ſands, where ſcarcely any other plant could be made to live; and there alſo it ſends out ſuch a number of healthy ſhoots all round, as cover the earth with the cloſeſt and moſt beautiful carpet that can be deſired.

The ſtalks of this plant, as has been ſaid, are weak and ſlender; ſo that they ſpread upon the ſurface of the ground, unleſs they are ſupported by ſome other vegetable. In ordinary ſoils, they do not grow to a great length, nor produce a great many flowers; but in richer fields, the ſtalks grow to a much greater length, —branch out a good deal, but carry few or no flowers or ſeeds; and as I firſt took notice of it only on poor ſoils, it was purely with a view to paſture that I firſt reſolved to cultivate it; and, with this

intention, ſowed it with my ordinary hay-ſeeds, expecting no material benefit from it, till I deſiſted from cutting my field; but found myſelf agreeably diſappointed, as it grew the firſt ſeaſon as tall as my great clover, and formed the fineſt hay I ever ſaw,—it being ſcarcely diſtinguiſhable from Lucerne, but by the ſlenderneſs of the ſtalk, and proportional ſmallneſs of the leaf.

It is nearly allied to Lucerne, in its botanical characters, and reſembles that valuable plant, in many other reſpects.—Like that, it is perennial,—ſends down a long root, to a great depth in the ſoil, which is at firſt ſmall, and gradually increaſes with age, till it at length becomes of a very conſiderable ſize; ſo that it is ſeveral years after it is firſt ſowed, before it attains its full perfection: But when it is once eſtabliſhed, it probably remains there for a prodigious number of years, in full vigour, and produces annually a great quantity of fodder. In autumn, 1773, I cut the ſtalk from an old plant of it that grew in a very indifferent ſoil; and after having dried it thoroughly, found that it

weighed

weighed fourteen ounces and a half. Like Lucerne, it is never affected with the ſevereſt droughts that we experience: But it does not reſemble that plant in delicateneſs of conſtitution, as it thrives in the ſtiffeſt clays, and is able to ſtand its ground among graſs, or any other weeds.

As this plant only produces ſeeds in abundance upon poor hungry ſoils, that could hardly afford nouriſhment to any other, and as the ſtalks ſpread out cloſe upon the ſurface of the ground, it ſeems to me, that the greateſt bar to the cultivating thereof, will be the difficulty of obtaining the ſeeds in abundance, as, in theſe circumſtances they muſt always be gathered by the hand. But as it is an abiding plant, thoſe who have ſuch ſoils as moſt ſtand in need of having plants of this ſort ſowed upon them, may be at a little trouble and expence to get them at once *properly* laid down with this graſs, as it will be only once that they will need to do it. It is poſſible, that future experience may diſcover ſome eaſier way of procuring the ſeeds than hath as yet occurred to me.

The

The ſtalks of this plant die down entirely in winter, and do not come up in the ſpring till the ſame time that clover begins to advance, ſo that it can never be of uſe but as a ſummer-paſture.—Neither does it advance very faſt after it is cut down, or eaten over, even in ſummer; but the great cloſeneſs of the ſhoots may probably counterbalance that defect.

I have ſeen another ſpecies of the *aſtragalus*, with an erect ſtalk, that naturally grows upon dampiſh ſoils; but have had no opportunity of making particular obſervations upon it, nor have as yet been able to procure any of its ſeeds. It ſeems more likely to anſwer well for hay than this does, as its ſtalks are longer.

The common yellow vetchling, *Lathyrus pratenſis*, or everlaſting-tare, might likewiſe be, on many occaſions, cultivated with profit by the farmer.—It grows with great luxuriance in ſtiff clayey ſoils, and continues to yield annually, for any length of time, a great weight of forage, which is deemed to be of the very beſt quality. And as it is equally fit for paſture or for hay, the farmer would have it in his power

Tab: 12.



Yellow Vetchling

power to apply it to one or the other of theſe uſes, at any period that might beſt ſuit his convenience.—It is likewiſe attended with this farther advantage, that as it continues to grow with equal vigour in the end of ſummer as in the beginning thereof, it would admit of being paſtured upon in the ſpring, till the middle, or even the end of May, ſhould it be neceſſary, without endangering the loſs of the crop of hay; which cannot poſſibly be done with rye-graſs, or any other plant uſually cultivated by the farmer, except clover, which is equally unfit for early paſture or for hay.—This plant would be the more valuable to the farmer, as it grows to the greateſt perfection on ſuch ſoils as are altogether unfit for producing ſain-foin, the only plant hitherto cultivated, that ſeems to poſſeſs qualities approaching to thoſe of this one.

It muſt, however, be acknowledged, that the difficulty of procuring ſeeds of this plant in abundance, muſt be a very great bar to the general cultivation thereof: For although theſe ripen very well in our climate, yet the quantity that it produces

duces is ſo inconſiderable, and the difficulty of getting them ſeparated from the pod, is ſo great, as to make it neceſſary to gather them by the hand; in which way the quantity obtained muſt be very trifling. To counterbalance this defect, however, it may be obſerved, that it is not only an abiding plant, which never leaves the ground where it has been once eſtabliſhed, but that it alſo increaſes ſo faſt by its running roots, that a very few plants at firſt put into a field, would ſoon ſpread over the whole, and ſtock it ſufficiently.—If a ſmall patch of good ground be ſowed with the ſeeds of this plant in rows about a foot diſtance from one another, and the intervals be kept clear of weeds for that ſeaſon, the roots will ſpread ſo much as to fill up the whole patch next year, when the ſtalks may be cut for green-fodder, or for hay. And if that patch were dug over in the ſpring following, and the roots taken out with the hand, it would furniſh a great quantity of plants, which might be planted in ſuch fields as you meant to have filled with this, at the diſtance of two or three feet

apart;

apart; which would probably there take root, and quickly overſpread the whole field.—And as there might always be a ſufficient quantity of the roots left to fill again the patch, from whence they are taken, it would be ready to furniſh a freſh ſupply the next ſeaſon, and might thus continue to ſerve as a nurſery for ever afterwards.

It appears to me, that this would be the moſt likely method of propagating this plant with eaſe: but I have not as yet had ſufficient experience thereof, to be able either to tell preciſely the expence of it, or to anſwer poſitively for the ſucceſs thereof in all caſes*.

The flowers of this kind of vetch, grow in a wide ſpike, having pretty long foot-ſtalks;—are of a bright yellow colour, and are ſucceeded by very flat pods, which are black when ripe, that are ſo tough, and adhere ſo firmly to one another, that they are with difficulty opened;—the ſeeds are flat,—ſmall, of a dark greeniſh grey colour,—and irregular figure;—round for the moſt part.

* Since the above was written, I have tried to cultivate it in this manner, and found it ſucceed.

The

The common blue tare, is, in many reſpects, of ſeemingly equal value with the former.—This carries a large cloſs ſpike of bright cerulean-coloured flowers, which are ſucceeded by ſmooth white pods, filled with round flatted blackiſh ſeeds, which rattle in the pods when ripe.—The leaves of this plant are much ſmaller, and more divided than thoſe of the former; the ſtalks are likewiſe ſmaller, and grow to a much greater length.—It produces a much greater quantity of ſeeds; but the ſmall birds are ſo fond of them, that unleſs the field is carefuliy guarded, few of the ſeeds are allowed to ripen; but if they were preſerved from that enemy, they might be eaſily propagated.—It ſeems to flouriſh on the ſame ſoil with the former,—is equally well liked by cattle, and will probably afford a more nouriſhing hay, on account of the quantity of ſeeds it contains:—But as the ſtalks come up more thinly from the root, and branch more above, it would not ſeem of itſelf to be ſo well fitted for a paſture-graſs as the former. If it were intermixed with other plants, that made the pile cloſs at the bottom, it might probably greatly increaſe the value of the

paſture,

p. 430

Tab 13



Blue Tare

J. A. del.

A B sc.

paſture, and would put it in the power of the farmer to cut a very fine crop of hay from his fields, at any time he might ſo incline.

It is often found growing among the corn, in ſtiff ſoils badly dreſſed, where its roots are allowed to remain; and is known in ſome parts of Scotland, by the name of *horſe-peas.*

But of all the plants of this tribe that have occurred to me, none ſeem to equal the purple everlaſting, or buſh-vetch *(Vicia ſepium)* for paſture.

The roots of this plant ſpread on every ſide, a little below the ſurface of the ground, like both the former; from which ariſe many ſtems in the ſpring of the year, quite cloſe by one another. And as theſe have a broad-tufted top, covered with many leaves, it forms a pile, even without any other plant, as cloſe as could be deſired.—It does not grow to a very great height; and as it ſprings up very quickly after being cut or cropt, it ſeems to be more properly adapted for paſturage than for hay; although it will grow to a ſufficient height for that purpoſe on a good ſoil. But as the ſtalks grow ſo cloſe upon

one another, there is great danger of having it rotted at the root, if the ſeaſon ſhould have a tendency to dampneſs.—It produces abundance of ſeeds, which could be ſaved with leſs difficulty than either of the former; were it not that they are very apt to be eaten by a worm, while yet in the pod, which often deſtroys them entirely. Clay ſeems to be the ſoil that it moſt affects. I know no plant that would be more valuable than this, as a food for beaſts, could it propagated with eaſe.

The leaves of this plant are broader than either of the former;—the flowers of a pale purple colour, ſpringing from the bottom of the leaves by pairs;—the pods are firſt yellow, but black when ripe, and roundiſh, almoſt like thoſe of common peas.—They open very ſoon after they turn black, and ſhed the ſeeds,—which are freckled and flatted like the vetch, or ſmall yellow lupine, but not ſo bright in colour.

I have been attentive to theſe plants of the pea-tribe, chiefly becauſe it has been often remarked, that no other claſs of plants

p 432 Tab. 14



Bush Vetch

AB sc

plants afford ſuch nouriſhing food for quadrupeds as this does; from which it is probable that they would yield hay of a more nouriſhing quality, than any that is produced from culmiferous plants. And as it is always for the profit of the farmer, to have as great a variety as poſſible of uſeful vegetables, that he can cultivate, that he may thus have it in his power to rear thoſe only which are beſt adapted to his ſoil and other circumſtances, it is imagined the few hints that have been given relating to theſe may be of ſome uſe; eſpecially as there are no other plants commonly cultivated by the farmer, that are, like theſe, ſo ſtrictly perennial, and which admit of being either cut or paſtured for any number of years, that he may incline :—qualities that in ſome particular ſituations would render them highly valuable.

There are a great variety of plants of this claſs, that I have had no opportunity of obſerving, which might probably be poſſeſſed of other qualities, that might render them very beneficial to the farmer, and therefore, they demand the particular

attention of the improver. Among theſe, the common everlaſting-pea, which is cultivated in our gardens, as a flowering-plant, would probably yield a prodigious weight of hay upon an acre;—as it grows to the height of ten or twelve feet, having very ſtrong ſtalks, that could ſupport itſelf without rotting, till it attained a very great height.—But I have never yet had an opportunity of trying it, or of knowing in what way it would admit of being cultivated.

Since the former editions of this Work were printed, another plant has attracted my notice, which promiſes to be a valuable acquiſition to the farmer, the *Coronilla varia*. It is at preſent cultivated in gardens, only for the beauty of its flowers. It there recommended itſelf to my notice, for the cloſeneſs and luxuriance of its ſhoots, and the richneſs of the herbage it produces. Having cut it over frequently, I found that it puſhed out freſh ſhoots with great luxuriance; and having found, upon trial, that it was eaten by horſes and cattle, I determined to make

ſome

ſome experiments on the eaſieſt way of propagating it.

This plant ſends out ſtrong ſhoots early in the ſpring, which are garniſhed with leaves, much reſembling thoſe of ſainfoin. Its flower is of the papilionaceous kind, which conſiſt of a round tuft, reſembling a head of clover, but larger; there being only one circle of flowers, each of which flowers, taken ſingly, is of a much larger ſize than a clover flower, and of a pale pink or bluſh colour. The plant has no claſpers, but it ſends forth flowers at every joint, which ſucceſſively come into bloſſom, from the month of May, till the end of the ſeaſon. Its roots are fibrous and ſpread to a great diſtance, near the ſurface of the ground, from which it ſends up abundance of ſhoots all around, ſo as to become very troubleſome in a garden.

With a view to propagate this plant, I tried to gather its ſeeds, but I ſoon found that was a very hopeleſs taſk; for the pods, in general, fall off ſoon after the flower is gone, ſo that not one out of ſome hundreds ever bears a ſeed. I then tried to propagate it by its running roots, and

ſucceeded in this way to my wiſh. Having dug up a number of thoſe roots, and divided them into pieces, leaving at leaſt one good eye to each (but better three or four, as theſe roots can eaſily be got in abundance, after you have once obtained the plant) I planted theſe by a dibble, about one foot diſtant from each, in a ſmall patch newly dug over, in the month of May, as might have been done in a field of new-ſown barley. It was left in that ſtate without farther trouble (unleſs to cut down the weeds, to prevent them from coming to ſeed) with a view to ſee if it could be made thus to fill the ground. Next ſeaſon, the whole patch was completely ſtocked with plants, which by the beginning of May, afforded a full crop of luxuriant herbage, more than a foot high over the whole; which in appearance very much reſembled a field of ſainfoin, only that it was conſiderably cloſer in the pile. It was cut over during the ſeaſon, three times, and afforded at each cutting a great load of very fine herbage.

Thus far does my experiment go, and no farther. It eſtabliſhes the fact, that it may

may be very eaſily propagated, and that it grows luxuriantly. The only inconvenience I can perceive, from the rearing of this crop, would be this: It increaſes ſo very faſt by the roots, that it probably would come, in a ſhort time, to overſtock the ſoil ſo much, as of neceſſity to dwarf the plants very much, and make its produce trifling. Should that happen to be the caſe, an obvious remedy occurs:—Whenever this malady was ſeen to come on, it would only be neceſſary to run a plough-furrow down the field, at the end of autumn, when the plant dies entirely down, and at the back of that another, and ſo on over the whole field; leaving it in ribs, or ridgelets, about two feet wide. In this ſtate let it remain, till the month of April, and then harrow down theſe ridgelets, ſo as to ſmooth the field, gathering off the roots which are torn out, and either employing them as plants where wanted, or giving them to beaſts, if they ſhall be found, upon trial, to be palatable and nouriſhing; otherwiſe, they may be thrown away, as uſeleſs. Notwithſtanding the ſeeming boldneſs of

this proceſs, there can be no doubt, but the whole field would be abundantly ſtocked with plants for the enſuing ſeaſon, which, in conſequence of this kind of hoeing, would grow with the greateſt luxuriance. By repeating the ſame operation every year, there can be no doubt but the field might be continued to yield abundant crops of this kind of herbage, for many years.

Theſe hints are here offered merely as experimental trials, not as practical directions, which are the reſult of experience. —The qualities of the plant require to be more fully aſcertained before the culture of it ſhould be entered upon at large,—for I well know that experience often diſcovers defects which are not obvious upon a firſt trial.—But if, among a number of trials, one only ſucceeds, much good is gained by it to the community at large. At preſent, when great clover becomes ſo ſhy in many places, it is of great importance to try to obtain a ſubſtitute for it.—This is, at leaſt, a probable one.—It is certain that it may be propagated, as above, fully as cheap as red clover;

clover; and as it is a perennial plant, ſhould it anſwer in other reſpects, much ſaving would be made in the article of propagation.

We have lately had another plant recommended to our notice, by the cultivators in France, from which great hopes have been entertained, the *Chicorium Intybus*. It is a ſtrong, robuſt, coarſe looking plant—but from the few trials I made upon it, it did not ſeem quite to anſwer the hopes that were entertained from it. In one reſpect, indeed, it ſeems fully to anſwer expectations; for both cattle and horſes ſeem to reliſh it almoſt above any other plant, ſo as to eat it very greedily. If it be cut and given to them, before its ſtalks have acquired a woody hardneſs, I have never ſeen one bit of it refuſed by them.

Several other plants have, of late, been recommended to the notice of the Britiſh Farmer, for cultivation, by well-informed cultivators, among which I have ſeen none that promiſes better than the *Medicago Lupulina*, an abiding plant, that grows with great luxuriance, and is reliſhed by all cat-

tle.—But if others ſhall be as unſucceſſful as I have been, in ſaving its ſeeds, it will be a matter of great difficulty, indeed, ever to get it propagated in abundance; for though I had near a dozen of healthy plants of it for three years, I could ſcarcely ſave the ſeeds from a dozen of pods, in a ſeaſon.———To return to our paſture-graſſes:

The narrow-leaved plantain, or rib-graſs, is well liked by horſes and cattle, and yields a very good crop, upon rich ground, tending to dampneſs, if it is at the ſame time ſoft and ſpungy; but upon any ſoil that has a tendency to bind, or upon dry ground, it furniſhes but a very ſcanty crop. But as both this and white or Dutch clover have been long cultivated as paſture-graſſes, it is leſs neceſſary for me to recommend them to the public notice: they are both good paſture-graſſes.

The ſmall graſs-leaved plantain* deſerves the attention of the farmer, as a valuable paſture-graſs. Like the milk-

* *Plantago tenuifolia.*

wort,

p. 434 Tab. 15



Narrow leaved Plantain or Ribgrass

wort, it will thrive upon barren ſoils, where hardly any other plant could live. It may be moſt eaſily diſtinguiſhed on poor clays, where it is frequently found without the mixture of any other plant.—But it alſo abounds in many other paſture-fields, where the graſſy-like appearance of its leaves prevents it from being remarked. I have ſeen ſome downs (links) upon the ſea-ſhore, the ſoil of which conſiſted of a ſhelly ſand, that were covered with this plant, almoſt entirely.

Its leaves are ſmall, and have much the appearance of ſome of the thickeſt and moſt ſucculent kinds of graſs.—Its flower-ſtalks are numerous,—about eight or nine inches long, and the ſpike of flowers and head uſually about three or four inches long.—It produces abundance of ſeeds, which could be ſaved at little expence.

Cattle, horſes, and ſheep eat the leaves greedily; eſpecially ſheep, which bite it very cloſe to the ground. On this account, the ſeed-ſtalks are ſeldom ſeen but on the top of ſeal-dikes, or on other corners to which no kind of cattle have

acceſs.—Even the ſtalks, while ſucculent, are cropped readily by cattle: But when they are hardened, and the ſeeds begin to ripen, they appear very coarſe and diſagreeable to look at.

No plant bears the ſea air better;—and it grows well where it is ſometimes covered with ſalt-water.—It would, therefore, do well for ſalt-marſhes.

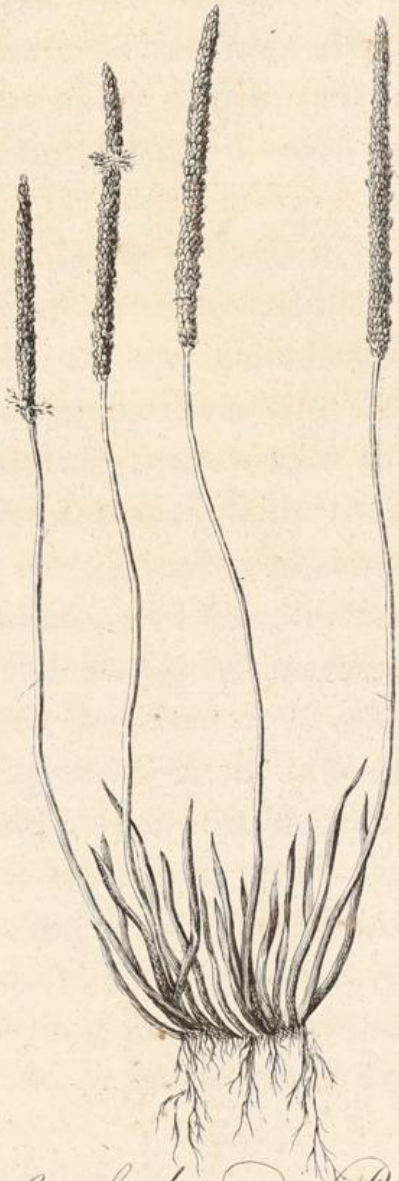
I ſhall only mention one other plant that has come within the ſphere of my obſervation, as deſerving to be cultivated by the farmer, *viz.* the common yarrow*, *Achillea millefolium*, or hundred-leaved graſs, as it is ſometimes called.

Thoſe who may have formed an opinion of this plant, from what they have remarked of it by way ſides, or other neglected corners where its flower-ſtalks have been allowed to advance, and its ſeeds to ripen, will probably be much ſurpriſed to hear *it* recommended as a

* The farmers in Scotland will pleaſe to take notice, that this is not the plant known among them by the name of *Yarr*, Spurrey *(Spergula)* but another plant, of very different qualities, as they will obſerve upon peruſing the text.

valuable

Tab 16



Small Grass leaved Plantain

valuable paſture-graſs, as they may very naturally imagine that no animal ever taſtes it. For theſe flower-ſtalks are carefully avoided by every animal, while all the plants around them are eaten to the ground.

But this plant is not ſingular in having its leaves reliſhed by many animals, and ſearched for with avidity, while its flower-ſtalks are rejected by them with diſguſt. For Nature, probably with a view to preſerve the ſeeds of thoſe plants from deſtruction, that were intended to clothe the fields with verdure, and furniſh abundant food for all the claſſes of *graminivorous* * animals, hath rendered moſt of their ſeed-ſtalks diſagreeable to the taſte of animals in general:—hence it happens, that the ſeed-ſtalks of almoſt all the graſſes, properly ſo called, are diſliked by almoſt every quadruped, while their leaves are reliſhed as the moſt grateful food that they can find †; and therefore, thoſe kinds of graſs,

* Animals that feed upon plants.

† Ought not this to afford a preſumption, that the hay which is made of the flower-ſtalks of *culmiferous* graſſes,

graſs, that run chiefly to ſeed-ſtalks, are diſliked as a paſture. It is probable, that the ſeed-ſtalks of every plant of this claſs, are equally diſagreeable, and would be equally avoided by them, were it not for the ſmall ſize of ſome of theſe, and the number of leaves with which they are enveloped; which, at the ſame time, prevents the animal from ſelecting them from the other parts of its food, and from feeling the diſagreeable flavour that they would be poſſeſſed of, if they were eaten by themſelves.

But if the plant of which we now treat, is allowed to remain untouched till its ſeed-ſtalks are formed, theſe become ſo large, and are ſo eaſily ſeparated from all other plants, that every animal which feeds there can diſtinguiſh and avoid them with the greateſt facility; ſo that while the leaves that ſpring out at the root are eaten down cloſe to the ground, the ſtalks are allowed to remain untouched, till their

graſſes, will not be ſo palatable or nouriſhing as that which is made from the leaves, or other parts of ſuch plants as admit of this?

ſeeds

Tab. 17.



Yarrow

T.H. del.

ſeeds are perfected. And as, by their natural ſtrength, they are able to reſiſt the inclemencies of the weather, and remain ſtanding long afterwards upon the ſame ſpot, when they aſſume a very diſagreeable appearance, we have been induced, from theſe circumſtances, to think but very meanly of the whole plant.

This prejudice is ſtill farther augmented by another circumſtance that rather ought, in the ſtrongeſt manner, to demonſtrate the real value and excellence of this plant. For, as we never ſee one ſeed-ſtalk of this graſs, in our fineſt paſture-fields, we too haſtily imagine that *it* in no caſe contributes to the goodneſs of them. —But the fact is directly the reverſe of what it appears: For, upon a cloſer inſpection, it will be found, that in almoſt every fine old paſture, a very great proportion of the growing vegetables with which it is covered, conſiſts of this very deſpiſed plant;—but the animals who feed there, are ſo fond of it, as never to allow one ſtalk of it, in theſe ſituations, to come to ſeed; ſo that it there always conſiſts of leaves, which are confounded with others

of

of which the pile conſiſts, and conſtantly eaten along with them. This, therefore, forms one of the beſt graſſes, in our fineſt paſtures, and is more univerſally found in theſe, than, perhaps, any other plant whatever; which is probably occaſioned by the extreme lightneſs of its chaffy ſeeds, which are eaſily carried by the wind to a great diſtance, and are thus more univerſally eſtabliſhed than other graſſes whoſe ſeeds are more weighty, and therefore leſs eaſily diſſeminated. As the ſeeds could be eaſily collected, and come up very readily when they are ſowed, the farmer has it in his power thus to improve ſuch paſtures as he may incline, at a very moderate expence.

One of the moſt perceptible diſtinctions that takes place between old rich paſtures, and ſuch as are newer, ſeems to be, that, in the former caſe, the pile of graſs is much cloſer than in the latter; which, in all probability, ariſes from a difference in the nature of the plants that abound in the one or the other. For if this were not the caſe, we might eaſily make our new paſtures as cloſe as any old ones could poſſibly

poſſibly be, by ſowing a greater quantity of ſeed: But ſhould we attempt thus to make the pile of a new-laid-down rye-graſs-field, equally cloſe with that of an old paſture, the plants would be ſo much ſtinted in their growth by this unuſual degree of thickneſs, that we would loſe our crop entirely. The only method, therefore, that remains to be followed by us, if we wiſh to make our artificial paſtures to equal or exceed the fineſt natural ones, in this reſpect, will be, to diſtinguiſh with care, thoſe plants that have a natural tendency to grow cloſe upon one another, from thoſe that require to have greater room to ſpread themſelves; and to cultivate the former with care, when we have once diſcovered them. Thus, if the plants above enumerated, the ſheep's-feſcue, and creeping poa, or meadow-graſs, naturally grow with their leaves much cloſer upon one another than rye-graſs, or moſt of the others; and the purple buſh-vetch has always perhaps ten times more plants ſpringing up in the ſame ſpace of ground than the blue-tare above-mentioned.—Now, it never fails that the yarrow a-

bounds very much in the very cloſeſt parts of the cloſeſt paſtures; and therefore it would ſeem, on this account, highly to merit the attention of the farmer, as it will give him an opportunity of making his new paſture-fields obtain a cloſe pile much ſooner than they would have done had they been left entirely to themſelves. —But this plant ſeems to be altogether unfit for hay, and, therefore, ought only to be ſowed where the field is intended for paſturage, unleſs that hay ſhall be made after the manner recommended in the Third Eſſay of the Third Volume of this Work.

It ſeems to delight chiefly in dry ſoils, or, rather, in ſoils that are not wet:—For it arrives at its greateſt perfection in rich fields that are naturally fitted to produce a rich and ſucculent crop of graſs.—It grows alſo upon clays, if dry—and is among the firſt plants that ſtrike root in any barren clay, that has been lately dug from a conſiderable depth; ſo that this plant, and thiſtles, are uſually the firſt that appear on the banks of deep ditches, formed in a clayey ſoil.

But although it takes root upon clayey ſoils

ſoils, and grows there more readily than moſt other plants, yet it delights more in a looſe, ſpongy, porous ſoil,—a kind of ſoil in which fewer plants are found to proſper well, than almoſt any other. The ſoil that is peculiarly fit for clover, is by no means ſo favourable for this plant as that on which rye-graſs thrives in perfection.—But it will grow and thrive in a ſtill more ſpungy ſoil than rye-graſs can do. My experiments, however, have not yet been ſo numerous as to enable me to ſpeak farther here with the certainty I could wiſh.

All animals delight to eat it; but from the dry aromatic taſte that it poſſeſſes, we would imagine that it would be peculiarly favourable to the conſtitution of ſheep. They are very fond of it, and eat it to the ground, in all their paſtures.

Before I leave this article, juſtice requires me to acknowledge, that I owed the firſt thought of the uſefulneſs of this graſs, to a hint with regard to it, thrown out by Dr. Hill, in ſome of his performances, which I found quoted in ſome book that I chanced to read.

There are, no doubt, many other plants, that would greatly add to the value of our paſtures, were their qualities and the mode of cultivating them duly pointed out. The *Melampyrum*, or cow-wheat, in particular, has been ſaid greatly to add to the quality of the milk, and flavour of the butter of the cows which feed upon it. But of this I have as yet had no experience.

I hope that this ſmall opening will encourage others to proceed in the ſame walk, and oblige the world with greater and more important diſcoveries.

XXXVI.

What is the moſt economical manner of conſuming the produce of any paſture-field?—That is to ſay—Whether ought the animals who are to feed upon it, to be turned upon it at large, and be allowed there to remain, without any change of paſture, for the whole ſeaſon?—or, ought they rather to be kept upon it only for a ſhort time, and then carried to another?

—or,

—or, in what other way ought they to be treated, ſo as to turn out to the greateſt profit of the poſſeſſor?

The practice that, in general, prevails throughout the greateſt part of Britain, in rich incloſed paſtures, where domeſtic animals are intended to be fattened for the butcher, is, to turn out the whole number of beaſts that is ſuppoſed the field could properly maintain, into it, in the beginning of ſummer, where they are allowed to go at their own eaſe all the remaining part of the ſeaſon, without any change of paſture at all.—And although many who have been accuſtomed to practiſe this method, are very poſitive in their aſſertions, that it is the moſt economical mode of conſuming their paſtures that could be practiſed, yet as I do not find they ſupport this aſſertion with any deciſive experiments, there ſeems to be ſo many reaſons to make us doubt if the fact be as they aſſert, as ſhould induce us at leaſt to ſuſpend our opinion till the neceſſary experiments ſhall be fairly made,

which ſhall aſcertain this point with preciſion.

For, as the greateſt part of the common graſſes grow more quickly during the beginning of ſummer, than they do after the ſeaſon is farther advanced, if we were to attempt to put nearly as many beaſts into the field, as would be ſufficient to eat up all the graſs that advances at that period, they would not have half food during the remaining part of the ſeaſon. To avoid this inconvenience, therefore, it becomes neceſſary to put only as many beaſts at that time into the field, as can be afterwards maintained in it properly, ſo that many plants muſt then be ſuffered to run to ſeed; after which, no animal will taſte them, unleſs conſtrained by hunger.—Many plants, alſo, are, at this period, trodden down by the feet of the beaſts, in their wanton gambols, which are never afterwards much reliſhed by them.—And as it has been already demonſtrated, p. 30, Vol. II, that many plants ſoon attain to a certain length, beyond which they never advance, if not eaten down or cropped; the whole

whole vegetation of the field muſt thus be ſtopped, and the total produce of it throughout the whole ſeaſon be greatly diminiſhed, when compared with what it might perhaps have been by a more ſkilful management. And,

If, with a view to remedy, in ſome meaſure, this inconvenience, a greater number of beaſts ſhould be put into the field during the beginning of ſummer, than towards the end of it, we would indeed, in ſome meaſure, diminiſh the evil, but not effect a radical cure.—For if the field were at that ſeaſon eaten ſo bare as to prevent any of the plants from running to ſeed, there would be ſome room to dread that the animals would be too much ſtinted, for food to fatten kindly.—And as the graſs upon which they have lately breathed is, in general, diſagreeable to them, it is much to be doubted if they would come ſo quickly into fleſh, as would abundantly reward the hopes of the huſbandman*.

From

* For theſe reaſons, experienced graziers, in general, find it their intereſt to keep their paſture-fields very

From theſe conſiderations, it would ſeem probable, that there muſt always be a conſiderable waſte of food, by this mode of management, let the farmer be as attentive as poſſible; which, it is imagined, might, in a great meaſure, be prevented by the following, or ſome ſimilar practice:

As every kind of animal delights moſt to feed upon freſh plants, that have newly ſprung up from a bare ſurface, in which there is no decayed or rotted ſtalks of any kind; there can be little doubt, but that if cattle which are intended to be fatted, were always ſupplied with a conſtant ſucceſſion of this kind of food, they would be brought forward in fleſh as quickly as the nature of that food could in any caſe do it.

To obtain this conſtant ſupply of freſh graſs, let us ſuppoſe that a farmer who has a large extent of paſture-ground, ſhould have it divided into fifteen or twenty diviſions, nearly of equal value; and that inſtead of allowing his beaſts to

lightly ſtocked with cattle; it being a ſmaller evil to loſe a conſiderable proportion of their graſs, than to have their cattle in any degree ſtinted in their food.

roam

roam indiſcriminately through the whole at once, he ſhould collect the whole number of beaſts that he intends to *feed*, into one flock, and turn them all at once, into one of theſe diviſions: In this caſe, the graſs being quite freſh, and of a ſufficient length for a full bite, it would pleaſe their palate ſo much, as to induce them to eat of it greedily, and fill their bellies before they thought of roaming about, and thus deſtroying it with their feet. And if the number of beaſts were ſo great as to conſume the beſt part of the graſs of one of theſe incloſures in one day, they might be allowed to remain there no longer;—giving them a freſh incloſure every morning, ſo as that the ſame delicious repaſt might be again repeated. And if there were juſt ſo many incloſures, as there required days to make the graſs of theſe fields advance to a proper length after being eaten bare down, the firſt field would be ready to receive them, by the time they had gone over all the others; ſo that they might be thus carried round in a conſtant rotation.

But as it would be neceſſary to allow

his *fattening* beaſts always to have a full bite, it would not be proper to keep ſo many of theſe as would at any time eat one of theſe fields quite bare in a day.—And as the graſs that they would thus leave behind them, would, if left in that ſtate, in part run to ſeed before they could return to the field, while ſome other parts of it would be withered or half-rotted, the paſtures would be thus rendered leſs ſweet and nouriſhing, than they would otherwiſe have been:—And as there would likewiſe be a ſmaller quantity of graſs produced on the field in this way, than if it had been eaten quite bare to the ground, it would be great want of economy in the farmer, not to keep another ſet of young or lean beaſts, which ſhould regularly ſucceed the firſt, and eat up all that they had left, ſo as to make it quite bare, and put it in a proper condition for vegetating again with vigour. And as it would be always in his power to augment or diminiſh this laſt ſtock, as circumſtances might require, by keeping a few ſupernumeraries in ſome ſpare field, or by buying in others, it would ſeem that

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he would thus have a probability of reaping the full benefit of every blade of graſs that could be reared upon the field;—more eſpecially if the circumſtances mentioned in the following Diſquiſition, were duly attended to.

There is no doubt, however, that cattle, when allowed to roam at large on an extenſive field, will fatten very kindly, if they have a ſufficient quantity of food: But the queſtion at preſent is, Whether the ſame field will feed, to perfection, a greater number of beaſts in the one or the other mode of managing it? The ſubject is of importance, and deſerves to be elucidated by *proper* deciſive experiments. See this ſubject farther elucidated, Vol. III, Eſſay Third.

XXXVII.

Can the produce of a farm be, in general, conſumed with as much profit by only one ſpecies of domeſtic animals, as by a greater variety of theſe?—If the laſt ſhall be the caſe, which of the animals commonly propagated by the farmer in this country

country could be moſt economically reared upon the ſame farm with others?—And, in that caſe, what would be the moſt proper method of feeding them?—That is to ſay—Whether ought they to be allowed to paſture on the ſame field at one time, or to ſucceed one another upon it?—If ſo, In what order ought they to follow one another?

As it is certain that one claſs of animals, on many occaſions, delights to feed upon plants which are totally diſregarded by, or which are even noxious to others, it would ſeem, that unleſs a man had his farm in ſuch order as that no one plant would grow upon it which he did not cultivate, it might ſo happen, that among the variety of plants which ſpontaneouſly ſpring upon it, there would be ſome that would be improper for any one claſs of animals;—all of which plants would be totally loſt, if he ſhould confine himſelf to that ſingle ſpecies of animal only. But as few farms are in the order here ſuppoſed, it ſeems highly probable, that it would be always an advantage

for

for the farmer to keep more claſſes of animals than one upon his farm: And conſidering it merely in this view, the greater variety he could keep, the leſs waſte he would ſuſtain. But other economical conſiderations may frequently make it proper for him to ſubmit to this loſs, inſtead of perhaps a greater, that he might ſuſtain by too cloſely guarding againſt it.

The rural economiſt reaps another advantage by allowing different claſſes of animals to paſture the ſame field: For, even ſuppoſing that the whole of the plants produced upon it ſhould be wholeſome and agreeable to one claſs, yet as no animal will eat the graſs that ſprings up where one of its own ſpecies has dunged till it has got a winter's froſt, although the graſs produced by this means is greedily eaten by another claſs of animals,—if no more than one ſpecies is ever admitted into any field, the waſte which is ſuſtained by that means muſt be very conſiderable; which would have been totally ſaved by a more prudent management.

On another account, likewiſe, we would expect that the farmer would derive ſome advantage

advantage by keeping different claſſes of animals rather than one ſpecies: For, as ſome of theſe naturally prefer the flowers and ſtalks of plants, which others reject, and only eat the leaves; while other kinds are ſtill more fond of the roots;—and as ſome kinds bite much cloſer to the ground than others do; it would ſeem, that by having different claſſes upon the ſame field, much would be ſaved that muſt otherwiſe have been loſt.

The Dutch, who are in all caſes attentive to economy, have long perceived the benefit that may be reaped from a due attention to this circumſtance, and have turned it to their advantage; ſo that it has become a common obſervation among them, that when eight cows have been in a paſture-field, and can no longer get any nouriſhment from it, two horſes will uſually ſubſiſt in it very well for ſome days; and when nothing is left for the horſes, four ſheep will live comfortably upon it for ſome time longer. In which caſe, it is plain, that if nothing but cows had been kept upon the paſture, all that was conſumed by the horſes and ſheep would have been loſt.

I imagine

I imagine, that all kinds of animals uſually feed moſt quietly when they are not mixed with others; and therefore it is probable, it would be uſually the moſt adviſable to keep the different claſſes ſeparate, as in the Dutch experiment: but whether the order they preſcribe is the beſt or not, I cannot pretend to ſay. As goats love the flowers and ſtalks, it is probable that they ſhould be firſt put into the field. Theſe might be followed by cattle who love to get a full bite, and cannot eat cloſe to the ground. Horſes, as delighting in ſhorter paſture, would probably ſucceed them with advantage; and ſheep, that delight in the crowns of roots, and that part of the graſs which grows neareſt the ground, ought, in all caſes, to come laſt. Probably, hogs and ſome other animals might be wanted to eat up the whole of the plants, without the ſmalleſt waſte.

By making different claſſes of animals thus ſucceed each other, in due proportions, in the different fields, as mentioned in the laſt Diſquiſition, it ſeems probable, that every plant might be eaten cloſe to the ground, without ſtarving any of the beaſts

that

that are fed upon the field; and thus the vegetation be kept up perpetually freſh and vigorous, without the ſmalleſt waſte. We are thus alſo enabled to obſerve the great utility that would reſult from carrying on the buſineſs of a grazier upon a very extenſive ſcale, as it is only in theſe circumſtances that the juſt proportion of the different claſſes of animals could be kept for effectually anſwering the purpoſe required. See this ſubject farther elucidated in the 3d Eſſay, Vol. III, of this Work.

XXXVIII.

Are there not many uſeful domeſtic animals known in different parts of the globe, that might be economically reared in this country, and tend much to promote the progreſs of uſeful arts, if they were introduced?—If this be ſo, what are the animals that promiſe to be of the greateſt utility, and the particular purpoſes that each of them might be ſuppoſed moſt effectually to ſerve?

For the reaſons alleged in the foregoing Diſquiſition, it is plain, that the greater

the variety of uſeful animals is among which the farmer may be at liberty to chooſe, the greater chance he will have to get every product of his farm conſumed to the utmoſt advantage. For, as different claſſes of animals require food of different kinds, he will thus have a chance of getting every uſeleſs vegetable conſumed with profit.

Hitherto, the attention of the farmer has almoſt never extended farther than to the five domeſtic animals ſo often mentioned in this Eſſay—horſes, cattle, ſheep, goats, and hogs; ſo that even ſome animals that are natives of this iſland have been totally neglected, or conſidered in ſome meaſure as wild, and therefore beyond the ſphere of the farmer's attention. Of this ſort is the rabbit; which, it is poſsible, might, on many occaſions, be kept as a tame animal with great profit, as it eats almoſt every green thing, and could probably be nouriſhed upon plants that are rejected by all our other domeſtic animals: and its fur, if the rabbit be of the beſt ſort, is of ſuch value, as always to be ſure of coming to a ready market.

But, not to dwell on what may by many be

be deemed ſuch an unimportant object, we may obſerve, that there ſeems to be no reaſon in the nature of things to make us ſuſpect, that the goat of Angora, which furniſhes the fine Mo-hair that conſtitutes ſuch a conſiderable branch of our Levant-trade, might not thrive in Britain as well as in its native country. For, although we do get this wool from ports that are ſituated in a warm climate, yet the animal itſelf lives upon the rocky mountains of Pontus, where it experiences a very conſiderable degree of cold: And it might probably be bettered, rather than rendered worſe, by being introduced into Britain.

The ſame argument might be adduced, to ſhow that the goat of Thibet, known by the name of Touz, that carries the ſtill finer fleece, which is valued at three times the price of the famous Perſian wool, might be here reared with profit, as the country that it inhabits is undoubtedly much colder in winter than any part of Britain.—Neither is there any certainty that the goat of Golconda, which yields the Bezoar as well as a very fine wool, might not admit of being kept with profit in Britain, as it has never

yet, that I have heard of, been fairly tried. But there can be no doubt but that the Chamois goat of the Alps would thrive well on the high mountains of Wales and Scotland, where hardly any other animal at preſent feeds: And the Bouquetin of the ſame country, which delights to live chiefly among the ice upon the tops of the higheſt Alps, and is in many reſpects an uſeful animal, would conſume thoſe plants that grow where none of our own animals at preſent dare venture.

The ſheep of Perſia and Spain are known to produce wool of a much finer quality than that which is yielded by ſheep in any other part of the globe; which we have hitherto been inclined rather to attribute to the influence of their particular climate and paſture, than to any eſſential difference in the original breed of that animal reared in theſe countries: And therefore we have been diſpoſed to look upon every attempt that may have been made to introduce that breed of ſheep into our own country, as wild and chimerical; ſo as to ſit down contented with our own ſituation, and allow the inhabitants of theſe countries to enjoy the

benefits of their good fortune without moleſtation.—Yet the Author hereof flatters himſelf with the hope, that if the Reader has attended to ſeveral obſervations that have occurred in different parts of this Eſſay, he will be led to think, that there does not appear any reaſon againſt it, ſo ſtrong as to debar us from all hopes of ſeeing ſuch an attempt, if wiſely conducted, attended with ſucceſs.

The Lama, Guanacoe, and Paco, of America, are varieties of a claſs of animals of the camel-tribe, which ſubſiſt upon little food, and probably delight to eat ſuch plants as are either uſeleſs, or noxious to all our domeſtic animals. Some of theſe have ſo much bodily ſtrength as to be employed by the natives of Peru as beaſts of burden; and they all afford a kind of wool of a peculiar quality, that might be employed with ſucceſs in many of our manufactures, and help to give them ſuch peculiarities as might entitle them to a preference to thoſe of other nations in foreign markets, were we ſo wiſe as to adopt them. And although they be natives of a tropical region, it has been already

ſhown

ſhown that there is reaſon to think they might be able to endure the cold of our climate, without any apprehenſion of their being hurt by it; ſeeing they conſtantly chooſe to frequent the ſnowy mountains that abound in their native country *.

Neither are we as yet ſufficiently acquainted with the nature and diſtinguiſhing qualities of the Urus, Biſon, and Buffaloe—varieties of the cattle *(Bos)* tribe. In Italy, and other warm countries, the Buffaloe is employed as a beaſt of burden, and is ſuppoſed to be equal in ſtrength to three or four horſes. They yield a conſiderable quantity of milk, of which good cheeſes are made; and although their fleſh is not ſo much valued as our beef, yet the hide is deemed, in many reſpects, preferable to that of our ordinary cattle. In Hindoſtan, and other parts of the Eaſt-Indies, they have another variety of theſe, that are ſtill

* Some attempts have been made to introduce theſe animals into Spain, but without ſucceſs.—Buffon juſtly obſerves, that theſe trials have probably proved abortive, by the animals having been confined to the warm plains of Andaluſia—a climate by far too hot for them to live in. Probably, they would have thriven upon the Alps, if allowed there to range at large.

more tractable than either the Buffaloe in Italy, or the ox in other parts of Europe, which are therefore employed as almoſt the only beaſt of burden in all theſe countries. —The Biſon is reckoned ſtill more docile and tractable than theſe, and is employed in ſome countries for the purpoſes of war; and, what is more ſurpriſing ſtill, as a guard and attendant of their flocks, in the ſame manner as our dogs. The Urus is a native of temperate climates, and, although of an enormous ſize, is gentle, and eaſily tamed; but, it is utterly unknown in Britain *. In Louiſiana, there is a variety of this claſs of animals that is covered with a very fine and cloſe fur, that more reſembles wool than hair, which is employed by the natives for the ſame uſes as wool. Theſe animals are there wild, but might eaſily be tamed. But whether that fleece would admit of being annually ſhorn like that of ſheep, or what would be its particular value in manufac-

* Some horns that ſeem to have belonged to the Urus, have been lately found in Scotland, which ſeems to prove that it had been once a native of this iſland. Theſe horns may be now ſeen in the Muſæum of the Scottiſh Antiquaries, in Edinburgh.

tures,—or, whether the animal would be poſſeſſed of any other valuable qualities, we are as yet a loſs to know. Its fleſh is eſteemed by thoſe who have eaten of it;—and its ſkin, dreſſed with the wool, forms ſuch a warm and uſeful covering for the Indians and Canadians, that they have hitherto kept them entirely for their own uſe; none of them, that I have heard of, having been hitherto exported.

In North America, they have likewiſe a ſpecies of deer, called by the natives *Orignial* or *Aurignial*, which ſeems to be poſſeſſed of ſome qualities that might perhaps, by the induſtry of man, be employed for his advantage. It conſiderably exceeds in height the talleſt horſe;—hath legs very long in proportion to its body;—runs with great ſwiftneſs; and, like all that claſs of animals, is endowed with very great muſcular ſtrength, and may be eaſily tamed, ſo as to become as gentle as a lamb. This account I had from a gentleman, who had frequently ſeen one of them in the poſſeſſion of Gen. Carleton, when Governor of Canada, that was tethered every day upon its paſture like a cow, and was equally

tame.—This is probably the ſame animal that has been diſtinguiſhed in Engliſh, by the name of Mooſe-deer, of the exiſtence of which, ſo many have doubted.—In its wild ſtate, it lives, in winter, chiefly upon moſs and branches of trees, in this reſpect, reſembling the Rhen-deer of Lapland. But, whether it could be brought at that time to feed upon any of the kinds of moſs that ſo often cover our paſtures,—or, whether the Rhen-deer is really incapable of being kept in any climate more temperate than Lapland, which has been often aſſerted with a great degree of confidence *;

—or,

* However poſitively this may have been frequently aſſerted, there ſeems to be much room to doubt if the fact be really ſo, as there is found in all the provinces of North America, even as far ſouth as the Back Settlements of Virginia, an animal of the deer-kind, called by the natives *Caribou*, which is acknowledged to be, in all reſpects, the ſame with the Lapland Rhen-deer. And what reaſon have we to imagine, that an animal which can bear the intenſe ſummer-heats of Lapland, would not live in a more temperate climate, where thoſe kinds of moſs on which it chiefly delights to feed, can be found?

Of all the animals that roam through the woods of North America, none are more wild than the *Caribou*:

nor

—or, whether any other variety of this claſs of animals, or any other creature that could be uſeful to man, could be fed on any of thoſe ſorts of moſs that ſo much abound in all our old paſtures, and are entirely uſeleſs for every economical purpoſe that we know of—is not at all aſcertained, although it is a ſubject highly deſerving the attention of the Public.

Many other animals have been ſlightly mentioned by hiſtorians as poſſeſſing particular valuable qualities, but with ſo little accuracy, as not to admit of our relying on their accounts as certain.—Of this claſs is the *Anta* of Peru, an animal of the

nor have the natives ever once thought that it would be poſſible to tame it, or render it ſerviceable to man as a domeſtic animal, although the experience of the poor Laplanders ſufficiently ſhows, that it may be rendered tame and gentle, and furniſh alone almoſt all the neceſſaries of life, to a frugal and abſtemious people. From which example, we ought to be taught never to deſpair of being able to domeſticate almoſt any graminivorous animal, however wild, if it can be of any eſſential ſervice to ourſelves.

N.B. Since the former Editions of this Work, the Rhen-deer has actually been imported into Britain, and and has been found to live, and propogate, in Yorkſhire, as well as in Lapland. *Note to the fourth Edition.*

Buffaloe-tribe, but of an uncommon kind, particularly eſteemed there for the remarkable ſtrength and thickneſs of its ſkin. The *Taparijſou*, an animal of Brazil, ſaid, in ſome reſpects, to reſemble an ox and an aſs,—remarkable likewiſe for the extraordinary ſtrength of its ſkin. Others aſſert, that in Brazil they rear a kind of animal, reſembling a ſheep, as large as a horſe, with long horns, and a ſhort tail &c. &c.—But whether ſuch animals as theſe do really exiſt or not, is very uncertain; and if they do, it is as doubtful if they could be of any uſe to us. But ſurely ſuch objects deſerve the attention of philoſophical enquirers. The exiſtence of the animal called *Nil-Ghau*, ſo lately ſeen in Britain, and ſo well deſcribed by Dr. Hunter, was deemed at leaſt as great an uncertainty as any of theſe*.

XXXIX.

* Several attempts have been made in Britain, to obtain collections of *plants* from all parts of the world. It is to be regretted that no public inſtitution has ever been made for collecting and preſerving uſeful animals from different parts of the globe.—Here opens a fine field for conferring immortal honour on the man who firſt ſhall begin ſo great and uſeful a work.

N.B.

XXXIX.

We in Great Britain are as yet ſo little acquainted with the nature of the mule, and, at the ſame time, have ſo many imperfect accounts of the amazing ſtrength and hardineſs of that ſingular animal, as makes it much to be deſired that an authentic account of it could be procured for the benefit of the farmer, ſo that he might know how far it might be prudent in him to make uſe of this in preference to every other beaſt of burden?

N.B. Since the former editions of this Work were publiſhed, the author preſented a memorial to Sir John Sinclair, pointing out the great benefits that might be derived from eſtabliſhing a ſociety for the improvement of Britiſh wool, earneſtly recommending it as an object worthy of his attention. He adopted the idea, and under his patronage has been ſince inſtituted the Society for the Improvement of Britiſh Wool; which, although it has not been productive of *all* the good that might have been derived from it, has ſtill been of *ſome* benefit to the country, by giving room for aſcertaining a few facts, which might long have remained doubtful. See farther on this ſubject, the following Eſſay in the preſent Volume; alſo, an Account of the Ruſſian Sheep, &c. by Dr. Pallas, publiſhed by Chapman, Fleet-ſtreet, London.

This

This animal is ſaid to be poſſeſſed of much greater ſtregth, in proportion to its ſize, than either the horſe or the aſs; —is longer-lived than either of them, and can be ſupported on much poorer fare; —is hurt by no ſort of bad treatment;— patient under hardſhips, with a long *et-cætera* of qualities, that thoſe who are unacquainted with it, have difficulty to bring themſelves to admit of, and yet know not how to reject the evidence with which they are ſupported, being ſometimes ſo very ſtrong.

If all theſe extraordinary advantages reſult from this kind of unnatural croſſing the breeds of animals, one would imagine, that thoſe who have experienced it in this inſtance, would have endeavoured to try what would have been the reſult of a ſimilar croſſing with regard to other animals that nearly reſemble one another;—ſuch as the cow with the urus, biſon, or buffaloe—the deer with the cow or goat, &c. &c.—But I have met with no account of any uncommon ſpecies of

animal

animal of the mule kind, excepting one, that carries in its face ſo much the appearance of a fable, that I ſhall give the account of it in the very words of the author who relates it, Jean St. Leger, in his account of Switzerland :—' Among* ' the domeſtic animals,' ſays he, ' there is ' only the *Jumarre*, that is altogether un- ' known in the northern countries. This ' animal is procreated either between a ' bull and a mare, or between a bull and ' a ſhe-aſs. The firſt are the largeſt, and ' are called *baf*; the latter are ſmaller, and ' are called *bif*.—

- - - - - - -

' ———They have the head and the tail ' of an ox, with a ſmall excreſcence in place ' of the horns; the reſt of the body re- ' ſembles that of the horſe or aſs. Their ' ſtrength is inconceivable in proportion to ' their ſize. They are ſmaller than mules, ' eat little, and are ſurpriſingly expedi- ' tious on a journey *(dévorent le chemin)*. I ' have travelled eighteen leagues, altoge-

* *Entre les domeſtiques, il n'y a que les* jumarres, *&c. Hiſt. Génér. des Egliſes Vaudoiſes, par Jean St. Leger, paſteur.* F. p. 8.

'ther on a mountainous road, on the 30th 'of September, on a jumarre, but with a 'good deal more eaſe than I could have 'done it on horſe-back.'

To deny a fact ſo poſitively aſſerted by a man of character, unleſs we had direct proofs of the contrary, would be rather bold. At the ſame time, I muſt acknowledge, that the difference of the mode of copulating is ſo great between cattle and horſes or aſſes, that it is hardly poſſible to avoid reading this account with ſome degree of ſcepticiſm. Mention is made of this ſame jumarre, which is called *gimarro* in Italy, by other authors. But as many of our nobility and gentry have occaſion to paſs through Switzerland in their way to Italy, it would be eaſy for them, if they choſe it, to get ſatisfaction as to this fact, upon the ſpot*.

N.B. Since the third edition of this Work, the following remarks relative to this

* Since the former edition of this Work, I have been aſſured by one who was in Switzerland for ſome months, that the *jumarre* is ſtill there employed as a beaſt of burthen, ſo that there can be no reaſon to doubt the fact. *Note to the Third Edition.*

ſubject has fallen in my way; it is extracted from Mr. Baird's Account of Middleſex, drawn up for the conſideration of the Board of Agriculture, when ſpeaking of the improvements that had been made by the late ingenious Mr. John Hunter, at Earl's court, in the pariſh of Kenſington, he ſays, page 42:

"This gentleman has, at preſent, a very beautiful little cow from a buffaloe and an Alderney cow. This animal is, in ſome meaſure, kept for her beauty; and, what adds to it, *ſhe is always plump and fat, whether in ſummer or winter, and upon much leſs food than would be ſufficient to ſupport a beaſt of the ſame ſize, of the ordinary breed.* I do not find that ſhe exceeds in *quantity* of milk, but the *quality* is very good, and it is certain, *ſhe can be fattened at a much leſs expence than an ordinary cow of the ſame ſize.*" This is a very curious fact, that deſerves to be particularly adverted to; ſhould it prove to be a general rule, and not a particular exception, it would lead to very important conſequences.

XL.

XL†.

Some plants grow only on a hard firm ſoil, and others thrive only in an open ſpungy mould.—Required, a liſt of each of theſe two oppoſite claſſes of plants, as alſo a ſpecification of ſuch plants as *approach* to either of theſe extremes?

It has been often diſputed by practical farmers, whether rolling ground was an advantageous practice, or the reverſe?—Probably, this may, in ſome caſes, depend on the nature of the ſoil—and in others it may be influenced by the peculiar economy of the plants that grow upon it.

The broad-leaved plantain * requires a ſoil of ſuch an unuſual degree of compactneſs, as ſeems hardly to be ever met with naturally;—on which account, this plant is ſcarcely ever ſeen but upon road-ſides, or other places where the ground has been

† This article, and the two following, ought to have been inſerted after VIII, p. 49, but they were accidentally omitted in that place.

* *Plantago major.*

artificially

artificially compreſſed by ſome weighty body paſſing frequently along its ſurface *: hence it has obtained the vulgar name of the *way-faring* (corruptly *wavering*) leaf. If this were an uſeful plant, it could not be propagated without the help of frequent rolling.

The common knot-graſs † poſſeſſes the ſame quality, in ſome meaſure, although not in ſuch an eminent degree as the former, as it is moſt frequently found in places that have been much trod upon, and afterwards allowed to be undiſturbed for ſome time; but it is alſo ſometimes met with in other places.

The ſame may be ſaid of the annual meadow-graſs ‡, which is the laſt plant

* I have been aſſured by a reſpectable perſon, that this plant is often met with in the common fields in ſome parts of the county of Durham. If ſo, the ſoil muſt be very uncommon, and deſerves to be accurately deſcribed. I never found it in the common fields in any place where I have been.

Since writing the above, I have ſeen in ſome fields the Plantago *media*, which I ſuppoſe has been miſtaken by the gentleman above-mentioned for the Plantago *major*.

† *Polygonum aviculare.* ‡ *Poa annua.*

that

that diſappears on the road-ſides, except the two above named; but it is alſo found in ſituations where the ground is not nearly ſo much compreſſed.

Many other plants that grow naturally upon ſuch ſoils as have an unuſual degree of firm compactneſs, can only be made to grow on more ſpungy fields by frequent rolling or preſſure of ſome ſort, which gives them artificially that firmneſs of texture they had not naturally.

Perennial red clover * is a plant of this ſort. It proſpers abundantly in firm, and what might almoſt be called, obdurate clayey ſoils; but, in others of a looſer texture, it is to be found only in the foot-paths that may accidentally be made through the fields. I have ſeen a foot-path of this ſort ſtored with this plant for many thouſand yards in length, while not a ſingle ſtalk of it could be found in the fields on either ſide.

The common white, or Dutch clover †, delights alſo in a firm ſoil, although it does not require ſuch a degree of compactneſs

* *Trifolium pratenſe.* † *Trifolium repens.*

as

as the former, and therefore proſpers n many fields without any artificial preſſure; but, on very ſpungy ſoils, Art muſt ſupply the deficiency of Nature, or it will not thrive.—Hence it happens, that, on ſoils of this ſort, white clover is frequently ſeen to flouriſh exceedingly on ſuch foot-paths as are moderately trod upon, while it only languiſhes, or hardly appears in other parts of the field.

On the contrary, the ſmall-leaved ſorrel * requires a ſoil of an exceedingly open and ſpungy texture, upon which alone it can be made to grow,—and is totally deſtroyed by any kind of weighty continued preſſure upon it; of which I had once an opportunity of being fully ſatisfied, by an experiment that deſerves to be recorded.

I had occaſion to lay down a ſmall ſpot of ground of this open ſpungy ſort, into graſs, by way of *lawn*. It was ſowed with white clover ſeeds;—but in ſome of the ſpungieſt, or, as the practical farmer would call it, *deafeſt* places, this ſmall-leaved ſorrel came up in ſuch abundance

* *Rumex acetoſella.*

as to choak the clover, ſo that hardly a ſingle plant of it could be ſeen.

Vexed at this diſappointment, I was extremely anxious to get this uſeleſs and unſightly plant eradicated:—But being at that time little acquainted with the nature of it myſelf, having come from a part of the country where it was hardly known,—I enquired of thoſe who had been accuſtomed with it from their infancy, how it might beſt be deſtroyed—but in vain.

A very little attention, however, made me ſoon obſerve, that this plant was never found but on ſoils that were exceedingly ſpungy and open; and therefore it ſeemed probable, that if theſe ſoils were rendered firm by preſſure, it might be thus deſtroyed.

And as rolling ſeemed to be the eaſieſt method of effecting this, I reſolved to try if it could be killed by this means.

With this view, a weighty ſtone-roller was brought to that part of the green where the ſorrel abounded moſt, which was drawn along it for twenty or thirty yards, and puſhed back again to its former

mer place regularly every morning,—keeping always exactly in the ſame tract.

In a few weeks the ſorrel there totally diſappeared; and the little alley formed by the roller in its courſe became covered with a cloſe pile of white clover; although the ground on each ſide of it ſtill abounded with the ſorrel, and hardly a ſtalk of clover appeared among it.

Old paſture-fields, in our northern climate, are frequently over-run with fog, conſiſting of various kinds of moſſes, which proſper abundantly during the winter-ſeaſon. I never yet obſerved any fog in the foot-paths through the fields that were moſt infeſted with it; which would ſeem to point out, that frequent preſſure might be an effectual mean of eradicating it. Every circumſtance that I have yet obſerved relating to the growth of this ſpecies of plants, ſeems to indicate that they proſper beſt on a ſpungy open ſoil. Moiſture and cold ſeem alſo to be favourable to them. They ſeem to grow even in winter more luxuriantly than in ſummer.

Spurrey*—or, as it is ſometimes called, *Yarr*,—is only found in the ſame ſort of ſpungy ſoils.—It is an annual plant, that is exceedingly pernicious to the crops of corn in thoſe countries where this kind of ground abounds. In firmer ſoils, the charlock †, and wild muſtard ‡, become the ſcourge of ſlovenly farmers in its ſtead.

When this ſpungy deaf ſoil is in a different ſtate of cultivation, it naturally produces the common dead (vulgo *dea*) nettle ‖. This eſpecially abounds where a ſoil of this ſort is trenched up, and the mould that has been long buried deep is expoſed to the air.

The cock-tail, or feather-graſs ¶, alſo requires an open and ſpungy mould, and cannot be made to thrive in any other.—Hence it happens, that in countries where this ſoil abounds, all the *manured* fields become naturally covered with this kind of graſs, when they are left to themſelves: For, as the ſeeds are light, they are carried

* *Spergula.*
‡ *Sinapis arvenſis.*
¶ *Holcus lanatus.*
† *Rhaphanus raphaniſtrum.*
‖ *Lamium.*

by

by the wind to a great diſtance, ſo that there is never want of ſeeds in abundance to ſtock all the fields; and where this graſs proſpers, it roots out all other ſorts.

Rye-graſs* will indeed make a ſtruggle with it. And when the ground is properly cleaned, and a little conſolidated by a good mode of culture,—if rye-graſs ſeeds are then ſowed in abundance, it will uſually get the better of the former.

This ſpecies of graſs (rye-graſs) which is now ſo univerſally cultivated in moſt parts of Scotland, requires a deep, open, looſe, deafiſh ſoil, tending to dampneſs, to bring it to full perfection. Wherever the feather-graſs naturally abounds, ſkilful culture with lime will make the rye-graſs flouriſh exceedingly. Nor do thoſe who have not ſeen a ſoil of the nature here treated of, know to what an amazing degree of luxuriance this plant may be reared. I know well that people who live in countries enjoying a much better ſoil in general than that which has been familiar to me for ſome time paſt, would be little diſpoſed to

* *Lolium perenne.*

give credit, ſhould I aſſure them that, on a ſoil of this ſort, I have meaſured ſeveral ſtalks of rye-graſs above ſix feet in length. —Yet this is a truth that could be atteſted by ſeveral reſpectable perſons who ſaw and meaſured theſe ſtalks, ſhould it be thought worth enquiring into*.

I forbear to mention the weight of hay I have cut from an acre of this ſort of ground at one cutting, as I am ſenſible it would appear incredible.

Yet, on this ſoil, no culture that I have ever ſeen tried, can produce an abundant crop of red clover; which requires a weightier, firmer, or ſharper ſoil.

The cock-tail, or feather-graſs, as has been ſaid, only appears in fields that have been *manured*.—In other fields, conſiſting of the ſame kind of ſoil, the ſmall bent-graſs† as naturally and univerſally eſtabliſhes itſelf.

* It is neceſſary to remark, that no kind of culture could bring rye-graſs to this amazing length, unleſs the ſeaſon was remarkably dry; for when the ſoil is rich, and the ſeaſon damp, ſuch a luxuriant crop would be rotted long before it could have attained any thing like maturity.

† *Agroſtis capillaris.*

The

Tab. 18.



Cocks tail or Feather Grass

The ſubject treated of in this Diſquiſition has been ſo little attended to, and ſo few practical farmers have had an opportunity of being intimately acquainted with ſoils differing ſo much from one another as thoſe that have furniſhed matter for theſe obſervations, that I am afraid I ſhall hardly here be perfectly underſtood. It is, however, extremely important, and deſerves to be farther elucidated.

Allow me here to draw one uſeful corollary that naturally ariſes from the conſideration of this ſubject, which I would beg to recommend to the attention of young and ſanguine improvers in agriculture, as it might tend to inſpire a little of that rational diffidence, the want of which has proved the ruin of thouſands who have ſet out in that career.

If large and extenſive diſtricts are to be found,—in which the ſoil, through almoſt every part of the one, differs very much from that in the other as to the abovementioned particulars, although they may perhaps agree very much in their general appearance, and the proportion of ſand and clay, and the other diſtinguiſhing particu-

lars of ſoils uſually taken notice of by writers on agriculture, or others, it muſt follow, that the man who is the beſt acquainted with the beſt mode of culture for the one of theſe countries, may be altogether unacquainted with the beſt method of treating a field, that he might think was very much of the ſame nature with his own in another diſtrict.

Hence it follows, that the travelling farmer ought to be cautious how he condemns ſome particular practices he may obſerve, that may to him appear extremely unreaſonable,—as circumſtances may ſometimes render one practice very proper, which, upon a ſoil of another ſort, would be attended with the moſt baneful conſequences.

Hence, likewiſe, it follows, that the young improver ought to be extremely cautious how he adopts the advice of ſuch farmers as may have been bred on a diſtrict at a great diſtance from his own, as he may ruin himſelf by purſuing a practice in the one caſe, that might be highly advantageous in the other. The hints of the ſenſible men in his neighbourhood ought to liſten-

ed

ed to with attention; but an obſerving eye, and an unremitting attention to ſuch facts as may occur to one's ſelf, are the only ſure guides. Till experience has accumulated wiſdom, ſafety conſiſts in cautious circumſpection alone.

If I ſpeak here with a more than ordinary degree of ſolicitude, it ariſes entirely from a full conviction of the miſchievous conſequences that often reſult from an oppoſite conduct, and a warm deſire to avert from others ſuch calamities as I have, in many inſtances, ſeen ariſe from it. My own extenſive experience in two very diſtant and diſſimilar parts of the country*, enables me to ſpeak with the greater certainty on this head.

As few who have always remained in one corner of the country, can have had an opportunity of perceiving the influence of particulars of this ſort in their full force, I ſhall beg leave to mention an anecdote relating to it that occurred to myſelf:

Some years after I had been in Aberdeenſhire, two very ſenſible farmers, from

* The writer was born near Edinburgh, in Mid-Lothian, and practiſed Agriculture there for ſeveral years before he removed to Aberdeenſhire.

the

the Lothians, came to viſit me in one ſeaſon, ſeparately.—It happened, that I was fallowing a field that year, of a ſoil of an exceedingly bad quality, which, in its external appearance, greatly reſembled ſome of the beſt fields that theſe gentlemen had been accuſtomed to ſee; and both of them, ſeparately, after walking over my farm, and examining the different fields with attention, pitched upon this as the very beſt field in my farm, although it was, in fact, by far the worſt they had ſeen.

One of theſe gentlemen had practiſed farming in his native place, with the greateſt ſucceſs, for upwards of fifty years; and the other, for more than forty.—They were both men much eſteemed for their knowledge and diſcretion; nor was there one in the county where they lived, that could have formed a juſter judgment of the value of any ſoil there, than they could have done.

A deciſion nearly ſimilar to this, was given afterwards, by a very ingenious and ſucceſsful farmer in Northumberland. The truth is, neither of them had ever

ſeen

ſeen a ſoil of the nature of that in queſtion; and it was no impeachment on their judgment, if they were unacquainted with its real qualities, and therefore reaſoned from analogy, that it would approach neareſt to the nature of thoſe ſoils that it moſt nearly reſembled.

XLI.

Some plants can be reared only upon ſoils that have been manured with one kind of manure, and the growth of others is chiefly promoted by other manures.—Wanted—A liſt of ſuch plants as have their growth chiefly promoted by any one ſort of manure, in preference to another.

Experience ſhows, that the common pea, whether white or grey, cannot be reared to perfection, in any field which has not been either naturally or artificially impregnated with ſome *calcareous* * mat-

* *Calcareous* is a general term, including all thoſe ſubſtances that might be converted into lime, if unmixed with any other extraneous matter.

ter.

ter.—Hence it happens, that peas are rarely cultivated univerſally as a field-crop, unleſs in thoſe parts of the country where either lime, or marle, or chalk, abound, or upon ſtrong clays. But on the ſea-coaſt, where ſhell-fiſh are often catched in abundance, and where the fields are manured with the ſhells of theſe mixed with dung, we meet with a few exceptions to this general rule.

It is pretty remarkable, that a ſoil which could hardly have brought one pea to perfection, although richly manured with dung †,—if it ſhall have been once limed, ſhall be capable of producing abundant crops of peas ever afterwards, if duly prepared in other reſpects.

Turnip, on the other hand, will grow in any ſoil, if it is manured with dung; —but lime does not promote its growth in ſuch a high degree.—Hence turnips are the firſt improving crop in a country deſtitute of lime, and peas in the other.

In countries where coal-foot is uſed as a manure in large quantities, the opinion

† In theſe caſes the pea ſeems to haulm, and uſually dies away after bloſſoming, without ripening the grain.

prevails,

prevails, that this manure deſtroys clover, while it greatly encourages the growth of rye-graſs. But I have had an opportunity of remarking, that this opinion is erroneous, although it is eaſy to account for the way in which it has come to be ſo univerſally adopted.

For ſoot, although it does not deſtroy clover, does not, in any ſenſible degree, promote the growth of that plant, when applied to the ground in any proportions. I have uſed ſoot as a top dreſſing for clover and rye-graſs, in all proportions, from one hundred buſhels per acre, to ſix hundred * ;—and I cannot ſay that ever I could perceive the clover upon theſe fields in the leaſt degree more luxuriant than in the places where no ſoot had been applied.

But the effects of this manure upon the growth of rye-graſs is amazing, and increaſes in proportion to the quantity, as far as my trials have gone.—Hence it happens, that, in fields dreſſed with ſoot, the rye-graſs ſo far overtops the clover, that it is not ſeen, and the whole crop *ſeems*

* The buſhel is not a common meaſure in Scotland: It is nearly the ſame with the pea or meal firlot.

to be rye-graſs, although, in fact, there is as much clover as if it had not been manured at all.

This is a very ſatisfactory proof of the influence of one manure in promoting the growth of a particular plant, in preference to that of another. There are, no doubt, many others that the farmer is at preſent ignorant of.—I ſhall ſuggeſt a few.

It conſtantly happens, that where a heap of ſoot has lain ſo long upon the ground as to deſtroy all the plants upon its ſurface, the firſt plant that appears afterwards is the common couch-graſs *.

It as univerſally happens, that the firſt plant that appears where a heap of common ſtable-dung has lain, is the common knot-graſs †.

Sain-foin thrives upon the thinneſt lime-ſtone-gravelly, or chalky ſoils, with great luxuriance, even where theſe are ſo poor as to afford a very ſcanty crop of other ſorts of graſs.

On much richer ſoils, that are not ſo highly impregnated with calcareous matter, that plant only languiſhes—on many

* *Triticum repens.* † *Polygonum aviculare.*

occaſions,

occaſions, it dies entirely.—Hence ſain-foin is a moſt valuable crop in chalky countries, —in others, it is juſtly thought of no value.

Lime ſeems to promote the growth of rye-graſs, in a higher degree than it does the growth of feather-graſs.—For, in fields that naturally abound with this laſt, and in which it even gets the better of rye-graſs when it is ſowed, if the ground be limed, the rye-graſs flouriſhes and deſtroys the other; and when that fails, it is ſucceeded by white clover, and the poa-graſſes, rather than by the feather-graſs.

Lime, or other calcareous matter, in the ſoil, ſeems alſo to be neceſſary for the production of wheat as of peas.—I once dreſſed a field for wheat, which had been limed for the firſt time ſome years before that; but it happened, that one of the ridges had been accidentally miſſed in the liming. It was a good crop in all other parts of the field; but not one ſtalk came the length of producing an ear of wheat, on that ridge which had not been limed. This was only a particular caſe; whether it would

would happen univerſally ſo or not, I cannot ſay.

Calcareous matters ſeem likewiſe to be peculiarly favourable for the production of barley, more ſo if in very large quantities than oats. I know a field that has been often manured with the ſhells of muſcles, &c. from a fiſhing town, which has carried good crops of bear *, almoſt without interminſion, for time immemorial. Sometimes, a part of it has been ſown with oats, but the crop extremely poor.

In the links at Sandſide, mentioned in Vol. I. *Eſſay on Quick-Lime*, Aph. III. § 41, which contains a very large proportion of calcareous matter, it has been found, by experience, that bear is the moſt profitable crop, and therefore no other crop is ever ſown upon it.—Quere, Is this the caſe with chalky ſoils?

On the contrary, oats, in general, ſeem to ſucceed better than any other kind of grain, on ſoils that have not been impreg-

* I am not ſo certain if *barley* would ſucceed upon ſuch ſoils, but I believe it would. Barley is diſtinguiſhed by having two rows of grain in the ear; *bear* has four or ſix rows, like wheat.

nated

nated with calcareous matter; for which reaſon, it would ſeem that *bear*, the only other culmiferous grain commonly cultivated on ſuch ſoils, is in general an unprofitable crop in countries where calcareous manures have not been uſed.

XLII.

There is reaſon to ſuſpect, that certain manures, which operate very powerfully upon ſome ſoils, do not promote the fertility of other ſoils in the ſmalleſt degree. It would ſurely be of great uſe to the practical farmer, to be made acquainted with theſe peculiarities.

In that part of the country where I was born, and firſt practiſed agriculture, no manure whatever produced ſuch a powerful and laſting effect, as horn-ſhavings.—Compared with the beſt yard (midding) dung, in the proportion of one ſtone of ſhavings to a cart-load * of dung, the

* Nothing is ſo indefinite, as a cart or waggon-load of things of this ſort, that are not commonly weighed

the effect of the firſt was, at the beginning, about equal; but, after the firſt crop, the horn-ſhavings were greatly ſuperior.

In Aberdeenſhire, I have found the effect extremely different.—A field of a good loamy ſoil, little different in appearance from thoſe on which I had formerly laid this manure with ſucceſs, was fallowed, and got a thorough dreſſing of horn-ſhavings.—It has ſince that time carried many crops of corn and graſs; but I have not been able to perceive a ſenſible effect of the manure on any of theſe crops. There has hardly been even a ſingle tuft of grain more buſhy and ſtrong in one part of the field than another;—a circumſtance that could hardly be avoided in uſing this manure, from the impoſſibility of ſpreading it ſo equally as is neceſſary.

Common ſalt is another manure, that I have tried almoſt with the ſame ſucceſs. It is well known, from numberleſs well-

or meaſured; therefore, it were to be wiſhed, that writers on agriculture would endeavour to to define them accurately.—The cart-load here meant, may be a quantity between thirty and thirty-ſix buſhels.

authenticated

authenticated experiments, that the moſt ordinary effect of this manure, is to promote the fertility of the ſoil in a very ſenſible degree for a ſhort time, when uſed in moderate quantities, and to check the vegetation of every kind of plant for a certain period, if employed in an over proportion*.

To try the effect of it upon my own particular ſoil, I fixed a pin in the middle of plot of graſs, in the month of May,—and round that, as a centre, deſcribed a circle of two yards diameter. Around the inner circumference of that circular line, I ſtrewed ſome common ſalt very thin, making it gradually thicker and thicker as it came towards the centre, till, at the pin itſelf, the ſalt lay near an inch thick upon the graſs.

The whole was ſoon diſſolved by the dews and rains, which were not copious at that ſeaſon. I looked with impatience to obſerve the effect of the experiment,

* I have reaſon to be now convinced, that this is rather a vulgar error, and that common ſalt is inefficacious as a manure, in moſt caſes, though in a few inſtances, perhaps, it may have been found to be otherwiſe.

but with aſtoniſhment obſerved, that the ſpot could not have been diſtinguiſhed from the reſt of the green, except by the pin, which was allowed to remain in its place three years.

I leave philoſophers to account for theſe uncommon phænomena.—Let the farmer, in the mean time, be taught from them to proceed with cautious diffidence, in the application of new and untried manures. For, it is not enough that he ſhould be *certain* they have been attended with the moſt beneficial effects, when tried by another:—Before he can be aſſured of ſucceſs, he himſelf ought to try their effects by a *fair* experiment on a ſmall ſcale, and be determined in his practice *at large* by the reſult of that experiment, if it has been clear and deciſive.

One other practical inference may be drawn from the above-mentioned facts, which might be of ſervice, if duly attended to.

Nothing is more common than to ſee writers on agriculture, who have lived in different parts of the country, accuſing one

one another of falſehood and miſrepreſentation; becauſe perhaps the one has recorded an experiment, with its reſult,—which has been tried by the other, with all imaginable fairneſs, who has found the reſult to be extremely different.—He repeats the experiment with all the neceſſary precautions, but ſtill the reſult is the ſame;—from whence he infers, that the firſt has told a falſehood, to ſupport ſome favourite theory.

Perhaps, I myſelf might have been accuſed of this in the preſent caſe, had not my own experience furniſhed both the reſults differing ſo much from one another. But if ſoils differ ſo much from one another, in ſome of their moſt eſſential qualities, while they are not ſenſibly different in their external appearance, ought we not to conclude, that the circumſtances which may affect the farmer are often ſo much concealed, as to authoriſe no one to dictate poſitively for another in all caſes.—Let us then proceed with ardour in our reſearches, but with unceaſing caution and diffidence, whenever we ex-

ceed the limits of our own proper experience.—A man who with confidence preſcribes to others what ſhould be done *in all caſes*, is moſt certainly unacquainted with the art he profeſſes, and muſt often fail.—Nor would this be ſo much to be regretted, did not thoſe who are ſo ſanguine in the opinion of their knowledge, uſually adviſe others to proceed upon ſuch a large ſcale, as muſt be attended with certain ruin to the undertakers, if it does not fully ſucceed.

Since the former editions of theſe Eſſays were printed, Gypſum has been recommended to the notice of the Britiſh farmer, as a moſt efficacious manure; and many experiments that have been made, chiefly in America, have been adduced as ſatisfactory evidence of this fact. Some experiments have, in conſequence of this, been made with it in England alſo, and, in moſt of theſe, it has been found to produce little or no effect. In a few caſes, here alſo, it has been found to be very efficacious.—From hence I conclude, that, like the manures above enumerated,

rated, it only operates powerfully on certain ſoils, or particular crops, and that theſe particular ſoils or crops have not, as yet, been aſcertained.

Thus it appears, that in whatever light we view this ſubject, we meet with much uncertainty and doubt. Were we to proceed forward, and conſider the nature and diſtinguiſhing qualities of different ſoils; —the ſeveral changes that may be produced upon theſe by culture, or other circumſtances;—the properties of different manures, and the effects that theſe, in various circumſtances, produce upon the different ſoils;—the mode of cultivating each variety of plants, ſo as to bring them to their greateſt perfection;—the effects of theſe upon the ſoil, and the conſequences of all the different alternations of crops, with all the variety of collateral circumſtances that branch out from theſe capital

heads;—we would find the ſame uncertainty prevail throughout the whole, as in the ſmall part that has juſt now engaged our attention; and might probably meet with a ſtill greater variety of dogmatic aſſertions and ill-founded opinions, maintained with a yet greater degree of obſtinacy, than the few that we have had occaſion to reprehend. But it was judged proper here to deſiſt.—If, in the foregoing pages, it ſhould be imagined that the Writer hath, on ſome occaſions, aſſumed a more deciſive tone than may ſeem to be conſiſtent with a work of this nature, he hopes the candid Reader will be more diſpoſed to aſcribe it to that involuntary ardour which naturally ariſes in the mind when it contemplates objects that it deems of great importance to numbers of mankind, and the conſequent eager deſire it feels to correct thoſe defects that appear to interrupt, in a high degree, the general good of ſociety, than to any ſiniſter cauſe. His only aim has been to endeavour to attain to the knowledge of uſeful truths, with a view to promote, to the utmoſt of his

his power, the general happineſs of mankind:—And as the errors into which he may have fallen, are involuntary, he will think himſelf obliged to thoſe who may point them out with candour, ſo as to enable him to correct them, if ever theſe ſheets ſhould come to another impreſſion.

DISQUISITIONS

ON THE

DIFFERENT VARIETIES

OF

WOOL-BEARING ANIMALS, &c.

ADVERTISEMENT.

THIS Eſſay was written for the Bath Society, and publiſhed in the Eighth Volume of their Memoirs, from whence it is reprinted, with conſiderable Additions.

Diſquiſitions concerning the different Varieties of WOOL-BEARING ANIMALS, *and other Particulars connected with that Subject. Written in the Year* 1794.

IT has been hitherto, in general, believed that the ſheep is univerſally a wool-bearing animal, and that there is no other creature upon the globe that carries *wool*, in the ſtrict and proper ſenſe of the word, but ſheep alone. But, there is now reaſon to doubt, if either of theſe propoſitions be ſtrictly true.

Among other good effects that will reſult from the reſearches of the Society inſtituted for the improvement of Britiſh wool, we have already become acquainted with the nature and diſtinguiſhing peculiarities of a great diverſity of *varieties* of ſheep, and other animals, that were not before known in Europe. It is to that ſource we owe an account of the different varieties or breeds of ſheep, that have been diſcovered in the Ruſſian dominions, by the learned

Dr. Pallas, ſo well known in the Republic of Letters, by his many ingenious Works in Natural Hiſtory, and other branches of Science; a tranſlation of which, into Engliſh, was lately publiſhed in London. By the ſame means, we have become now perfectly well acquainted with the Spaniſh ſheep, and its diſtinguiſhable peculiarities; as well as with a great many other varieties of the ſheep from many parts of Aſia, differing from each other in a much greater degree than ever we ſuſpected before, in Europe, was poſſible.

It would take up too much of the time of the Society, were I to enumerate, in detail, the individual varieties that might be ſpecified. I ſhall here only briefly ſtate, that (in as far as I yet know) all of them may be reduced to one or other of the three following claſſes, or the mongrel breeds reſulting from an intermixture with each other, viz.

CLASS FIRST.

WOOL-BEARING SHEEP, *properly ſo called.*

THIS claſs comprehends a great many of the varieties of ſheep found in Britain, and

and throughout the greateſt part of Europe. Sheep referrible to this claſs, are alſo found in Aſiatic Ruſſia, in Africa, at the Cape of Good-Hope, and in various parts of India.

Among moſt of the varieties of this claſs, unleſs where it has been purified by a careful ſelection, continued for many years, there is found intermixed with the wool, in different proportions, a kind of ſhort, opaque, brittle, unelaſtic hair, uſually of a dead white or chalky-colour, which is well known to manufacturers, and is eaſily diſtinguiſhable from other hair. It is known by the name of *ſtitchel*-hair in ſome places. In other places, it is called *kemps*; and, probably, it has many other local names, with which I am unacquainted. This kind of hair does not looſen from the ſkin, at the ſame time with the wool, and may thus be, in ſome meaſure, ſeparated from it among ſome of the purer wool-bearing breeds. I have reaſon to believe, though I am not abſolutely certain of the fact, that this kind of hair is peculiar to the ſheep of this claſs, and is not to be found in either of the other two claſſes, unleſs, where they participate with this one in a mongrel breed.

CLASS SECOND.

HAIR-BEARING SHEEP,

Whoſe pile is long in the ſtaple, and of a quality that admits of being employed in many manufactures, nearly for the ſame purpoſes as wool.

SHEEP referable to this claſs, have been uſually confounded with the former, inſomuch that they have almoſt entirely eſcaped the notice of naturaliſts and others. The pure breeds of this ſort are ſcarcely any where to be found among *manufacturing* nations; but they are reared, in preference to the wool-bearing ſort, among the Ruſſians, and other northern nations, where the ſkins of ſheep, with the fleece on, are uſed for clothing, as they are found to be much more durable than thoſe which carry wool properly ſo called. There are, however, a great many varieties among the breeds of ſheep in this country, which are mongrels between this claſs and the former. Here, however, as in moſt caſes, where accurate diſtinctions are wanted, although it ſeems eaſy at firſt ſight to diſtinguiſh wool from hair, by the criſpineſs of the former, in conſequence

ſequence of which, it ſhrinks in length, ſo as to require to be ſtretched out before it can be accurately meaſured, which is not the caſe with hair in general, yet this is found to afford a rule too vague for accurate diſcrimination. The following characteriſtics, may, I think, be ſufficiently accurate to be relied on:

1*ſt*, Wool, like the body-hair of moſt animals, is an annual production, ſpringing from the ſkin of an animal. It conſiſts of a great number of diſtinct filaments, that grow more or leſs cloſe to one another in different breeds; but which ſpring out of the ſkin about the ſame time, like corn from a cultivated field; advance nearly with an equal rapidity, till they have attained their full perfection of growth; they then looſen from the ſkin nearly at the ſame period (when a new crop ſprings up below) and fall off in large parcels all at once, ſo as to leave the body, at one period, nearly bare, or covered only with a ſhort coat of wool. Hairs, on the other hand, (ſuch of them as are of an annual growth) only) looſen from the ſkin ſeparately, and at remote periods from each other, and, unleſs where they are accidentally matted together,

ſo as to entangle the looſe hairs among thoſe that are faſt; they fall off individually one by one, and are ſucceeded by other individual hairs to ſupply their place. And as this proceſs goes on through the greateſt part of the year, the length of the coat of *hair*-bearing animals, if left to themſelves, is not near ſo different, at different ſeaſons of the year, as that of wool-bearing animals.

Hair, indeed, as well as wool, ſeems to part from the animal more freely during the ſpring and earlier part of the ſummer than in the autumn and winter ſeaſon; but as the hairs looſen individually, and fall off ſeparately, and as freſh hairs ſeem to ſpring out to ſupply the place of thoſe which have fallen off the moment they are diſplaced, as takes place with regard to the ſhedding of teeth among young animals, it muſt neceſſarily happen, that the pile, or, as we call it, the fur of ſoft-haired animals, will be thinner, and conſequently leſs abundant in ſummer than in winter; a fact that has been often remarked in regard to hares, rabbits, and other fur-bearing animals, but which has not, to my knowledge, been hitherto fully adverted to. This has been,

been, in general, attributed to the effect of heat, phyſically conſidered; and hence it has been inferred, that all fur-bearing animals would carry a thin coat of fur in hot climates univerſally; a fact that is clearly contradicted by experience. This phænomenon ſeems to be connected rather with the revolutions of the ſeaſons, like the incubation of birds, and the ſpringing up of certain plants and flowers, at particular ſeaſons of the year. The fleece appears indeed to be very thin during the warm ſeaſon, but this is not ſo much becauſe there are fewer hairs in it, but becauſe many of theſe hairs are then ſo ſhort, as to contribute little to the weight of the pile; whereas, in winter, theſe ſhort hairs have become longer, and thus thicken the pile by growing up among the longer hairs that have adhered to the ſkin during the whole of the ſummer ſeaſon. This hypotheſis ſeems to be ſtrongly confirmed by a fact reſpecting furs that has not hitherto been much adverted to, which, I have reaſon to believe, prevails very univerſally, viz. that if a lock of the hair taken from any

kind of fur, be held by the points and combed the reverſe way, a much greater proportion of it would always be combed out, than ever happens with regard to any kind of *wool* if treated after the ſame manner. Hence, I am, at preſent, inclined to infer, that this great diverſity in the length of the different filaments in the ſame pile, is a diſtinguiſhing characteriſtic between hair and wool, let the fineneſs of each be what it may. I ſpeak at preſent however only hypothetically, for I have not had opportunities ſufficient to obſerve theſe facts to enable me to ſpeak with *certainty*.

2*dly*, A filament of wool has no determinate proportional thickneſs in its different parts, but is variable in all poſſible proportions. Sometimes, the root-end is thicker than the points; ſometimes, and indeed for the moſt part, in this climate, the points are thicker than the roots; ſometimes, the middle is thicker than either end; ſometimes, it is quite the reverſe; at ſome times, the variation of thickneſs is great, and extremely perceptible; at other times, the filament is of an equal thickneſs throughout

throughout all its parts. Theſe variations in regard to the thickneſs of the different parts of a filament of wool, have been proved, by experiment, to depend upon the degree of heat or cold that has acted upon the animal at the time the filament was in its ſtate of growth; that part of it which grew during the influence of a continuation of warm weather, being always thicker than that part of it which grew during cold weather; the difference of ſize varying with the difference of temperature, in all proportions, the ſize of the filament continuing the ſame only where the animal has been kept in an equal temperature of heat during the whole period of its growth.

Hairs, on the contrary, ſeem to have always a determinate ſhape and relative proportion, under whatever circumſtances they ſhall have been produced—one ſpecies of hairs being of one ſhape and proportion, and another kind of another ſhape. In general (and with no exception, that I know of) the body-hairs of animals are thickeſt at the root, and taper ſenſibly to-

wards the point, which is directly the reverſe with all wool of grown ſheep in this country *.

By

* I find reaſon to proceed with great caution in this Diſquiſition, becauſe I have not had opportunities of obſerving facts with the neceſſary preciſion to enable me to deduce general concluſions with the certainty I wiſh to do. The obſervation in the text is juſt, as far as reſpects the common breeds of animals that are reared in this country; but ſince the above was written, I have ſeen reaſon to believe, that there is a much greater diverſity in this reſpect, than I ſuſpected at the time that paper was written. Before that time, I had often remarked, that the kind of hair called *kemps*, which grows among the wool of our ſheep, is always thicker at the roots than the points; from whence I naturally inferred, that all kinds of hair that grows up among wool, was always of the ſame ſort. I now find that this is not the caſe; for the native ſheep of Jamaica, which carry a conſiderable proportion of very fine wool, bear, at the ſame time, a kind of hair, intermixed among that wool, which is totally different from the *kemps* among our wool, in many reſpects; in particular, it is *invariably* much thicker at the points; that is to ſay, coarſer, of greater diameter, taking each hair individually, than at the roots. It is alſo uniformly of a greater length than the wool, ſo as to cover that wool over the whole body, which is directly the reverſe with kemps. Each of theſe hairs of the Jamaica ſheep, is marked from the point downwards with tranſverſe rings, of ſhort diameter, that

are

By theſe two criteria, wool may be, in general, diſtinguiſhed from hair, where

are alternately black and white, ſo as to give it very much the external appearance of badger's hair.

I find reaſon, alſo, to be ſatisfied, that the form and external appearance of the hairs of different animals differ greatly from each other. Among thoſe which have fallen under my own obſervation, the hairs of the *muſk* animal (a fine ſkin of which I ſaw in the poſſeſſion of Mr. FORSYTH, at Kenſington) is, perhaps, the moſt uncommon I have ſeen. Theſe hairs are ſtiff, and approach, in part, to the nature of quills, though they are much ſofter and more flexible than thoſe of the hedge-hog or porcupine. They draw to a narrow point, and are much thicker at the root. Each hair has the appearance of being a flaccid tube, and is a little twiſted, ſomewhat in a ſpiral form, ſo as to have a ſlight appearance of a rope.

Hairs differ alſo from each other in reſpect to the manner in which they are placed into the ſkin. The moſt beautiful variety of this kind I have ſeen, is that of the great polar or white bear, the hairs of which are placed all over the ſkin in tufts, with bare places between, exactly like the briſtles in a clothes-bruſh. Theſe are placed in rows with the moſt perfect regularity, like cabbages planted with the utmoſt preciſion in a garden, ſo that when the ſkin is folded back, either acroſs the body, or lengthwiſe, or diagonally, the ſkin is diſcovered clear between them, in regular rows. Other variations, I have no doubt, take place in regard this particular, that have never fallen within the ſphere of my obſervation.

they are entirely uncompounded, without difficulty. But as all the different varieties of ſheep breed readily with each other, and produce a mongrel race, in which the diſcriminative qualities of the parents are blended together, it neceſſarily follows, that where the mongrel breed is produced between a wool and a hair-bearing race, it will afford a fleece that can neither be diſtinctly characteriſed as hair nor as wool, but will participate of the qualities of both. If this mongrel ſhall mix again with a wool-bearing race, the fleece of the deſcendant will approach nearer to wool; if with a hair-bearing race, nearer to hair; and ſo on, they may be blended *in infinitum*. By this means, the diſtinctive characteriſtics of hair and wool may be, in time, entirely loſt, and fleeces be produced that are neither the one nor the other. This ſeems to be preciſely the caſe with moſt of the breeds of ſheep in Britain at the preſent day; and we muſt go, in ſome meaſure, out of the iſland, to recover the genuine breeds; but which, if attended to, will enable us to account for various phenomena that have puzzled many intelligent men.

The

The moſt uncontaminated breed of wool-bearing ſheep I have as yet met with, is, the Shetland breed; and there the wool riſes ſo entirely from the ſkin, about the beginning of June, as to render the ſhearing of their ſheep unneceſſary. It may be plucked off at that time without occaſioning to the animal the ſmalleſt uneaſineſs, as it will fall off of itſelf, if not taken away; the young fleece ſpringing up beneath it like a young ſhorn fleece. The ſame phenomenon is obſervable in all the breeds of ſheep in the northern parts of Scotland, where the proper time for ſhearing is always indicated by nature, and muſt be attended to. For although theſe ſheep have got ſuch an intermixture with the hair-bearing race as not to allow it to looſen quite ſo entirely as that of the Shetland breed; yet it is looſened to ſuch a degree, that if the ſheep are ſhorn too ſoon, and before the wool is properly *riſen*, as the phraſe there is, it is difficult to paſs the ſheers through it, and the ſkin is left very bare, the young wool not being yet grown. On the other hand, if that ſhearing be too long delayed, the young wool has grown to ſuch a length as to entangle

tangle the ſheers in it, ſo as to cut off a part of it, which is both troubleſome to the ſheep-ſhearer, and when it is thus ſhorn, the wool is uſeleſs. But when the wool is riſen to its proper ſtate, the ſheers ſlide over the young fleece, and cut off the few remaining hairs of the old fleece with the utmoſt eaſe, ſo that the ſheep diſcovers no marks of being new ſhorn, and looks like a lamb in that reſpect.

It would ſeem that there is a much greater proportion of the hair-bearing race among the breeds of ſheep in the ſouthern parts of the iſland; for I obſerve that Mr. Lisle, who lived in Hampſhire, and was an attentive obſerver, though he had heard of this young wool, under the name of *rowety*-wool, had never ſeen it. It is well known in Scotland, that this phenomenon does not depend on the leanneſs of wool-bearing ſheep, as he ſuppoſes, but takes place among thoſe that are in the beſt condition ſooneſt*.

The

* I find that moſt people have an idea, that the phenomenon of young wool riſing at the bottom of the fleece of ſheep before ſhearing, and all the peculiarities here mentioned, are entirely occaſioned by a check the ſheep have received from a want of food in the winter:

to

The pureſt of the hair-bearing ſheep I have ſeen, were ſome fleeces that were ſent to me from the Baltic, which were as evidently hair as the fleece of a goat, though finer and ſofter. The Ruſſians prefer this breed of ſheep, becauſe the fleece, when at its full length, adheres ſo much more firmly to the ſkin than wool does, that it laſts much longer when made into clothing than the other; for which reaſon, a wool-bearing ſheep among them is a great rarity.

Among the ſheep referable to this claſs, there are ſome breeds which afford a ſmall quantity of a very fine ſoft wool underneath the hair, of which the *Argali* of PALLAS

to this opinion I cannot accede, for the reaſon after-mentioned; though I know well that when a ſheep has ſuſtained a great ſtreſs of weather during winter, it does happen that the old fleece ſometimes ſeparates prematurely from the ſkin; but in that caſe the fleece becomes matted, and aſſumes an appearance extremely different from the natural healthy riſing above alluded to. In this laſt caſe, the wool does not ſeparate in the early part of the ſpring as where it is matted; but it adheres to it till the month of June at leaſt, and even then it looſens in a gradual manner, as the young fleece begins to riſe, and always ſooneſt upon the ſheep in the beſt condition; which, on that account, are often ſhorn ten days or a fortnight ſooner than the others.

is a noted example; but the greateſt part of the varieties we know have none of this. I have never heard of an unadulterated breed of this kind that had ſtitchel-hair among the fleece, though it is often found among the mongrel breeds between this and the former. Neither have I ever heard of a finer kind of wool being found at the bottom of the fleece of any of the wool-bearing breeds.

The very long wool of Lincolnſhire, which I have examined with care, appears to be from a mongrel race, very nearly allied to this claſs, with a ſmall blend of wool in it; and is of a harder feel than ſome of the pure hairy breeds, ſome of which are tolerably fine and ſoft, and very tough and durable in work, and have a fine gloſſy ſilky-like appearance. I have had wool, of the genuine wool-bearing breed of ſheep, that meaſured 17½ inches in length, which was extremely fine and ſoft, and nothing reſembling that haſky kind of hair-wool in Lincolnſhire.

CLASS THIRD.

SHEEP *that carry* SHORT THICK HAIR, *which in no reſpect reſembles wool of any ſort.*

OF this variety of ſheep-ſpecies we have no breeds in Britain; but that ſuch ſheep do exiſt, we have the cleareſt proofs. So little are they known, indeed, in this country, and ſo little is it ſuſpected here that ſuch an animal exiſts, that I was not a little ſurpriſed when I firſt ſaw one of this kind, and therefore examined it with a good deal of attention. This creature was on board a Daniſh Eaſt-India ſhip that put into Leith roads laſt ſeaſon [1794] and was bought, with ſeveral others of the ſame ſort, as they aſſured me, in the iſland of Madagaſcar. It was a ram of a good ſize, and was covered all over with a thick coat of ſhort thick ſtiff hairs, like thoſe of a horſe, but rather ſtronger in the pile, and ſhorter. The colour was a fine brown, The hair lay cloſe to the ſkin, and was very ſmooth and gloſſy, like the coat of a well-

dreſſed horſe, in fine order. They aſſured me, it had never had any other covering on it but what I ſaw, and that all his companions were of the ſame ſort.

This fact threw the ſubject of ſheep into a new point of view, that I had never adverted to before; and enabled me to account for ſome phenomena reſpecting ſheep, that had puzzled me a good deal. In the account that Dr. PALLAS had given of the famous Boucharian lamb-ſkin furs, ſome of the peculiarities he mentioned appeared to me to be incompatible with the nature of wool, and much more nearly allied to that of hair. But, as I had no idea that any ſheep of this kind exiſted, I was perplexed about it, and could come to no decided opinion reſpecting it. Since then, I have had an opportunity of ſeeing a night-gown, lined with Boucharian lamb-ſkin fur, which, I find, conſiſts of nothing elſe but *hair*, without the ſmalleſt intermixture of wool. It is ſomewhat longer than the Madagaſcar ſheep's hair, ſofter, and gently waved by means of a little curl upon it, which gives to it the beautiful foliage-like appearance for which theſe furs

have

have been ſo much valued; ſo that this forms a ſecond variety of this claſs of ſheep.

While I am juſt writing, I have received a letter from Sir JOSEPH BANKS, bart. on this ſubject; who ſays, "I once imported "three ſheep from Spain, which were as "ſleek and ſmooth as a horſe, and never, at "any ſeaſon, ſhowed the leaſt ſign of wool "or down in the moſt minute quantity." The fact, then, is inconteſtibly eſtabliſhed, that ſheep, which produce as little wool as horſes do, exiſt; and, perhaps, they are much more common than we at preſent ſuſpect. The Boucharian breed of ſheep is kept in immenſe flocks, over the extenſive plains of Great Tartary. I have been alſo aſſured, of late, that they have a breed of this kind of ſheep in the iſland of Antigua.

And laſt winter [1796-7] I ſaw a ſheep of this ſort, in a field near Dulwich, in Kent, within three miles of the metropolis, feeding quietly, and very tame—ſo as to ſuffer me to come quite cloſe up to it, to examine the hair. Where it had come from, I could not learn; but, it ſeemed to be

be a different variety from the Madagaſcar ſheep I had formerly ſeen. In colour, in particular, it was very different; the Madagaſcar ſheep being of a clear gloſſy brown, this one white, with a few dark-coloured ſpots upon it. So that this kind of wooleſs ſheep, ſeems to be by no means rare. I am aſſured, that the greater part of the ſheep in India are of this ſort, though there are alſo many of the wool-bearing race to be found in thoſe regions.

A natural inference from theſe facts is, that ſince we find one claſs of animals, ſome breeds of which produce wool, and other breeds produce nothing but ſhort hair, in no reſpects reſembling wool, may not a ſimilar diverſity take place in regard to other claſſes of animals? And although it ſhould happen that the inhabitants of one country ſhould be poſſeſſed only of the hair-bearing breed of creatures of that ſort, like the Madagaſcareſe ſheep, and know nothing of any other ſort; yet, there is no reaſon, from that circumſtance, for them to conclude, that no other breed of that kind of creature exiſts. This train of reaſoning being ſuggeſted, it rouſed the mind to attend

tend to facts; and I had ſoon occaſion to obſerve, that ſo far from having reaſon to be ſurpriſed at finding breeds of ſheep ſo much diverſified, as above ſet forth, there were innumerable well-known facts, which, if adverted to, would have led to the ſame concluſion.

For example: there is no man in Britain, who has not had occaſion to obſerve as great a diverſity in regard to the coat of dogs as of ſheep.

1*ſt*, The ſmooth-haired dog; examples of which, are, the Italian greyhound, and Spaniſh pointer.

2*dly*, The long-haired, ſoft, wavy-fleeced dog; as in the Engliſh ſpaniel, and Newfoundland dog.

3*dly*, The wool-bearing dog, or, at leaſt, the dog that carries a coat, which for cloſeneſs, length, and ſoftneſs, may be compared to wool, is very common. Some of them carrying an immenſe quantity of hair, of a long lank quality, and others carrying it of a cloſe curled texture, very like the fleece of many kinds of ſheep. The fleece of theſe creatures muſt be ſhorn at the beginning of ſummer, to let them be com-

fortably cool; and I have ſeen it ſpun and worked into ſtockings, which could not be diſtinguiſhed from wool.

I have in my poſſeſſion at preſent, ſome of the hair of a dog of this kind, that I found in London, belonging to a black-ſmith, which is ſoft as wool, and which I find has among it a few hairs reſembling, *in every reſpect*, that kind of hair called *kemps*, which has been hitherto deemed quite peculiar to the ſheep kind.

N.B. There is a kind of fox, in Siberia, that carries a fur exactly like *wool*, as I have been aſſured by a gentleman who lived long there. The Ruſſian name of it, being literally tranſlated, is, *the little dog's fur*.

The ſame diverſity is obſervable in regard to goats: as,

1*ſt*, The ſmooth ſhort-haired goat, very common.

2*dly*, The long-haired ſhaggy goat, very common alſo. The hair of this kind of goat is uſually very coarſe; but underneath it, as in the long-haired breeds of ſheep, there is a quantity of wool, of an exceedingly fine quality, which may be ſeparated from

from it about the month of June, by combing. From this circumſtance, it would ſeem that this wool, like the *wool* of the ſheep, riſes from the ſkin, and becomes looſened from it, while the hair ſtill adheres firmly to it. Of the fineneſs of the quality of this kind of wool, you may ſatisfy yourſelf, by examining the ſmall ſhred of a little web that will accompany this, of that kind of wool, which was manufactured under my eye here laſt ſummer. There was as much of it, as made three full-ſized ſhawls and a waiſtcoat-piece, from whence the pattern ſent was cut. The chain is ſilk, as there was too little materials to make it of wool. Theſe ſhawls were compared with the fineſt India ſhawls that could be found in this place, and were deemed ſofter than any of them. The ſhawl-wool in India is preciſely of the ſame nature, and is obtained from the Thibet goat. I have examined ſome Thibet goats in this country, and find their hair rather longer and coarſer than the common European goat, from which it differs little. If it was a fair ſpecimen I ſaw, the *wool* was rather

leſs abundant on theſe than on the common goat.

3*dly*, The wool-bearing goat, for ſo I think the Angora goat may be called, whoſe hair is as fine, as ſoft, and as fit for work, as almoſt any wool; but whether it *riſes* like wool, or is in this reſpect like hair, I have had no opportunity of obſerving. A ſpecimen of Angora goats-hair, produced in Britain, will accompany this.

Whether there will ever be diſcovered the ſame diverſity of hogs, I cannot tell; but we already are acquainted, in Europe, with ſomething analogous to the two firſt-mentioned breeds of ſheep, viz.

1*ſt*, The ſmooth ſhort-haired Chineſe breed. The Jamaica breed of hogs belongs alſo to this claſs.

2*dly*, The long-haired breed, having wool under its long briſtles; of this kind, is the ſmall breed of hogs found in Orkney and the Shetland Iſles. Its briſtles are very long and ſhagged, and under them is found a very abundant quantity of wool, which is ſoft; but its peculiar qualities have not been as yet ſufficiently inveſtigated. I have hitherto

hitherto heard of no breed of hogs that carries wool only.

Hence, it appears, that the diverſity of animals that carry *wool*, is much greater than has hitherto been in general ſuſpected; nor can we at preſent ſay, with any degree of certainty, that there may not ſtill exiſt, in ſome corner of the globe, one or more of every ſpecies of domeſtic animals we are now in the cuſtom of rearing, and that do not carry wool with us, which may alſo carry wool, as well as ſome varieties of the ſheep. And ſince it is well known, that the inhabitants of Europe have derived great advantages from ſelecting the *wool*-bearing breeds of *ſheep*, and rearing them in place of the ſmooth-haired ſort; it is equally certain, that, could we diſcover any varieties of the other domeſtic animals of the ſmooth-haired kinds, that we have been accuſtomed to rear, which ſhould afford *wool* as the ſheep does, the benefit we might derive from ſubſtituting theſe wool-bearing breeds, inſtead of thoſe hairy ſorts we now propagate, would be very great, if their qualities in other reſpects be nearly the ſame.

Of all the varieties of domeſtic animals we have been accuſtomed to rear in Europe, next to the ſheep, the bullock is the moſt valuable. We, it is true, like the inhabitants of Madagaſcar with regard to ſheep, have been hitherto in the cuſtom of rearing the ſmooth-haired bullock only; and though, perhaps, like the inhabitants of Madagaſcar, we may have accidentally heard that there are ſome varieties of this claſs of animals that carry ſomething like wool, in other parts of the world; yet as theſe have never come to our door, and preſented themſelves to us, we either doubt if ſuch animals do exiſt, or conclude they would not thrive with us, and therefore ſit ſtill, contented with what we have, without making any efforts to better ourſelves. Is it not a well known fact, that we have continued for more than a hundred years paſt to import wool from Spain in great quantities every year, without ever once attempting to rear the breed of ſheep that produced it, though they were in a manner at our door? And is it not alſo known, that inſtead of making a fair experiment to aſcertain

certain with preciſion whether that wool could be produced here or not, writers have been ſquabbling with each other about the poſſibility of a thing which could never be proved *pro* or *con* by reaſoning, but by fair experiment only? And is it not alſo a fact, that although it be now proved to demonſtration, by repeated experiments, that the wool of ſheep brought from Spain, does not degenerate in Britain, there has been, till this hour, no attempt made to obtain a ſingle individual of the *fineſt* breed of ſheep from Spain? And is it not alſo a fact, that becauſe thoſe ſheep that have been brought over from Spain, at random, have not been ſo fine in the carcaſe as ſome of the ſelected and improved breeds of ſheep in Britain, that different perſons are ſtill diſputing about the poſſibility of having ſheep with a good carcaſe from Spain; as if a fact of this ſort could be aſcertained without accurate trial and experiment? Thus do we ſit in our elbow-chairs, and argue, without data, till we reaſon ourſelves into indolence and inattention, that make us remain contented with the dregs only of what

might eaſily be within our reach. To men in theſe circumſtances the words of the poet may be applied:

O leaden-hearted men, to be in love with death!

It is moſt certain, that the perſon who ventures to rouſe the attention of men to the inveſtigation of facts which they have not been accuſtomed to take notice of, muſt inevitably expoſe himſelf to the ſneer of ignorance; but that is of little conſequence, if it ſhould chance to throw a ſingle ray of light upon a ſubject that has been hitherto involved in darkneſs.

That there is nearly an equal diverſity of breeds of cattle as of ſheep, ſcarcely admits of a doubt; of which the following facts are proofs:

1*ſt*, The ſhort ſmooth-haired breeds. Of theſe, the ſhorteſt I have ſeen, is a bull, of the *Zebu* kind, that was lately exhibited in Edinburgh, as a ſhow. His hair did not exceed half an inch in length, and was very cloſe, firm, and elaſtic. There are many breeds of cattle in Britain, the Holderneſſe in particular, the hair of which is ſhort and very ſmooth.

2*dly*,

2*dly*, The long ſoft wavy hairy breeds. Of theſe the Lancaſhire cattle are are a good example; and many of the Highland breeds, ſome of which have manes like horſes.

3*dly*, The long ſoft wool-like bearing breed, of which the buffaloe, or rather biſon, of Louiſiania, is the chief. The hair of this animal is ſaid to reſemble clothing wool, in length, in thickneſs, and in cloſeneſs; a ſmall ſpecimen of this wool, is incloſed, which I received from Sir Joſeph Banks, bart. But as the creature has never yet been domeſticated, or ſubjected to particular obſervation, by men whoſe judgment could be relied upon, our notions of it are but very imperfect. I do not hear that there are any long hairs upon this breed of cattle.

4*thly*, The long-haired wool-bearing breeds. Belonging to this claſs there are three varieties obſcurely known, viz.

1*ſt*, The *Sarluc*, by ſome naturaliſts called the grunting ox, an animal of the Southern Tartary, which is not yet ſufficiently known. The fleece of this creature

is

is ſaid to be thick and long, falling down below its knees, and of a very fine quality.

2*dly*, The Chittigong cow, of the higher Hindoſtan, which is deſcribed nearly in the ſame terms.—Its hair, or wool, is much eſteemed by the natives, and is applied by them to various purpoſes.

3*dly*, The Muſk ox, of Hudſon's-Bay. This animal is much better known to me than the former, as I had the deſcription from a gentleman in Edinburgh who lived many years in Hudſon's-Bay, and who had ſeen thouſands of them, dead and alive. The whole body of this creature, which is rather leſs than a middle-ſized ox with us, is covered over with a very cloſe fleece of long, ſoft, flexible hair, of a fine quality, which might be employed in manufactures for many of the ſame purpoſes as wool. Beneath that hair, and towards its roots, lies another coat of exceedingly fine wool, which could be applied in fabrics of the fineſt quality. It has been ſpun and worked into gloves and ſtockings, which are ſaid to be as ſoft as ſilk. The buffaloe-wool incloſed, I ſhowed to the gentleman, who

ſaid

ſaid it was nothing like ſo fine as that of the muſk-ox.

The fleſh of this kind of ox is very fine, unleſs at the rutting ſeaſon, when it acquires a muſky flavour, from whence its name. Herds of many thouſands of them are to be found up the country, among the Eſquimaux, but none of them have ever yet been domeſticated. They do not ſeem to be either ſo wild or ſo ferocious as the wild breed of European cattle that are ſtill kept in Whittingham-park, Northumberland.

To ſhow what practical uſes may be derived from theſe facts, I ſhall beg leave to ſubjoin a few farther obſervations on ſubjects connected with this, that have reſulted, in ſome meaſure, from the enquiries which have been ſet on foot by the wool ſociety:

1*ſt*, It is now aſcertained, that all the varieties of ſheep yet known do readily intercopulate with each other, and that the progeny is a prolific animal, capable of continuing the ſpecies; but that in reſpect to its characteriſtic qualities, it is of a *mongrel* race, participating nearly alike of the qualities

qualities of both its parents. And as theſe mongrel breeds may be intermixed with other varieties *in infinitum*, it may in many caſes happen, that new mongrels may be produced, in which the diſtinguiſhing peculiarities of the original breeds may be blended in all poſſible proportions, and loſt.

In like manner, the varieties of dogs may be blended and loſt, if no care be taken to preſerve them; and ſo of cattle: At leaſt, we know for certain, that the different European breeds may be ſo; and we have reaſon to believe, that the buffaloe, the zebu, and the other varieties that have not yet been tried in Europe, may be blended together.

2*dly*, The effects of climate and food, in altering the qualities of the *breed*, are found to be nothing; though the effect of theſe things upon the individual creature that is ſubjected to their influence, may, in ſome caſes, be very perceptible. For example:

It has been ſhown above, that the wool of *wool-bearing* ſheep is affected by heat or cold; but this is nearly in the ſame manner as heat or cold affect the mercury

in

in the thermometer. It is a momentary impulſe, which ceaſes to operate the inſtant its influence is withdrawn; and the animal, which may have been made to undergo great variations of heat, returns to its former ſtate as ſoon as its original temperature is reſtored. But even this variation ſeems to be felt only by the *wool-bearing* breeds; and is, beſides, of much leſs powerful influence than has been uſually ſuppoſed. Nor is there is a ſingle fact, that has ever been diſcovered, that gives the ſmalleſt countenance to the generally-received opinion, that heat tends either to make the fleece thinner in pile, or to encourage the growth of hairs among it; far leſs, that it operates, as M. BUFFON and his followers aſſert, in producing permanent changes on the deſcendants of the animals.

Heat likewiſe tends to accelerate the fattening of ſome animals, to whom it is congenial; as the hog, to an aſtoniſhing degree.

Richneſs of paſture alſo tends to produce temporary changes. On the wool: there is reaſon to believe it tends to augment its length

length *in ſome degree*, though but a little: it adds to its ſoftneſs and toughneſs; but, in regard to coarſeneſs or fineneſs, no fact has as yet been found to aſcertain that it has any ſenſible effect, though I am aware that *opinions* are here as deciſively adopted, as if the facts had been fully aſcertained. On the carcaſe: abundance of food is well known to augment the ſize of all animals to a certain degree, when compared with ſcanty feeding. A ſcarcity of food, approaching to the ſtate of ſtarvation, is alſo well known to render the wool which grows at that period of ſtarvation, brittle and unelaſtic.

3*dly*. The influence of breed, in propagating the qualities of the parent ſtock, or in altering the qualities of it at pleaſure, by blending it with others, may be ſaid to be all-powerful. There is not a ſingle fact, that I have ever been able to meet with, properly aſcertained, which tends to ſhow, that the diſtinguiſhing peculiarities of any breed of animals can be ſenſibly changed in its eſſential characteriſtics, by any change of climate, or any other circumſtance, except an intermixture of blood alone; but innume-

rable

rable facts may be found that aſcertain the contrary. The Perſian and Arabian breeds of horſes brought into Europe, are only changed by intercopulating with other breeds. The Chineſe hogs may be continued for ages unchanged, if no croſs be permitted. Theſe facts are notorious; and every other fact upon this ſubject tends to eſtabliſh the ſame concluſion.

4*thly*, Although the ſame breed of animals appears not to be liableto be changed by climate, or other extraneous cauſes, yet it is found by experience, that individuals may be met with, among every breed of animals, which are, in ſome leſſer circumſtances, different from others, though they ſtill poſſeſs the general characteriſtics of the parent breed, ariſing from circumſtances that have hitherto eluded our obſervation, and which it therefore exceeds our power either to accelerate or to retard. So ſtrong alſo is the propenſity of nature, in all caſes, to produce its own kind, that if the individuals poſſeſſing theſe qualities, thus, as we would ſay, accidentally procured, whether beneficial or hurtful, be ſelected and put to breed with others that poſſeſs

qualities

qualities ſomewhat of the ſame ſort, it is found, that the deſcendants of theſe ſelected animals will, in general, be poſſeſſed of the diſtinguiſhing peculiarity for which they were ſelected, in an eminent degree; though among theſe alſo ſome individuals will be found to have leſs of it than others: And if theſe leaſt approved individuals be baniſhed from the ſelected ſtock; and thoſe, both males and females, which poſſeſs the wiſhed-for quality in the moſt eminent degree, be put to breed together, the deſcendants of theſe will be ſtill more improved: and by continuing this mode of ſelection for a great length of time, the improvement, as to this particular quality, may be carried to an indefinite height. In this way, may be produced an improved breed; which, though agreeing in the general characteriſtics with the parent ſtock from which it was ſelected, may poſſeſs ſome peculiar qualities in a much higher degree than it does.

It is of much importance to the practical farmer, to advert to this peculiarity in the economy of nature, becauſe it puts it very much within his power to benefit himſelf

by attention and care, in regard to circumſtances that would otherwiſe ſeem to be entirely beyond his reach. For were he to be perſuaded that certain peculiarities he wiſhes to obtain, are neceſſarily dependant upon a temperature of climate he never can enjoy, or that certain bad qualities in the animals he breeds are inſeparably dependant upon the nature of his paſture, which it exceeds his power to change, he muſt of of neceſſity ſit down contented with what he has, without a hope of improvement; but if upon examining the facts above ſtated with attention, he ſhall find that the influence of breed is ſo powerful as is there ſtated, he will be at pains, in the firſt place, to look around him, to ſee if he can diſcover any breed poſſeſſing qualities, upon the whole, more valuable than his own, which is found to ſubſiſt on paſtures of a quality not better than his own; and when he has once found them, continue, with uninterrupted attention, to ſelect the beſt in all reſpects, particularly thoſe that thrive beſt among them, to breed from. This has been done by Mr. BAKEWELL, and thoſe who have adopted his ſyſtem, with ſuch ſucceſs,

as not only to eſtabliſh the principle for which I contend beyond a doubt, but alſo to give room for encouraging others to adopt a ſimilar plan for improvements in other reſpects, than thoſe that ſeem, hitherto, to have come within the compaſs of his plan.

5thly, There ſeems to be no reaſon for believing that any one peculiarity we may be in queſt of, is neceſſarily connected with, or dependant upon, any other peculiarity in the animal creation. For example: The improvers of live ſtock, in the preſent age, hold it out to view, as a general principle, that a facility in fattening is invariably connected with certain peculiarities in ſhape; and of courſe they conclude, that, wherever theſe peculiarities of ſhape are to be found, the facility of fattening will be found alſo, and the reverſe. This, I contend, is a falſe principle, and I venture to ſay, that when the facts ſhall come to be thoroughly inveſtigated, their concluſion will be found to be erroneous; indeed it is in ſome degree departed from in *practice* already, though in theory the principle is ſtill adopted, without limitation. A few years ago, ſhortneſs of leg was deemed a point indiſpenſably

diſpenſably neceſſary in a feeding beaſt, and it went the length of almoſt being deemed —the ſhorter the better: this is now no longer contended for. Many of the characteriſtics of the preſent day will, in like manner, gradually fall into diſuſe, as people come to open their eyes on this ſubject. The fact is, I have ſeen animals that had a powerful tendency to fatten, which are almoſt, in every reſpect, the reverſe of the ſhape moſt highly eſteemed at preſent, and the contrary. And by referring every perſon who has had opportunities of obſerving *many breeds* of the ſame kind of animals, to his own experience, I have no doubt, but he will eaſily recollect inſtances of the ſame kind; or, at leaſt, if his mind be unprejudiced, that he will ſoon have occaſion to obſerve it. To that experience, then, whether paſt or to come, I refer on this occaſion.

One circumſtance, however, it is neceſſary here to advert to, viz. that as the breeds of animals from which the ſelection was begun, were originally of very good kinds, and chanced at the ſame time to poſſeſs thoſe ſhapes that are now deemed ſo eſſen-

tially requiſite; and as the improved breeds that have been ſelected from theſe are found to poſſeſs thoſe ſhapes, it is by no means an unnatural concluſion to infer, that theſe ſhapes are in ſome degree inſeparably connected with the propenſity to fatten eaſily. Had it chanced that equal pains had been beſtowed upon ſelecting from another good breed that was differently ſhaped, the prejudice would have been equally ſtrong, in favour of that ſhape. But as the breeds that have been hitherto the object of ſelection, have got the ſtart of all others in point of improvement, it is probable the prejudice in favour of their ſhape may long continue to prevail; nor do I wiſh it to be underſtood that I have any prejudice againſt the ſhapes recommended. Far from it, for I think them very beautiful—I only wiſh to ſay, that that circumſtance is not *eſſentially* connected with the other; for as every error, when admitted as a truth leads to unforeſeen and often pernicious conſequences, though the opinion objected to may not be of much conſequence in the particular inſtance now under conſideration, its influence

may

may be very unfavourable in regard to others. Allow me to add one farther illuſtration on this head, before I put an end to this long paper:

If it be admitted, that a faculty of fattening eaſily be neceſſarily connected with certain peculiarities of ſhape, merely becauſe it chances accidentally, as I will ſay, that theſe two peculiarities happen to be united in that breed of animals which has been brought forward to notice; we ought, by the ſame mode of reaſoning, to infer, that that quality of fattening eaſily, is as neceſſarily connected with coarſeneſs of wool, or lightneſs of fleece, or any other uſeleſs or hurtful peculiarity, if it ſhould ſo happen that the favourite breed chanced to have coarſe wool, or a thin fleece, &c. The conſequence of this concluſion would be, that every man who wiſhed to improve the carcaſe of his ſheep, would turn away from every breed of ſheep that carried fine wool or a cloſe fleece, as he now does from thoſe breeds that have long legs, or what is deemed in other reſpects, improper ſhapes; and fine-woolled ſheep, carrying cloſe fleeces, would come to be entirely neglected. But

if, inſtead of this prevention, he ſhould be convinced, that it might be very poſſible to find a ſheep that would have a tendency to fatten kindly among thoſe breeds that carry very fine wool and cloſe fleeces; he would be as anxious to ſelect from theſe breeds, as from others; and probably as ſucceſsful too, if he had ſet out at the ſame time with the man who began to ſelect from the coarſe breed. I am, myſelf, perfectly ſatisfied, from a variety of facts that have fallen under my own obſervation, which would fill a volume nearly to enumerate, that fine wool, for example, is neither neceſſarily connected with thinneſs of pile, (the Spaniſh ſheep carry the cloſeſt pile of fleece yet known in this country) with ſhortneſs of ſtaple (I once had a fleece of wool, that meaſured 17 inches and half, which was finer than the beſt Spaniſh-wool I could buy in London, and extremely ſoft) with tenderneſs of conſtitution, with a tendency to fatten ſlowly, or with any one quality that can be named, though it may be *accidentally* connected with theſe: And I have not a doubt, but when the eyes of mankind in general ſhall be opened, ſo as

to

to admit of their examining the facts that fall under their notice, without prejudice, they will be able, in time, to ſelect breeds that ſhall be diſtinguiſhed not only for *one* valuable peculiarity to the excluſion of all others, but even to obtain that valuable peculiarity conjoined with moſt, if not all the other peculiarities that can be deſired. That period is, I fear, ſtill at a great diſtance.

But, if theſe remarks ſhall tend in any degree to call the public attention to this ſubject, whether with a deſire to refute or to confirm theſe remarks, it will equally anſwer the end in view, which is to remove hurtful prejudices, and to diſcover the truth. He who does ſo, is on my ſide, alike if he refutes by juſt reaſoning, from well-eſtabliſhed facts, as if he confirms theſe remarks.

The SECRETARY *of the Bath and Weſt of England Society, to Dr.* ANDERSON.

THE Secretary of the Bath and Weſt of England Society, begs leave, in the moſt reſpectful manner, to convey to Dr. ANDERSON, ſome few remarks and queries, which aroſe in the Committee, reſpecting his excellent paper on Wool-bearing Animals. In general, as might be fairly expected, this paper was much approved; but doubts ariſing on two or three ſentences, they will be ſet done in order, and the Doctor will greatly oblige, by giving them a reconſideration and reply, as early as ſhall be convenient to him.

1*ſt*, " And is it not alſo a fact, that " though it be now *proved to demonſtra-* " *tion*, by repeated experiments, that the " wool of ſheep brought from Spain *does* " *not degenerate in Britain**, there has " been till this hour, *no attempt made to* " *obtain a ſingle individual of the fineſt breed* " *of ſheep* § *from Spain?*

* Query

* Query from the Committee. *On what experiment or experiments is this fact, if it be one, founded?*

§ From the ſame. *Has not the attempt been made by the king, and ſucceeded? Or, at any rate, are not the rams ſelected and ſent to him by the Marchioneſs Del Campo, to be conſidered as the beſt?*

2*dly*, " Nor is there a ſingle fact, that " ever has been diſcovered, which gives " the ſmalleſt countenance to the gene- " rally received opinion, that heat tends " either to make the fleece thinner in " pile, or to encourage the growth of " hairs among it. Far leſs that it ope- " rates, as M. BUFFON and his followers " aſſert, in producing permanent changes " on the deſcendants of animals †."

† Query from the Committee. *Is this a clear caſe? Do not our ſheep ſent to and kept at the Weſt-Indies, rather prove the contrary?*

To JAMES ANDERSON, Eſq. LL.D. F.R.S.

ANSWER

Answer *to the* Secretary.

Dear Sir, *Saturday, Feb. 25th*, 1795.

I THANK you for your very kind letter of the 13th inſtant, which only came to hand on Thurſday laſt; I embrace the firſt poſt for acknowledging that favour and of giving anſwers to the queries your Committee have done me the honour to propoſe.

1ſt, A variety of experiments have been made with the Spaniſh breed of ſheep, for three years paſt, by many of the members of the Society of Britiſh Wool. I have ſeen many ſpecimens of the wool of both parents, and of the progeny, which have been compared together, by the members of the Committee and others; and in no inſtance, has it ever been obſerved, that the wool of the progeny, where the breed was pure, was *coarſer* than the average of the parents. Of the effects of croſſing, and other

other peculiarities, affecting the wool in particular cases, I have not time to speak; I shall only observe, that, in general, the Spanish sheep that have come to Scotland have not been found to thrive, being liable to many diseases, especially the foot-rot. You are aware that bad health affects the *quality* of the wool, in a very remarkable degree, in some cases.

2*dly*, The king has certainly got sheep from Spain, as has the Society for British wool. But do the gentlemen of the Committee believe, that Mr. BAKEWELL, or any other eminent breeder, would have thought he could have obtained the very best kinds of British beasts, by getting the Duchess of * * * * *, or any other Duchess or Duke in the kingdom, to order her or his steward to buy the best, and send them to him? Such are not the steps required to make improvements of this kind. Do we not all know, that every person of high rank is liable to be imposed upon by their servants and dependants, in almost every thing? And what would have been the consequence, if the steward had

had wiſhed to fruſtrate the liberal intentions of his miſtreſs? No precautions have been adopted to guard againſt this. We know, that the *fineſt woolled* Spaniſh ſheep have not been ſent, becauſe finer Spaniſh wool can be bought than any of them carried. And I have very great reaſon to believe, from the information of perſons who have ſeen the flocks in Spain, that there are fine woolled ſheep in Spain, much ſuperior *in carcaſe* to any we have got *.

3*dly*, If any of the gentlemen of the Committee knows of any well-authenticated fact, which proves that the fleece degenerates, as ſpecified, in the Weſt-Indies, I ſhall be glad to be informed of it. I know of none, though I know it has been aſſerted ten thouſand times, by perſons who never had adverted to the fact; before I did advert to it, I myſelf believed it firmly; ſince I inveſtigated the caſe with attention, I have

* For the precautions neceſſary to be obſerved in ſelecting ſheep of the beſt ſort, ſee Account of Ruſſian ſheep, Appendix fifth.

been obliged to abandon that opinion *. When the gentlemen of the committee advert

* It is very eaſy to account for the origin of this popular opinion. Wool is not an object of attention to any perſon in the Weſt Indies; it cannot be there manufactured, and there are no uſes to which they can apply it in its unmanufactured ſtate, of courſe, the fleece of the ſheep is entirely neglected, and in that ſtate the wool of European ſheep when carried thither will not be ſhorn, but will be ſuffered to looſen from the ſkin, and drop off of itſelf, the conſequence of which will be, that if there were any kemps among the wool, which is very often the caſe, theſe hairs will remain fixed in the ſkin while the wool falls off; in which ſtate the animal is perfectly bare of *wool*, and in its ſtead, the body is ſeen to be covered with a thin coat of long coarſe ſtraggling hairs only.—This fact being ſeveral times obſerved, is more than ſufficient to give riſe to an opinion, that all ſheep which come from this country, have the wool transformed into hair, and this will naturally be aſcribed to the influence of the climate, though nothing can be more certain than that the ſame phenomenon would take place in Britain. In fact, it does take place every year in Shetland, where the practice of ſheering their ſheep does not prevail. So much for the individual ſheep, that have been ſent out from this country.

With regard to the deſcendants of theſe ſheep, as the few ſheep that go from this country are ſuffered to run at large among the native ſheep, they of courſe will intercopulate with them, ſo that the progeny will be a mongrel

vert to the numberleſs opinions that are readily admitted, without proof, as facts reſpecting wool and ſheep in Britain, they will not be ſurpriſed at this opinion reſpecting ſheep in the Weſt-Indies, being admitted. I have been in the cuſtom, for many years paſt, of admitting no aſſertion, on ſubjects of this ſort, without proofs; and in ſearching for proofs on this head, I have found a great number of facts, that have obliged me to abandon my former opinion. No opinion is more univerſal in the Weſt-Indies, than that the ſheep which are deemed the native breed of the iſland of Jamaica, carry *no* wool at all, but hair only. I had an opportunity, I think, of ſending to you a ſpecimen of the natural fleece of one of thoſe ſheep, which conſiſts, for the greateſt part, of wool, perhaps *finer* (un-

grel race, approaching to the nature of the native ſheep. —Theſe being once more croſſed, will approach nearer to their nature, and ſo on, till, in a ſhort time, they will be in no reſpect diſtinguiſhable from the native ſheep.— Here, then, is a pure metamorphoſis of the kind—but it is a change which has no dependance on climate.---The ſame thing muſt have happened, under ſimilar circumſtances, in Siberia or Lapland, juſt as much as in Jamaica.

doubtedly ſofter) than the beſt Spaniſh wool.

Pleaſe to accept of theſe haſty notices in good part, and believe me to be, with great ſincerity,

Dear Sir,

Your obliged humble ſervant,

JAMES ANDERSON.

Mr. Wm. Matthews.

POSTSCRIPT.

ADDITIONS

Made to the above, in the year 1797.

SINCE the paper above was written, two valuable animals of the wool-bearing claſs have come to my knowledge, with which I was then entirely unacquainted—one of theſe is the Jamaica breed of ſheep, concerning which, I have mentioned the nature of its hair at page 326, in putting this edition to the preſs. The ſheep itſelf was diſcovered in Britain, by Sir Joſeph Banks, Bart. who favoured me with the following account, in a letter, dated Nov. 1794. Sir Joſeph had occaſion to viſit an acquaintance, immediately on that gentleman's return from Jamaica, and in walking upon the lawn, before dinner, he ſaw a ſheep of a very unuſual appearance.—He aſked what ſort of a ſheep it was, and was told it was one of the native Jamaica ſheep, which had been put on board for live ſtock, but having had a quick paſſage, its life had been ſaved. Sir Joſeph, who had honoured me with ſome communications reſpecting wool

juſt

juſt before that, expreſſed a deſire to ſee its wool. Wool! ſaid the gentleman, it carries no wool, but only hair.—Well, ſaid Sir Joſeph, let me ſee the nature of its fleece, whatever it be.—On that the gentleman called the ſheep, which, being quite tame, came up to him.—He then plucked a lock between his finger and thumb from the back of the ſheep, and looking at it for ſome time, he exclaimed, with ſome degree of aſtoniſhment—here is actually ſome wool, and until this moment I never did believe that theſe ſheep carried the ſmalleſt portion of wool whatever, though I have ſeen great numbers of them daily for many years paſt! Sir Joſeph examined it alſo, and ſent the lock, exactly as it was pulled, knowing I ſhould deem it a great curioſity. The lock conſiſted of hair of the kind above deſcribed, and of more than an equal quantity of wool of a ſingularly fine quality; being much finer than any Spaniſh wool I ever ſaw, and as ſoft as ſilk.—At that time it was about an inch long, and by the uſual ſhearing time, I ſuppoſe it might have attained nearly to two inches in length;

and as the hair could be eaſily ſeparated from the wool, ſeeing it is uniformly about half an inch longer, I have no doubt but the fleece of this animal, would be of as great value as the beſt fleeces that have been ever reared in this iſland; as the wool appeared to me to be equally ſoft with Vigonia wool, which frequently ſells here, when clean picked, at the rate of one guinea per pound,—and it has the advantage over that, in being of a pure white; ſo that it admits of being dyed of any colour. I conſider this breed of ſheep, therefore, as a very proper object for experiment.

It has been, in general, believed, that the breed of ſheep juſt now deſcribed, which are found in Jamaica, are the very ſame ſort with thoſe in England, which have degenerated from their original ſtate, in conſequence of the influence of the climate, which is ſaid to convert the Engliſh wool into hair,—and it has been often ſeriouſly affirmed to me, by reſpectable perſons, that there could be no doubt of the fact, that Engliſh ſheep are invariably transformed into that kind of animal after being a few months in Jamaica. I had been, however,

ever, assured by Dr. Wright, who was an attentive naturalist, and had lived many years in Jamaica, that they were a distinct breed.—But had I never heard any surmise of that sort, nor been able to account for the prevalence of that opinion in any way, the fact above stated puts the matter beyond a doubt.—No sheep that are reared in this island, ever carried a hair of the kind which is natural to that sheep; nor have we any wool that can admit of being compared with it, in point of fineness. We have never, in short, seen any wool of the same sort in this island; and that breed of sheep seems to be more nearly allied to the Argali of Pallas, than to any other breed of sheep hitherto described. None of the breeds of sheep reared in this island, approach to it in the smallest degree. It is curious to observe that the *hair* of this animal is much coarser, and its *wool* much finer, than can be found on any of the sheep reared in Britain; so that, by the vulgar hypothesis, it would seem that the climate produced two effects on the same animal at the same time, directly the reverse of each other!

The other valuable wool-bearing animal of which I have received notice, is what has been conjectured by Dr. Anderſon, of Madras, with much ſeeming probability, to have been the animal which gave riſe to the famous Argonautic expedition, as the wool of it may, in the ſtricteſt propriety, be denominated the GOLDEN FLEECE. Hitherto it has been, in general, ſuppoſed that the epithet *golden*, was applied to the fleece of Colchis, merely allegorically in alluſion to its value; but, from the ſpecimen ſent to me, it may be literally and truly called ſuch; for I never ſaw any natural animal production, which ſo nearly aſſumed the appearance of gold as that does. A bit of the ſkin, about the ſize of the palm of the hand, with the wool adhering to it, was brought to Dr. Anderſon, by a Sepoy, who had been employed in a military expedition to the northern parts of India, and all the account he could give of it was, that it was part of the pillage that had been obtained after the overthrow of one of the chiefs in thoſe regions. A part of this Dr. Anderſon ſent to me, and it is now in

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my poſſeſſion. The pile is ſoft and fine; its colour is a bright yellow, of the colour of gold, and it has a gloſs luſtrous as ſilk. In length, it is about nine inches; nor is it frizzed up, like moſt kinds of wool, but hangs down with a gentle wave, tending to a kind of ſpiral curl upon it, very much reſembling the wool of the Angora goat in every reſpect, except the colour. It is evidently not dyed,—for not only is the bit of ſkin to which the wool adheres of its native colour, but there is plainly perceptible, a ſmall variation in the tint, between the roots and the points of the wool, the roots being rather the lighter of the two, which would not have been the caſe, if it had been dyed. In ſhort, the beauty of this lock is ſuch as to have attracted, in a very high degree, the admiration of all who have ſeen it;—and even in the preſent ſtate of arts, a manufacturer gave it as his opinion, that it was an article of ſo great value, that he would purchaſe it, if it could be procured, at an exceedingly high price:—but if we look backward to thoſe diſtant periods, when ſilk was not at all known in Europe, and

when the art of dying was but in its infancy, we can eaſily conceive, that the value of an article of this kind would be deemed ineſtimable.

We have to regret that ſo little is known of the animal which produces this fine fleece.—All that is as yet done, is, to aſcertain that ſuch an animal does actually exiſt; and that, of courſe, it is not beyond the bounds of *poſſibility* to diſcover it. In that enquiry, Dr. Anderſon, at Madras, is engaged at preſent, and no man, from the great range of his correſpondence, the univerſality of his acquaintance, and the reſpectability of his character in India, is ſo likely to ſucceed in the diſcovery of it as himſelf: Nor is any one ſo likely to procure the living animal, if it ſhould be diſcovered. But ſuch animals, if obtained, ought not to be delivered up as toys to princes, or their dependants, to play with.

Since the fact is now undeniably eſtabliſhed, that there are various *breeds* of the ſame ſpecies of animals, which differ radically from each other, and preſerve theſe diſtinct characteriſtics under every change of climate or management, while the

blood

blood continues uncontaminated; and ſince we find that theſe variations reſpecting the fleece, or external coat of hair, are ſo very great as has been above made evident, we have reaſon to believe, that the variations which may take place between different breeds of the ſame ſpecies of animal, reſpecting their other qualities may be equally great and ſtriking as thoſe which regard the fleece; it therefore behoves us to advert to all the peculiarities of every different breed or variety of animals, with much more care than we ever yet have been accuſtomed to do, if we wiſh to carry our improvements to the higheſt degree of poſſible perfection. This opens up a tract for enquiry, that is as yet entirely unexplored; for, ſo long as an idea prevailed that the different varieties of the ſame ſpecies of animals were merely caſual deviations from the ſame parent ſtock, theſe accidental variations muſt have been conſidered as of a nature ſo fleeting and periſhable, as not to be worth the pain of accurate inveſtigation.

In conſequence of this mode of reaſoning, the real qualities of the different

kinds of wool and hair, produced by different breeds of ſheep, have ſcarcely been at all adverted to, becauſe, where a variation was perceived, it was attributed to climate, food, &c.—and not to the nature of the breed.—Hence it was inferred, that under the ſame temperature, and with the ſame food long enough continued, all the varieties would be nearly the ſame. By a ſimilar mode of reaſoning, we have acquired the habit of thinking the other qualities of all the varieties of any one claſs of animals are actually the ſame; and that if they appear at times to differ, this is owing to the operation of accidental circumſtances only: of courſe, we have been equally careleſs in obſerving the other qualities as that of the wool, ſo that many of theſe peculiarities have totally eſcaped our notice.—I ſhall beg leave here to give ſome hints reſpecting theſe, merely to ſet a going this ſpecies of inveſtigation;

The *ſize* of animals, like the qualities of the wool, have been ſuppoſed accidental —That this is not the caſe, admits of clear proof. None of the creatures we rear, are ſo much under our management, or ſo

univerſally

univerſally ſubjected to our obſervation, as the dog; nor are there a greater diverſity of breeds to be found in any ſpecies of creature.—In reſpect of ſize, in particular, this is very remarkable, for the ſmalleſt lap dog, when compared with the largeſt ſized maſtiff, is not, perhaps, one twentieth part of its bulk. And that this is not owing to the fullneſs of feeding, is very evident, ſeeing that theſe ſmall dogs are in general much better fed, and more highly pampered than thoſe of the largeſt ſize. Hence we are led to conclude, that there are varieties of the ſame ſpecies which are radically different in point of *ſize*, and which cannot be made to approach to each other, by any mode of management whatever, where the blood is unmixed.

The ſame thing is obſervable in other animals. The breed of cattle peculiar to the highlands of Scotland, may be made as fat as the Holderneſs breed; the Shetland breed of horſes as the large black dray horſes in England, and the Chineſe hog as the Berkſhire pig; but no management can bring theſe ſmall breeds to equal

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the others, in point of ſize, when equally well fed. Obſerve, I do not ſay, that full feeding will not raiſe the ſize; for it is an undoubted fact, that every animal when well fed, will riſe to a larger ſize than where it is not well fed; but this rule applies equally to all animals, to the larger as well as the ſmaller, ſo that if equally well or ill fed, they will ſtill preſerve their diſtinctive ſize.

Different breeds of the ſame ſpecies vary from each other alſo in reſpect to ſhape. The pug-dog, the ſpaniel, the greyhound, the maſtiff, are all diſtinguiſhable from each other in point of ſhape, by the ſlighteſt glance of the eye; nor can any management tend to confound them, if the breeds are preſerved unadulterated. So is the Devonſhire, the Lancaſhire, the Holderneſs, the Kiloe cattle; the Shetland, the Lanarkſhire, the Suffolk, the Leiceſter ſheep; the Swediſh, the Holſtein, the Spaniſh, the Arabian horſes; each of which can be recogniſed by a glance of the eye, when compared with the others; and they are all equally permanent.

Different

Different breeds vary from each other alſo, to an aſtoniſhing degree, in reſpect to their propenſity to increaſe in corpulency by abundant feeding. No art can ever bring the grey-hound to be as full of fleſh, as a breed of lap-dogs (I believe they are called ſhock-dogs,) which have a propenſity to fatten more than any others;—and, it is not a little remarkable, that ſome of the leaneſt kind of dogs, eat the moſt food of any, in proportion to their ſize. It has been often remarked, that a grey-hound is the moſt voracious of all dogs, and that a maſtiff, in proportion to its ſize, eats very little, though it may very eaſily be fattened. The blood-horſe and the alderney-cow, can never be made ſo fat as many other varieties of their ſpecies.

Theſe obſervations lead to very important concluſions, to the farmer; for if ſuch remarkable diverſities be occaſioned merely by the *breed*, it behoves him to be exceedingly attentive to this article, and to inveſtigate, with the moſt careful impartiality, the peculiarities which eſſentially diſcriminate one breed from another; to

conſider

conſider each peculiarity of every breed, individually and ſeparately, and not to blend them in the groſs, as has hitherto been done. It would lead me much farther, than I at preſent chooſe to go, were I to enter minutely into this ſubject—my object is not at preſent to teach others, but merely to put them into a train of inſtructing themſelves; and, with that view, I ſhall merely glance at a few other circumſtances, before I put an end to this Eſſay.

It is not the abundance of food, that will produce a large breed of animals in any place, though the want of food will every where ſtint them in ſize. Hence we are not to conclude, that wherever a ſmall breed of any domeſtic animal prevails, it muſt be a poor barren country.—If the animals be fat, it is a proof they have abundance of food, whatever be their ſize—though if they be thin, it is not a proof that they are in want of food. The Shetland poney is of a ſize as ſmall as that of the iſland of Tiree; but the firſt is a plump ſtrong-made animal, that is almoſt continually fat, the laſt is a thin

puny

puny creature, that looks always ſtarved, though its native food is richer. In like manner, the Alderney-cow is a hard-boned, hungry, ſtarved-like creature, when even on the beſt of graſs. The Kiloe is not much higher in ſtature, but it is a burly looking creature, compared with the other, and has a tendency to fatten kindly wherever it has food enough. The firſt is a native of a fine climate and good ſoil; the laſt is found in an ungenial region, and very unfertile country.

From theſe conſiderations, it will appear, that ſeveral of the queſtions which have been keenly agitated among warm diſputants, for many years paſt, do not admit of a ſolution in the way they have contended for. One party, for example, maintains that it is more advantageous to rear large than ſmall beaſts; and, in confirmation, he produces a fact, by which it appears, that in that particular caſe, the large beaſts were, in truth, the moſt profitable of the two. Another, on the contrary, maintains, that ſmall beaſts are univerſally more profitable than large, and ſtates a fact, which proves clearly, that the

the ſmall breed was indeed more beneficial than the large. They may be both right as to the particular facts alleged, and both wrong as to the general concluſion. It is not the ſize, but the other peculiarities of the individual breeds that influence this queſtion; ſeeing two breeds, of equal ſize, may poſſeſs properties extremely diſſimilar. It is, therefore, a groundleſs prejudice, either to approve or to condemn a particular breed, from adverting to its ſize only; of courſe, we ought to reject none from the particular inveſtigation of its qualities, above recommended. For this reaſon, the Muſk ox, of Hudſon's Bay, which is rather ſmall; the Biſon of Louiſiana, which is of a larger ſize, and ſtrong, both of which fatten kindly; the Alderney-cow, which is alſo ſmall, but valuable on account of its milk; and the Arnee, of Hindoſtan, which is by far the largeſt of the cattle-tribe yet known, ſhould each of them have their reſpective peculiarities diſtinctly aſcertained.

Of all the animals of the *Bos* tribe, the Arnee is, doubtleſs, the largeſt yet known;

known; and although largeneſs of ſize be not in itſelf a quality that ought to recommend an animal to favour; eſpecially where it is to be ſuffered to graze upon the meadows, where the exorbitant weight of the creature may be ſometimes hurtful; yet, there may ariſe occaſions, in which great bodily ſtrength may be of ſingular utility: and as it is poſſible to feed beaſts always in the houſe, ſhould the animal be in other reſpects deſirable, the damage that might be done by its weight in paſturing, may be thus entirely avoided. This creature, when tamed, is gentle, and very ſuſceptible of being trained to any purpoſe that may be wanted; but, with its other qualities, we are very little acquainted. It is known in the higher parts of India, where it is uſed as a beaſt of parade, nearly in the ſame manner as the Elephant, to which, in point of ſize, it more nearly approaches, than, perhaps, any other animal, that is yet known to us, as I chanced accidentally, to gather from the following incident:

Mr. William Haig, while firſt lieutenant, on board the Hawkeſbery Eaſt Indiaman,

diaman, then in the river of Ganges, about fifty miles below Calcutta, obſerved an animal in the river, alive, but floating towards the ſea, carried down by the current; a boat was immediately put off, and the creature ſecured by means of a rope thrown over its horns, and towed towards the ſhip. They were ſurprized at the largeneſs of the ſize of the animal; and being juſt come into the river, from Europe, it was accounted a glorious prize, and inſtantly ſlaughtered for the ſake of freſh proviſions. It was found to be a bullock of only two years old, yet when cut up, the four quarters weighed full 1450 pounds. From this datum we cannot ſuppoſe, that a beaſt of this kind, of full ſtature, and completely fatted, would weigh leſs than 4500 pounds; for we know that a lean bullock, of two years old, will not amount to one-third part of the weight that the ſame animal would have attained at nine years of age, when fully fatted; and as this creature muſt, in all probability, have been carried down the river for, perhaps, a thouſand miles, before it was catched (none of theſe cattle, that I have

I have heard of being bred, lower than Plaſſy) we muſt ſuppoſe that it would be very much emaciated; yet all on board the ſhip thought it excellent eating. As the head, feet, ſkin, entrails, and tallow, of a fatted animal, weigh very little leſs than the four quarters, we ſhall ſee reaſon to believe that ſome of theſe, when alive, may be found, which will not be leſs than from 80 to 90 cwt. upwards of four ton weight! ſo that it muſt be a very ſtately creature. They are ſaid to be ſometimes eleven or twelve feet in height.

The horns of this breed of cattle grow right upwards, nearly in the ſame plane with the face. At firſt they ſpread outward, but as the creature grows older, they gradually bend inward, till at laſt they form nearly a circle, of a large ſize. I ſaw an Indian painting, in the poſſeſſion of Gilbert Innes, eſq. of Stow, in Edinburgh, repreſenting a fight between an elephant and two tigers; a kind of entertainment, ſometimes given by the grandees of India, for the amuſement of the public. In this painting many people were preſent; ſome elephants were there alſo, under the care of attendants, and

three of these cattle were there seen also, standing quietly, under the charge of their keepers, who were mounted upon them, nearly as the cornac is upon an elephant; nor were they represented as much, if at all, inferior in size to that monstrous animal.—The colour was uniformly black, except a tuft of red, or rather flame-coloured hair, pretty long, on the top of the forehead, exactly between the horns. It was guided by a rein fastened to the gristle between the nostrils. It is therefore plainly a domesticated animal, and its appearance is of the most gentle and inoffensive kind.

The Bison, or, as it is commonly called, the Buffaloe of Louisiana, is also a beast of a large size, and great bodily strength, and has a propensity to fatten kindly. It was not known that it could be very easily domesticated till of late; but I find, among other peculiarities respecting this creature, mentioned in the Seventh Volume of the Bath Society papers, written by a Mr. Turnbull, a very singular and easy method of catching them, which appears to be well known to the inhabitants of the back settlements

tlements in America, who often go out to hunt the Buffaloe. He ſtates, that if a female who has a ſucking calf at her foot, chances to be killed, the calf never leaves its dam even when the hunter comes up, but ſtands quietly by, and follows the body of its mother wherever it is carried, were it even into the heart of a city; and as the calf is eaſily tamed when once got into hand, it ſeems to be often reared, in the back ſettlements as a domeſtic animal. The writer of that paper does not there ſpecify any of its other qualities, but its ſtrength alone, which, he ſays, is much greater than that of the European ox, and its ſtep longer, on which account he ſtrongly recommends it as a beaſt of draught.

The *Zebu* breed of cattle has been alſo imported into this country, I find, from India, by ſeveral gentlemen, and is found to thrive here, and to breed perfectly well, ſo that it is probable, its qualities will come in time to be accurately aſcertained. In regard to one particular, both theſe breeds poſſeſs a peculiarity, that is well known to be totally diſtinct from any of the breeds of cattle that are natives of this country. The

peculiarity which diſtinguiſhes the Biſon from other varieties of the *Bos* tribe, is a large hump upon the ſhoulder, which when cut up, is found to afford a fleſh that is of a quality totally diſtinct from that of any other part of the body, and is univerſally eſteemed much more delicate eating. The *Zebu* is alſo diſtinguiſhed from other creatures of the ſame genus, by a particular kind of excreſcence, that riſes from the ſhoulder alſo, but in a manner totally different from that of the Biſon; and the quality of the fleſh of this excreſcence (which is of a conſiderable ſize) is different from any meat furniſhed by our cattle, and differs alſo from that of the Biſon. This is deemed ſuch a peculiar delicacy, that I have often heard gentlemen who have been uſed to it in India, ſay, they found all the meat in this country, harſh to their palate, ſo that they could with difficulty bring themſelves to eat of it. It is not impoſſible but the meat in the other parts of the body may alſo differ conſiderably from our's, and from each other. The ſkin alſo of theſe animals may be found, upon trial, to be poſſeſſed of properties that may render it highly va-

luable

luable in manufactures; particularly that of the *Arnee*, which is probably, in many reſpects, different from that of the ſmaller animals of the ſame genus. It is certain, that the Indians make of the ſkin of the Biſon, manufactured in their manner, a kind of leather, that is ſoft, tough, and very light, of which they form a kind of jerkin, or a ſhield, perfectly capable of reſiſting the force of an arrow. Whether this quality depends upon the nature of the ſkin, or on the mode of manufacturing it, remains to be aſcertained.

I ſhall juſt add one other hint reſpecting *varieties* of animals of the ſame ſpecies, with a view to lead to an inveſtigation, that never has yet, that I know of, been the ſubject of elucidation. We have ſeen above, that different *varieties* of the ſame ſpecies poſſeſs certain permanent and diſtinct peculiarities, that cannot be altered but by an intermixture of blood. Thoſe peculiarities that I have taken notice of above, reſpect chiefly external circumſtances, which are very obvious to the ſenſes.—There are other peculiarities, however, of a more obſcure nature, if I may be allowed

to adopt that expreſſion, which, though equally uſeful, are not ſo eaſily aſcertained by ſenſible marks which admit of accurate comparative trial, but which are ſtill eaſily recogniſed, when you take two breeds that differ very much from each other.—Of this nature, is what is called hardineſs, or perſevering firmneſs under fatigue, often called *ſpirit*—as contraſted to that ſluggiſh want of mental and muſcular exertion, which is called *ſoftneſs* in horſes; the blood-horſe, for example, and ſome other noted breeds of active horſes, compared with the large black dray-horſe. Of a nature equally obſcure, though I am ſatisfied too equally diſtinct from each other, is the taſte and flavour of the fleſh of different breeds of the ſame kind of animal, though this circumſtance does not ſeem as yet ever to have attracted the public attention in the ſmalleſt degree. Every perſon knows, however, that there is an exceedingly great difference between the delicacy of the meat he eats at different times; but as it is well known that the flavour of meat may be affected by circumſtances that are totally unconnected with the breed, ſuch as, in ſome

ſome kind of animals, the age at which they have been killed, or the nature of the food upon which they have been fed, or the time the meat has been kept after it has been ſlaughtered; and as no pains is, in general, taken to diſcriminate how far either of theſe circumſtances have tended to operate in the particular caſe in queſtion, each individual feels himſelf, in general, diſpoſed haſtily to conclude, that the particular circumſtance which he chances to have fixed upon as obnoxious, or the reverſe, has occaſioned the good or the bad flavour he perceives. Is his mutton peculiarly delicate —one man immediately concludes, it muſt have been fed upon heath, which gives it the high flavour.—If bad, it has been fed upon turnips; or it is, perhaps, the age—or the ſize—or any other circumſtance that may chance to operate upon his imagination at the time—but he ſeldom thinks of aſcertaining with the neceſſary degree of preciſion, whether this be the fact or not. I myſelf know, for a certainty, that I have heard things of this nature repeatedly mentioned as facts that were inconteſtible, which I knew at the time to be totally dif-

ferent from what was aſſerted, when it would have been very idle, or very rude in me to have conteſted it: neither have I myſelf had opportunities of aſcertaining the fact referrable to this head with the neceſſary preciſion to be able to lay down any rules that can be relied upon. My obſervations go no farther than to furniſh me with reaſons for doubting; but they have been long enough continued to authorize me to ſuggeſt hints for farther inveſtigation. In ſhort, I have ſeen reaſon to be ſatisfied that, independant of age, and food, and every other circumſtance which tends to affect the taſte of meat, there is a flavour peculiar to the meat of every diſtinct breed of domeſtic animals that are reared in this iſland, which can only be changed by blood. I do not ſay that this flavour cannot be altered by the circumſtances above ſtated;—far from it—for I know that the alteration that may be produced by theſe means is always very great. What I mean is ſimply this; that under the ſame circumſtances reſpecting age, food, and every other particular, the flavour of the meat of two diſtinct breeds will be different, in moſt caſes.

In regard to mutton, I ſhall beg leave to ſpecify the true Welſh breed, and the new Leiceſterſhire, as the greateſt contraſt to each other that I know.—The firſt I conceive to be by much the fineſt flavoured mutton I have ſeen, and the laſt the loweſt. —The difference is to me nearly as great as between a golden pippin, and an ordinary apple. Whether this difference of flavour depends upon the breed or the feed, may be aſcertained by very eaſy experiment. Let any gentleman who has a convenient incloſure, buy a ſcore of lambs of one year old, of each kind; let them be turned together into as rich a paſture as you pleaſe, and let the two beſt of each kind be always choſen at the ſame time, when wanted, and then ſlaughtered, and treated in every reſpect alike, till the whole ſhall be conſumed, as they advance in years. Two of the ſame age will thus always be compared together; if no difference in the flavour be then perceived, I am clearly in a miſtake.—Many other good conſequences, beſides that here ſtated, would reſult from this experiment, if conducted with

with accuracy, and faithfully recorded; and it would coſt nothing.

I ſhall juſt add, that I have reaſon to ſuſpect that the delicacy of flavour is by no means neceſſarily connected with the *ſize* of the breed; for though, in this inſtance, it ſhould be found that the ſmalleſt is preferable, I have no doubt but that in other trials it would be found that the reverſe would be the caſe.

APPENDIX.

APPENDIX.

APPENDIX.

LINNÆUS, who is juſtly celebrated for his knowledge in the different branches of *Natural Hiſtory*, gave the firſt hint for beginning the following ſet of uſeful experiments in rural economy, which were afterwards proſecuted by ſome of his pupils, and publiſhed in the *Amœnitates Academicæ*, under the title of the *Swediſh Pan*.

The deſign of this truly valuable ſet of experiments was, to aſcertain which of all the plants common in Sweden were eaten, and which of them were refuſed by the five moſt valuable domeſtic animals—oxen, cattle, horſes, ſheep, and ſwine—that it might ſerve as a direction to the rural improver, in the choice of plants proper to be cultivated by him for any particular purpoſe; as alſo to enable him to know what ſpecies of animals it would be

be moſt profitable for him to allow to be fed with the produce of any field, in its natural ſtate.

Mr. Stillingfleet tranſlated into Engliſh the Introduction to this ſet of experiments; but he omitted the experiments themſelves, on account of the difficulty of making ordinary readers know the plants by the names that were given them.

I am not ſatisfied that this reaſon is ſufficient to prevent a tranſlation of this ſet of experiments from being of ſome uſe even to the Engliſh reader, as few perſons are unacquainted with many of the plants by their Engliſh names; and as there are fewer ſtill, who have the ſmalleſt ſpirit of enterpriſe, who may not have an opportunity of getting the particulars about which they may be in doubt, explained by ſome of their acquaintance, if they really are deſirous of it.

On this account, I have choſen to publiſh the experiments themſelves, having ſubjoined the Engliſh names given to the ſeveral plants, taken from Hudſon's *Flora Anglica*; to ſome of which, I have added ſuch

ſuch vulgar names as have come to my own knowledge.

I have likewiſe been tempted to undertake this, in ſome meaſure, with a view to excite a deſire of attaining an adequate knowledge of botany, among philoſophic farmers, who would reap many benefits from a competent proficiency in this ſcience.

The utility of this branch of ſcience, will appear plainly from the peruſal of the following ſet of experiments. For, without its aid, it would have been impoſſible for any inhabitant of Britain to be benefitted by any of the facts contained in them; as it would not have been poſſible for them to know, with certainty, any one plant mentioned through the whole of theſe numerous experiments; whereas, it is now eaſy to know, with the utmoſt certainty, every herb that occurs.

Thoſe who view botany in this light—who conſider it as a neceſſary ſtep of that ladder by which they may be enabled to attain uſeful knowledge, will look down with equal contempt on thoſe who reſt

ſatisfied

ſatisfied with being able to name every plant that may occur to them, and conſider this as the ultimate uſe and end of this ſcience; as of thoſe who, with a faſtidious pride of mind, deſpiſe this purſuit, as mean and ignoble, and glory in their ignorance of a ſcience they think unworthy of the attention of men who are buſied in purſuits of things of real utility.

It is, indeed, no more, at beſt, than a vocabulary, and although it be poſſible for one to learn all the words of a vocabulary, without attaining any knowledge of the language; yet, it is impoſſible for a ſtranger to that language to attain a knowledge of it, without firſt retaining in his memory the words of which it conſiſts; which he will beſt attain by the aid of that vocabulary.

The ſcience the botaniſt ought to wiſh to attain, is the *knowledge of plants*.—The ſeveral ſyſtems of botany that have been invented, pretend to do no more than to claſs theſe plants in ſuch a manner, as to facilitate the attainment of their names: —It is, therefore, of the greateſt importance,

ance, as a *mean of attaining knowledge*; but as an *ultimate end*, it is, perhaps, the moſt trifling purſuit that can occupy the mind of man.

A man who values himſelf for his knowledge in this mere ſyſtem of claſſification, without aiming to make it of any other uſe, exactly reſembles him who ſhould glory in being able to repeat with facility all the words of any unknown language.—If the mere botaniſt adds any thing new, he may be of ſome uſe to others by abridging their labour, but muſt be conſidered as the verieſt dunce of a drudge that ever exiſted. His life is ſpent in the arduous purſuit of a ſhadow, inſtead of a reality.

Linnæus, although he has done more to aſſiſt others in attaining the names of plants with certainty and facility, than perhaps any other man, ſeems to view the ſcience in its proper light; as he has endeavoured to extend the views of his pupils to the deſire of diſcovering ſuch plants as are poſſeſſed with qualities that may be of uſe to mankind. The following ſet of experiments is one ſatisfactory proof of

this; and many others might be produced, were this a proper place for it.

We have reaſon to regret, that other eminent Naturaliſts, who live in other parts of the world, have ſo ſeldom followed his example in this reſpect. And it ought to cover them with ſhame, when they reflect, that under the influence of this ſingle man, the ſmall and inconſiderable kingdom of Sweden ſhould have produced a greater number of really valuable experiments on the uſes of plants, and other natural bodies, within theſe few years, than perhaps all Europe beſides; although the attainment of knowledge there is much more difficult than in many other places; and although it is next to impoſſible for the moſt ſucceſsful experimenter to publiſh his diſcoveries to the world, without almoſt a certainty of loſing by the publication.

The following Experiments were publiſhed by Nicolas Haſſelgreen, in the year 1760,—who, after having mentioned the firſt hint for this purpoſe that was given by Linnæus, in the Relation of his Journey to Dalicarlia, *anno* 1743, and taking notice

that his diſciple Profeſſor Kalm, in imitation of him, mentioned ſome of the plants that cattle ate or refuſed, which he had occaſion to remark in a journey he made to Bahus, he adds,—

"*Anno* 1747, and 1748, our Preſident (Linnæus) undertook, with great diligence, not only to make experiments himſelf, but to excite his diſciples and auditors to do the ſame; of which I was one. Thus at laſt many experiments were made, and repeated, eſpecially by D. D. Hagſtrom, Mag. E. G. Liidbeck, E. Ekelund, J. G. Wahlbom, L. Montin, F. Olbders, J. C. Forſkahl, A. Fornander, not to mention others who have ſtrove as it were to outdo one another in finding the plants which were moſt ſuitable for different animals."

When ſhall Britain be able to produce ſuch a fraternity, emulouſly contending who ſhall moſt promote ſuch another ſet of uſeful experiments?

By this means, they were enabled to produce above two thouſand certain experiments, ſome of which were repeated, he aſſures us, ten times over, and ſome of them twice as often.

The plants were choſen when the leaves were in perfection, and were handled as little as poſſible before they were given to the different animals. They were offered to theſe animals when their bellies were pretty full; and every poſſible caution was taken to obtain a perfect knowledge of what they voluntarily ate, and what they rejected.

It is not, however, to be doubted, that, ſhould the ſame experiments be repeated by others, the reſult might differ in many inſtances.—Some individual animals are much nicer in their taſte than others, *naturally*; — others, from *habit*, may be induced to eat with pleaſure many plants that they would have at firſt refuſed. From which circumſtance, the reſult of the ſame experiment, tried at different times, on different animals, might vary.

Nevertheleſs, it may, in general, be allowed as an undoubted fact, that whatever plant has, in any of theſe experiments, been eaten by any claſs of animals, will in general be eaten by other animals of the ſame claſs, if proper means are uſed for inducing thoſe

that are ſhy at firſt to taſte it, and become acquainted with it.

But it is by no means certain, that although all the animals of one claſs have refuſed a particular plant, other animals of the ſame ſort will on no occaſion be induced to eat of it. I ſhall have occaſion to take notice of ſeveral inſtances of this ſort that have come to my own knowledge, which ſhall be ſubjoined, by way of Notes, to the Table of Experiments.

In the Table that follows, the Latin generic name of the plant is firſt given in Roman characters, after which follows the name of the ſpecies in *Italics*—which is ſucceeded by the Engliſh name, taken from Hudſon's *Flora Anglica*.

The following letters indicate the duration of the different plants:—A ſignifies an annual plant; B, a biennial; P, a perennial; T ſignifies a tree or ſhrub; and the numbers I. II. III. &c. ſhow the times of their flowering, *viz.* I. January, II. February, III. March, &c.

The five columns on the right hand ſerve to denote the five domeſtic animals, to which the plants have been offered.

The firſt marked O. *oxen*—the ſecond G. *goats*—the third Sh. *ſheep*—the fourth H. *horſes*—and the fifth Sw. *ſwine*.

The marks in theſe columns oppoſite to the name of every plant, ſhow whether that plant was eaten or refuſed by the animals expreſſed in each column.—By the mark (1) is denoted that the plant was eaten; by the mark (0) that it was refuſed; and by both of theſe (10) or (01) that it was ſometimes eaten and ſometimes refuſed: The letter (n) denotes that it was not tried with the particular animal in whoſe column it is placed, although there is no explanation of this in the original work.

The Swediſh Naturaliſt arranged the plants according to the order they hold in the *Flora Suecica* of Linnæus.—I have thought it better to alter that arrangement to one which I imagine is better adapted to the uſe of the farmer,—and which is divided into claſſes, according to the number of animals that eat each plant.

The firſt claſs (§ I) contains ſuch plants as were either eaten by all the five claſſes of animals, or only rejected by one of them.

The

The ſecond claſs (§ II) contains thoſe that are eaten by four, or rejected only by two.

The third (§ III) contains thoſe that were eaten by three, or rejected by three.

The fourth (§ IV) contains thoſe that were eaten by two, or rejected by four.

The fifth (§ V) contains thoſe that were not eaten by any animal at all.

This arangement is only broken through in ſome caſes, where a plant or two are placed with others of the ſame ſpecies, although differing a little from the others.

There are in the original Table, many plants that were not tried at all.—Theſe are here entirely omitted.

To aſſiſt the reader to turn to any plant he may wiſh to examine, a Latin and an Engliſh Index are ſubjoined.

A TABLE, ſhowing what Plants are eaten or neglected by the five moſt common Domeſtic Animals, Oxen, Goats, Horſes, Sheep, and Swine.

§ I.

Plants that were either eaten by the whole five animals, or only rejected by one.

		O.	G.	Sh.	H.	Sw.
1	Veronica *officinalis.* Male ſpeedwell, P V.	1	1	1	1	o
2	—— *ſcutellata.* Narrow-leaved water ſpeedwell, P VI.	1	1	1	1	n
3	—— *agreſtis.* Germander ſpeedwell, or chickweed, A V.	1	1	1	1	n
4	—— *hederifolia.* Ivy-leaved ſpeedwell or ſmall hen-bit, A IV. V.	1	1	1	1	n
5	—— *triphyllos.* Trifid ſpeedwell, A V. VI.	1	1	1	1	n
6	Anthoxanthum *odoratum.* Vernal or ſpring-graſs, P VIII. Tab. IX.	1	1	1	1	n
7	Milium *effuſum.* Millet-graſs, A VI. VII.	1	1	1	1	n
8	Aira *cæſpitoſa.* Turfey hair-graſs, P VII. VIII.	1	1	1	10	1
9	—— *flexuoſa.* Small hair-graſs, P VII. VIII.	1	n	1	1	n
10	—— *Montana.* Mountain hair-graſs, P VII. VIII.	n	n	1	n	n
11	—— *cærulea.* Purple hair-graſs, P VIII.	n	1	1	1	n
12	—— *caneſcens.* Grey hair-graſs, P VII.	1	1	n	n	n
13	Poa *aquatica.* Reed meadow-graſs, P VII.	10	n	1	10	n
14	—— *compreſſa.* Creeping meadow-graſs, A VI. Tab. VIII.	1	1	1	1	n

		O.	G.	Sh.	H.	Sw.
15	Poa *annua*. Annual meadow-grafs, or Suffolk-grafs, A VI.—IX.	1	1	1	1	1
16	—— *pratenfis*. Great meadow-grafs, A VI. Tab. VII.	1	1	10	1	1
17	—— *anguftifolia*. Narrow-leaved meadow-grafs, A VII.	1	1	1	1	1
18	—— *trivialis*. Common meadow-grafs, P VI. VII.	1	1	1	1	1
19	—— *alpina*. Alpine meadow-grafs,	1	1	1	1	n
20	Briza *media*. Middle quacking-grafs, cow-quakes, and ladies-hair, P VI.	1	1	1	n	n
21	Cynofurus *criftatus*. Crefted dog's-tail-grafs, P VIII. Tab. X.	n	n	1	n	n
22	——— *cæruleus*. Blue dog's-tail-grafs, P VII.	n	1	1	1	o
23	Dactylis *glomeratus*. Rough cock's-foot-grafs, P VI.—VIII.	o	1	1	1	n
24	Bromus *fecalinus*. Field brome-grafs, A V. VI.	1	1	1	1	n
25	——— *arvenfis*. Corn brome-grafs, P VII.	1	1	1	1	n
26	——— *giganteus*. Tall brome-grafs. P VIII.	1	1	1	1	n
27	——— *pinnatus*. Spiked brome-grafs, P VI.	n	1	10	1	n
28	Feftuca *fluitans*. Flote fefcue-grafs, P VI. VII.	1	1	1	1	10
29	——— *rubra*. Purple fefcue-grafs, P VI. * Tab. III.	n	1	o	1	n
30	——— *ovina*. Sheep's fefcue-grafs, P VI. VII. Tab. IV.	1	1	1	1	n
31	Avena *pratenfis*. Meadow oat-grafs, goofe-grafs *vulgo*, P VII.	1	1	1	1	n

* Sheep, I have found, delight much to paſture on fields that abound with the purple feſcue-graſs, and eat them quite bare.

		O.	G.	Sh.	H.	Sw.
32	Avena *fatua*. Bearded oat-graſs, P. VIII.	n	I	I	I	n
33	—— *elatior*. Tall oat-graſs, knot-graſs *vulgo*, P VII. VIII,	I	I	I	n	n
34	Arundo *phragmites*. Common reed-graſs, P VII.	I	I	O	I	O
35	—— *calamagroſtis*. Branched reed-graſs, P VI. VII.	n	I	n	n	n
36	Triticum *repens*. Common wheat-graſs, dog's-graſs, quick-graſs, or couch-graſs, P. VI.—VIII.*	I	I	I	I	O
37	Scabioſo *arvenſis*. Common field-ſcabious, P VIII.	IO	I	I	IO	O
38	—— *columbaria*. The leſſer field-ſcabious, P VIII.	n	I	I	I	n
39	—— *ſucciſa*. Devil's-bit, P VI.—VIII.	I	I	I	I	O
40	Aſperula *adorata*. Woodroof, P V.	I	I	I	I	O
41	—— *tinctoria*.	I	I	I	I	O
42	Galium *aparine*. Cleavers, or gooſe-graſs, A V. VI.	I	I	I	I	O
43	—— *uliginoſum*. Marſh-gooſe-graſs, P VII. VIII.	I	I	I	I	I
44	Sanguiſorba *officinalis*. Burnet, P.	I	I	I	I	n
45	Anchuſa *officinalis*. Hounds-tongue, P VI.	I	I	I	I	IO
46	Aſperuga *procumbens*. Small wild buglóſs, great gooſe-graſs, and German madwort, A IV. V.	IO	I	I	I	I
47	Ulmus *campeſtris*. Common elm-tree, P.	I	I	I	I	I

* This graſs is not much liked either by oxen or horſes. The roots of it are reliſhed by cattle.

A IV. V.

47 Ulmus *campeſtris*. Common elm-tree, P. 10 1 1 1 1

* This graſs is not much liked either by oxen or horſes. The roots of it are reliſhed by cattle.

		O.	G.	Sh.	H.	Sw.
48	Laſerpitium *latifolium*.	1	1	1	1	1
49	Heracleum *ſphondylium*. Cow parſnip, B VII.	1	1	1	10	1
50	Pimpinella *ſaxifraga*. Small Burnet ſaxifrage, P VIII.	1	1	1	1	1
51	Convalaria *bifolia*,	1	1	1	1	1
52	Rumex *acetoſa*. Common ſorrel.	1	1	1	1	1
53	——— *acetoſella*. Sheep's-ſorrel, P V. VI. VII.	1	1	1	1	1
54	Triglochlin *paluſtre*. Arrow-headed-graſs, P VII. VIII.	1	1	1	1	1
55	——— *maritimum*. Sea-ſpiked-graſs, P V. VI.	1	1	1	1	1
56	Sorbus *aucuperia*. Quicken, rawen-tree, or mountain-aſh, T V.	1	1	1	1	1
57	Pyrus *communis*. The wild pear-tree, T V.	1	1	1	1	n
58	——— *malus*. The apple-tree, T IV.	1	1	1	1	n
59	Meſpilus *cotoneaſter*. The medlar, T V.	1	1	1	1	n
60	Roſa *canina*. Dog-roſe or hip-tree, T V. VI.	1	1	1	10	1
61	——— *ſpinoſiſſima*. Burnet roſe, T VI.	1	1	1	0	1
62	Rubus *idæus*. Raſpberry-buſh, T V. VI.	01	1	1	0	1
63	——— *fruticoſus*. Bramble, T V.—IX.	n	1	10	1	n
64	——— *cæſius*. Small bramble, or Dewberry-buſh, T VI.	1	1	1	0	n
65	——— *ſaxatilis*. Stone-bramble, P VI.	1	1	1	0	1
66	——— *chamæmorus*. Cloud-berries, or knout-berries, P V. VI.	1	1	1	n	n

		O.	G.	Sh.	H.	Sw.
67	Fragaria *veſca*. Strawberry, P IV.	10	1	1	0	0
68	Potentilla *fruticoſa*. Shrub cinquefoil, T VI.	1	1	1	1	0
69	——— *argentea*. Silver-weed, or wild-tanſey, P VI. VII.	0	1	0	0	1
70	——— *repens*. Common cinquefoil, or five leaved-graſs, P VI.	1	1	1	1	n
71	——— *verna*. Spring cinquefoil, P V. VI.	1	1	1	1	n
72	——— *rupeſtris*. Upright baſtard-cinquefoil, P VII.	1	1	1	1	n
73	——— *norvegica*. Norwegian cinquefoil,	1	1	1	1	1
74	Thalictrum *flavum*. Meadow-rue, P VI.	1	1	1	1	10
75	Euphraſia *officinalis*. Eyebright, A VIII. IX.	1	1	1	1	0
76	——— *odontites*. Red eyebright, A VIII. IX.	1	1	1	1	n
77	Thlaſpi *burſa paſtoris*. Shepherd's purſe, A III. IV.	1	1	1	1	1
78	Myagarum *ſativum*. Gold of pleaſure, A VI.	1	1	1	1	n
79	Crambe *maritima*. Sea-colwort, P V.	1	1	1	1	1
80	Geranium *ſanguineum*. Bloody crane's-bill. P VII. VIII.	1	1	n	1	1
81	——— *ſylvaticum*. Mountain ditto, P VII. VIII.	1	1	1	0	1
82	——— *pratenſe*. Crowfoot craneſbill, P VI. VII.	1	1	1	1	1
83	——— *rotundifolium*. Round-leaved craneſbill, A VII.	0	n	1	1	0
84	——— *columbinum*. Long ſtalked dove's-foot craneſbill, A VII.	n	1	1	n	0
85	——— *molle*. Common dove's-foot craneſbill, A V. VI.	n	1	1	n	n

		O.	G.	Sh.	H.	Sw.
83	——— *rotundifolium.*	n	n	I	I	o
84	——— *columbinum.* Long ſtalked dove's-foot craneſbill, A VII.	n	I	I	n	o
85	——— *molle.* Common dove's-foot craneſbill, A V. VI.	n	I	I	n	n
86	Geranium *robertianum.* Herb Robert, B IV.	n	I	o	I	o
87	——— *cicutrinum.* Hemloc-leaved craneſbill, A IV.—VI.	I	n	IO	I	n
88	Polygala *vulgaris.* Milkwort, P V. VI. Tab. XI.	I	I	I	I	o
89	Geniſta *tinctoria.* Green-wood, dyers-weed, or wood-waxen, T VII.	I	I	I	I	n
90	Aſtragalus *glycyphyllos.* Wild liquorice, P. VI. VII.	I	I	I	I	o
91	Anthyllis *vulneraria.* Kidney-vetch, or lady's-finger, P VII.	I	I	n	n	n
92	Orobus *tuberoſus.* Wood-peas, or heath-peas, P V.	I	I	I	I	n
93	——— *niger.* Black wood-peas,	I	I	I	I	o
94	——— *vernus.* Early wood-peas,	I	I	I	I	n
95	Lathyrus *ſylveſtris.* Narrow-leaved peas everlaſting, P. VII. VIII.	I	I	I	I	n
96	——— *heterophyllus.*	I	I	I	I	n
97	——— *pratenſis.* Tare everlaſting, or common yellow-vetchling, P VII. VIII. Tab. XII.	I	I	I	I	o
98	——— *paluſtris.* Marſh chickling vetch, P VII. VIII.	I	I	I	I	n
99	Vicia *ſativa.* Common vetch, or tare, A V. VI.	I	I	I	I	n
100	—— *ſepium.* Buſh vetch, P V. Tab. XIV.	I	I	I	I	I
101	—— *ſylvatica.* Tufted wood vetch, P VII. VIII.	I	I	I	I	n
102	—— *cracca.* Tufted vetch, P. VII. VIII.	I	I	I	I	IO
103	Ervum *tetraſpermum.* Smooth tare, A IV. V.	I	I	I	I	n

		O.	G.	Sh.	H.	Sw.
104	Ervum *hirſatum*. Hairy tare, A VI.	1	1	1	1	n
105	Piſum *arvenſe*. Common peas, A	1	1	1	1	n
106	—— *maritimum*. Sea peas, P VII.	1	1	1	1	n
107	Lotus *corniculata*. Birds-foot trefoil, P VI.—VIII.	1	1	10	1	10
108	Trifolium *repens*. Dutch clover, white trefoil, P VI.—IX.	1	1	10	1	o
109	——— *pratenſe*. Purple or honeyſuckle trefoil, T V.—IX.	1	1	1	1	1
110	——— *arvenſe*. Hares-foot trefoil, A VII. VIII.	n	1	n	n	n
111	——— *agrarium*. Hop trefoil, A VI.	1	1	1	1	n
112	——— *procumbens*. Decumbent, or creeping trefoil, P V.—VIII.	1	1	1	1	1
113	——— *melilotus*. Common melilot, B VI. VII.	1	1	1	1	1
114	Medicago *falcata*. Yellow medick, P VII.	1	1	1	1	n
115	——— *lupulina*. Melilot trefoil, A V.—VIII.	1	1	1	1	n
116	Ononis *mitis*. Creeping-reſt harrow, P	1	1	1	o	o
117	——— *ſpinoſa*. Reſt-harrow, or cammock, P. VI.—VIII.	1	1	1	o	o
118	Sonchus *arvenſis*. Tree ſow-thiſtle, P VIII.	1	1	n	1	n
119	——— *oleraceus*. Common ſow-thiſtle, A VI.—VIII.	n	1	1	01	1
120	——— *alpinus*. Mountain ſow-thiſtle,	1	1	1	1	1
121	Prenanthis *muralis*. Ivy-leaved wild lettuce, P VII,	1	1	1	1	n
122	Scorzonera *humilis*,	1	1	1	1	1

		O.	G.	Sh.	H.	Sw.
123	Tragopogon *pratenſe*. Yellow goats-beard, B VI. - -	1	10	1	1	1
124	Carduus *lonceolatus*. Spear-thiſtle, B VII. - - -	10	10	0	10	0
125	——— *nutans*. Muſk-thiſtle, B VII. - - -	10	0	0	1	n
126	——— *acaulis*. Dwarf caroline thiſtle, P. VII. - -	0	n	n	n	n
127	——— *heterophyllus*, - - - - -	1	1	1	1	0
128	——— *criſpus*. Curled-thiſtle, A VI. - - -	1	1	1	1	n
129	——— *paluſtris*. Marſh-thiſtle, P VII. - - -	0	n	n	1	1
130	Solidago *virga aurea*. Common golden-rod, P. VIII. - -	1	1	1	1	1
131	Achillea *milleſolium*. Common yarrow, or millfoil, P V. VII. * Tab. XVII.	10	10	10	1	1
132	——— *ptarmica*. Sneezewort, or gooſe-tongue, P. VIII. -	1	1	1	1	1
133	Centaurea *ſcabioſa*. Great knapweed, or matfellon, P VI. VII. -	0	1	1	1	1
134	——— *jacea*. Common knapweed, or matfellon, P VI. VII. -	1	1	1	10	10
135	——— *cyanus*. Blue-bottles, A VII. - - -	1	1	1	0	0
136	Humulus *lupulus*. The hop-plant, P VI. - - -	1	1	1	1	1

* The fineſt paſtures I ever ſaw, thoſe eſpecially on which horſes, cattle, and ſheep, chiefly delighted to feed, always abounded with this graſs.

§ II.

Plants that are eaten by four of the five animals, or rejected only by two of them.

		O.	G.	Sh.	H.	Sw.
137	Scirpus *ſylvaticus*. Millet cyperus-graſs, P VII.	1	1	1	1	0
138	——— *maritimus*. Round rooted baſtard cyperus, P VIII.	1	n	n	n	n
139	——— *lacuſtris*. Bull-ruſh, P VII. VIII.	0	1	0	n	1
140	——— *paluſtris*. Club-ruſh, P VII.	0	1	0	1	1
141	——— *cæſpitoſus*. Dwarf club-ruſh, P VII.	n	1	n	n	n
142	Nardus *ſtricta*. Matt-graſs, P VI. VII.	10	1	10	1	0
143	Phalaris *arundinacea*. Reed canary-graſs, P VII.	1	1	1	1	0
144	——— *phleoides*.	n	1	1	n	0
145	Phleum *pratenſe*. Meadow cat's-tail-graſs, P VII.	1	1	n	1	0
146	Alopecurus *pratenſis*. Meadow fox-tail-graſs, P V.	10	1	1	1	10
147	——— *geniculatus*. Flote fox-tail-graſs, P VI. VIII.	1	1	1	1	0
148	Melica *nutans*. Melic-graſs, P VI. VII.	1	1	n	1	n
149	——— *ciliata*.	n	1	n	1	n
150	Agroſtis *ſpica venti*. Silky bent-graſs A VII.	n	1	0	1	n
151	——— *arundinacea*.	n	0	n	1	n
152	——— *rubra*. Red bent-graſs, A VII.	n	0	10	1	n
153	——— *ſtolonifera*. Creeping bent-graſs, P VIII.	1	n	1	1	n

		O.	G.	Sh.	H.	Sw.
154	Agroſtis *tenuiſſima*. Fine bent-graſs, P VIII. *	I	I	n	I	n
155	——— *canina*. Brown bent-graſs, P VII. VIII.	I	n	n	I	n
156	Gallium *verum*. Yellow ladies'-bedſtraw, or cheeſe renning, P VII. VIII.	10	I	I	O	O
157	——— *mollugo*. Wild madder, or great baſtard-madder, P VI. VII.	I	I	I	O	I
158	——— *borealis*.	10	I	I	I	O
159	——— *paluſtre*. White ladies'-bedſtraw, P VII.	I	O	I	I	O
160	Sherardia *arvenſis*. Little field madder, A V. VI.	O	I	10	I	n
161	Cornus *ſanguinea*. Cornel or dog-berry-tree, T VI.	O	I	I	I	O
162	——— *ſuecica*,	O	I	I	I	I
163	Euonymus *Europæus*. Spindle-tree, T IV. V.	I	I	I	O	n
164	Alchemilla *vulgaris*. Ladies'-mantle, P VI. VIII.	10	I	I	I	O
165	——— *alpina*. Cinquefoil, ladies'-mantle, P VII.	I	I	O	O	O
166	Cuſcuta *Europæa*. Dodder, hillweed, or devil's-guts, A VII.	I	01	I	O	I
167	Lycopſis *arvenſis*. Small wild bugloſs, A VI.—IX.	I	I	I	I	O
168	Convolvulus *arvenſis*. Small bindweed, P VI. VII.	I	I	I	I	O
169	——— *ſepium*. Great bindweed, P VII. VIII.	O	I	I	I	n
170	Polemonium *cæruleum*. Great valerian, or Jacob's ladder, P VI.	I	I	I	10	n

* Horſes, cattle, and ſheep, will eat this graſs; but they leave it for almoſt any other ſort, and always ſtay with reluctance on the fields where it abounds.

		O.	G.	Sh.	H.	Sw.
171	Campanula *rotundifolia*. Round-leaved bell-flower, P VIII. - -	1	1	1	1	0
172	——— *perſicifolia*, - - - - -	n	1	10	1	n
173	——— *latifolia*. Giant throatwort, P VII. VIII. - - -	n	1	1	1	n
174	——— *trachelium*. Canterbury-bells, P VII. VIII. - -	1	0	n	0	n
175	Ribes *rubrum*. Currants, T V. - - - -	1	1	1	10	n
176	—— *nigrum*. Black-currants, T V. - - -	n	1	n	1	n
177	—— *alpinum*. Sweet mountain-currants, P V. - - -	1	1	1	1	n
178	—— *uva criſpa*, - - - - -	0	1	10	1	n
179	Daucus *carota*. Wild carrot, or bird's-neſt, B VI. VII. - -	1	1	1	1	n
180	Selinum *paluſtre*, - - - - - -	1	1	n	1	n
181	——— *oreoſelinum*, - - - - -	0	n	1	1	n
182	Ligusticum *Scoticum*. Scotch ſea-parſley, B VII. - - -	0	1	1	1	n
183	Angelica *ſylveſtris*. Wild angelica, P VI. VII. - - -	1	1	n	0	1
184	——— *archangelica*, - - - -	1	1	1	0	1
185	Phellandrium *aquaticum*. Water-hemloc, B - - - -	0	1	1	1	10
186	Cicuta *viroſa*. Long-leaved water-hemloc, P VII. - -	0	1	1	1	n
187	Æthuſa *cynapium*. Fool's-parſley, A VIII. XI. - - -	1	1	1	1	1
188	Scandix *anthriſcus*. Small hemloc-chervil, with rough ſeeds, A V. VI. -	1	1	1	n	n
189	——— *cerefolium*, - - - - -	1	1	1	0	n

		O.	G.	Sh.	H.	Sw.
190	Chærophyllum *ſylveſtre*. Myrrh, wild cicely, or cow-weed, P V. VI. *	o	10	10	10	o
191	——— *temulum*. Wild-chervil, P. VI. VII.	o	n	o	n	n
192	Carum *carvi*. Carraways, P V. VI.	10	1	1	10	1
193	Aegopodium *podagrica*. Herb-gerard, goutweed, or aſhweed, P V.	1	1	1	o	n
194	Apium *graveolens*. Smallage, B VIII.	10	1	1	o	n
195	Viburnum *epulus*. Water-elder, T V. VI.	1	1	1	10	n
196	Linum *catharticum*. Purging-flax, A V. VI.	n	1	1	1	n
197	Ornithogalum *luteum*. Yellow ſtar of Bethlehem, P	o	1	1	1	10
198	——— *minimum*,	o	1	1	n	o
199	Juncus *effuſus*. Common ſoft-ruſh, P V.—VIII.	n	1	n	1	o
200	——— *glomeratus*,	n	1	n	n	n
201	——— *ſquarroſas*. Moſs-ruſh, or gooſe-corn, P VI.	n	n	n	1	n
202	——— *bufonius*. Toad-ruſh, A VII. VIII.	n	n	n	1	n
203	——— *bulboſus*. Bulbous-ruſh, P VII.	1	1	1	1	n
204	——— *piloſus*. Common hairy wood-ruſh or graſs, P IX.	o	1	1	1	n
205	——— *campeſtris*. Small hairy-wood-ruſh, P IV.	n	1	1	1	n

* I have found, by experience, that ſheep eat this in the field early in the ſpring. Cattle uſually do not eat it while growing, and ſometimes reject it when given them by the hand; but after they have been accuſtomed to it for ſome time, they eat it as greedily as any plant whatever.

		O.	G.	Sh.	H.	Sw.
206	Trientalis *Europæa.* Chickweed, winter-green, P VI. - -	0	1	1	1	n
207	Epilobium *anguſtifolium.* Roſebay-willow herb, P VII. VIII. - -	1	1	1	0	0
208	——— *hirſutum.* Small-flowered hairy willow-herb, P VII. -	10	1	1	1	0
209	——— *montanum.* Smooth-leaved willow-herb, B VI. - -	n	1	n	10	0
210	——— *paluſtre.* Marſh willow-herb, P VII. - - -	n	1	1	1	0
211	Erica *vulgaris.* Common heath, or ling, T VI.—VIII. - -	1	10	10	1	0
212	——*tetralix.* Croſs-leaved heath, T VII. VIII. - -	n	1	n	n	0
213	Vaccinium *ulginoſum.* The great bilbury buſh, T IV. V. - -	1	1	1	1	0
214	——— *myrtyllus.* Black wortleberries, or bilberries, T IV. V. -	0	1	10	0	n
215	——— *vitis idæa.* Red wortleberries, T. IV. V. - -	0	1	0	0	n
216	——— *oxycoccus.* Cranberries, moſs or moor-berries, T IV. V. -	0	1	0	0	1
217	Polygonum *amphibium.* Perennial arſmart, P VI. VII. - -	0	1	1	1	1
218	——— *perſicaria.* Dead or ſpotted arſmart, A VIII. IX. - -	0	1	1	1	0
219	——— *viviparum.* Small biſtort, or ſnakeweed, P VI. - -	1	1	10	0	1
220	——— *aviculare.* Knot-graſs, A VI.—IX. - - -	1	1	1	1	1
221	——— *convolvulus.* Black *bindweed*, A VI.—IX. - -	1	1	0	0	0
222	——— *fagopyrum.* Buck-wheat, or Brank, A VII. VIII. - -	1	1	1	0	0
223	Dianthus *deltoides.* Maiden-pinks, P VI. VII. - - -	1	1	1	1	0
224	——— *arenarius.* Stone-pink, P VII. - - - -	1	n	1	1	n

		O.	G.	Sh.	H.	Sw.
225	Dianthus *armeria*. Deptford pink, A VII.	1	n	1	n	n
226	Cucubalus *behen*. Bladder campion, or white corn-campion, P VII.	1	1	1	o	o
227	——— *dioicus*,	10	1	1	1	1
228	Silene *nutans*. Nottingham-catchfly, P. VI. VII.	o	1	1	1	1
229	—— *rupeſtris*,	n	n	n	1	n
230	—— *veſcaria*,	o	n	1	10	10
231	Alſine *media*. *Common chickweed*, A I.—III.	1	o	10	1	1
232	Stellaria *graminia*. Leſſer ſtitchwort, P VII.	1	1	1	1	1
233	——— *pentagyna*,	n	n	1	1	1
234	Spergula *arvenſis*. Corn-ſpurry, yarr, A VIII. *	o	1	1	1	1
235	Agroſtemma *githaco*. Cockle, A VI.	n	1	1	1	n
236	Lychnis *flos cuculi*. Meadow-pinks, wild williams, or cuckow-flower, P VI.	n	1	1	1	n
237	Oxalis *acetoſella*. Wood ſorrel, P IV.	01	1	1	o	1
238	Sedum *telephium*. Orpine, or live-long, P VIII.	1	1	1	o	1
239	——— *album*. White ſtone-crop, P VI. VII.	n	1	o	n	n
240	——— *acre*. Wall ſtone-crop, or pepper, P. VI.	o	1	o	o	o
241	——— *ſexangulare*. Inſipid ſtone-crop, B VII.	n	1	n	n	n

* There is no plant I know that cattle or ſheep are more greedy of eating green,—either as it grows, or when cut, than this one.

		O.	G.	Sh.	H.	Sw.
242	Lythrum *ſalicaria.* Purple-ſpiked looſe ſtrife, or willow-herb, P VII. -	1	1	1	1	0
243	Prunus *padus.* Wild cluſter, or bird-cherry, T V. - -	10	1	1	0	1
244	——— *ſpinoſa.* Black-thorn, or ſloe-tree, T III. IV. - -	n	1	1	1	n
245	Cratægus *aria.* White beam-tree, T V. - - -	n	1	1	n	n
246	——— *oxycantha.* White-thorn, or haw-tree, T V. - - -	1	1	10	1	n
247	Spirea *filipendula.* Dropwort, T VII. - - - -	1	1	1	0	1
248	—— *ulmaria.* Meadow-ſweet, P. VI. VII. - - - -	0	1	1	0	1
249	Tormentilla *erecta.* Tormentil, or ſeptfoil, P. VI. - - - -	1	1	1	0	1
250	Comarum *paluſtre.* Purple marſh cinquefoil, P. VI. - - -	10	1	10	0	0
251	Geum *urbanum.* Common avens, or herb-bennet, P. VI. VII. -	1	1	1	10	1
252	—— *rivale.* Water-avens, P VII. - - - -	01	1	1	10	10
253	Tilia *Europæa.* Lime, or Linden-tree, T VII. - - - - -	1	1	1	1	n
254	Ciſtus *helianthemum.* Dwarf ciſtus, or little ſunflower, P VII. - -	n	1	1	1	0
255	Lionurus *cardiaca.* Motherwort, B VII. - - - -	01	1	1	1	0
256	Prunella *vulgaris.* Self-heal, P. VIII. - - - - -	1	1	1	10	n
257	Scutellaria *galericulata.* Hooded willow-herb, P VIII. - - -	1	1	1	0	0
258	Melampyrum *criſtatum.* Creſted cow-wheat, A VII. - - - -	1	1	1	0	0
259	——— *arvenſe.* Purple cow-wheat, A VII. - - - -	1	1	0	n	n
260	——— *nemorum,* - - - - - - - -	1	1	1	1	n

		O.	G.	Sh.	H.	Sw.
261	Melampyrum *pratenſe*. Meadow cow-wheat, A VII.	1	1	1	o	o
262	——— *ſylvaticum*. Yellow cow-wheat A VI.—VIII.	1	1	1	n	n
263	Euphraſia *officinalis*. Eyebright, A VIII. IX.	1	1	1	1	o
264	——— *odontites*. Red eyebright, A VIII. IX.	1	1	1	1	n
265	Draba *verna*. Common whitlow-graſs, A IV.	10	1	1	1	o
266	—— *incana*. Wreathen-podded whitlow-graſs, B V.	10	1	n	n	n
267	Braſſica *campeſtris*. ——— cabbage,	1	1	1	o	1
268	——— *napus*. Wild navew, B V.	1	1	n	n	1
269	Sinapis *arvenſis*. Wild muſtard, or charlock, A V.	1	1	1	10	1
270	Siſymbrium *amphibium*. Water-radiſh, P VI.	o	01	01	n	n
271	——— *pinnatifidum*,	1	n	1	1	1
272	——— *ſophia*. Flixweed, A VII.	1	10	1	10	o
273	Eryſimum *officinale*. Hedge muſtard, A V.	o	1	1	o	o
274	——— *cherianthoides*. Treacle wormſeed, A VII.	1	1	1	1	1
275	——— *barbarea*. Winter creſſes, or rocket, P V.	1	10	10	o	o
276	——— *Alliaria*. Jack-by-the-hedge, or ſauce alone, P V.	1	1	o	o	o
277	Malva *rotundifolia*. Dwarf-mallow, A VI.—X.	01	o	1	1	n
278	—— *ſylveſtris*. Common mallow, P V.—X.	1	n	n	n	n
279	—— *alcea*. Vervain mallow, P VII.—IX.	1	1	1	1	n

		O.	G.	Sh.	H.	Sw.
280	Malva *moſchata.* Jagged-leaved vervain-mallow, B. VIII. - -	1	n	0	1	n
281	Leontodon *taraxacum.* Dandelion, P. IV.—VI. - - -	01	1	10	0	1
282	——— *autumnale.* Yellow devil's-bit, P. VIII. - - - -	0	1	0	1	1
283	Hypochæris *maculata.* Long-rooted hawkweed, P V.—VII. - -	0	1	10	1	1
284	Hieracium *alpinum.* Mountain hawkweed, P VII*. - - -	n	n	n	n	n
285	——— *piloſella.* Common creeping mouſe-ear, A V. - -	0	1	10	0	n
286	——— *dubium.* Mouſe-ear hawkweed, P VII. VIII. - - -	n	n	1	n	n
287	——— *auriculata.* Narrow-leaved hawkweed, P VII. - -	0	n	1	n	n
288	——— *præmorſum,* - - - - -	1	n	1	n	n
289	——— *murorum.* French, or golden lungwort, P VII. - -	n	n	n	1	n
290	——— *umbellatum.* Narrow-leaved buſhy hawkweed, P VII. VIII. -	1	1	1	1	1
291	Crepis *tectorum.* Smooth ſuccory hawkweed, A VI.—IX. - -	1	1	10	10	1
292	Lapſana *communis.* Nipple-wort, A VI. VII. - - -	1	0	1	1	1
293	Serratula *tinctoria.* Saw-wort, P VII. - - - -	0	1	0	10	0
294	——— *alpina.* Mountain ſaw-wort, P VII. - - -	n	n	n	n	n
295	——— *arvenſis.* Corn ſaw-wort, or way-thiſtle, P VII. - -	10	1	10	10	10
296	Tuſſilago *farfara.* Common colt's-foot, P III. - - -	10	1	1	0	0

* I have remarked, that ſheep are extremely fond of all the plants of this claſs, as well as the leontodons.

		O.	G.	Sh.	H.	Sw.
297	Tuſſilago *petaſites*. Common butter-bur, P III. IV.	1	1	1	1	n
298	Arnica *montana*,	0	1	1	10	n
299	Matricaria *ſuaveolens*. Sweet-ſcented fever-few, A V.	n	1	1	1	0
300	—— *chamomilla*. Corn fever-few, A V.	1	1	1	10	0
301	Viola *odorata*. Sweet-violet, P III.	n	n	n	n	n
302	—— *canina*. Dog's-violet, P IV.	1	1	1	0	1
303	—— *paluſtris*. Marſh-violet, P VI.	1	n	10	n	n
304	—— *hirſuta*. Hairy-violet, P III.	1	1	1	1	n
305	—— *mirabilis*,	1	n	1	0	n
306	—— *biflora*,	n	1	n	n	n
307	—— *tricolor*. Panſies, or heart's-eaſe, A V.—IX.	1	1	0	0	10
308	Carex *vulpina*. Great carex, P. VII.	n	1	n	1	0
309	—— *muricata*. Prickly carex, P VI.	n	1	n	1	n
310	—— *digitata*,	n	n	1	n	n
311	—— *globularis*,	n	1	n	n	n
312	—— *filiformis*,	1	n	1	n	n
313	—— *capillaris*,	1	n	1	n	1
314	—— *panicea*. Pink carex, P VI. VII.	1	1	1	n	n
315	—— *pſeudo-cyperus*. Baſtard carex, P VII.	1	1	1	n	n

		O.	G.	Sh.	H.	Sw.
316	Carex *cæſpitoſa*. Turfy carex, P. V. VI.	1	1	1	1	n
317	—— *veſicaria*. Greater bladder carex, A. VI.	1	1	1	n	n
318	—— *acuta*. Brown carex, P V.	1	1	1	1	o
319	Betula *alba*. The birch-tree, T VII.	1	1	1	1	o
320	—— *alnus*,	1	1	1	1	o
321	—— *nana*. Dwarf birch,	1	1	1	1	n
322	Quercus *robur*. The oak-tree, T IV.	1	1	1	1	n
323	Fagus *ſylvatica*. The beech-tree, T V.	n	1	1	n	n
324	Carpinus *betulus*. The hornbeam-tree, T V.	1	n	n	n	n
325	Salix *pentandria*. Sweet-willow, T IV.	n	1	1	n	n
326	—— *amygdalina*. Almond-leaved willow, T V.	n	1	n	1	n
327	—— *cinerea*,	n	1	n	1	n
328	—— *caprea*. Common-ſallow, T IV. V.	1	1	1	1	n
329	—— *alba*. Common white-willow, T IV.	1	1	1	1	n
330	—— *viminalis*. The oſier, T IV.	1	1	1	1	n
331	Hippophæ *rhamnoides*. Sallow-thorn, or ſea-buckthorn, T VI.	o	1	1	1	n
332	Populus *tremula*. Trembling-poplar, or aſp-tree, T III.	n	1	1	o	o
333	—— *alba*. White-poplar, T III.	10	1	1	1	n
334	—— *nigra*. Black-poplar, T III.	1	1	1	1	n

		O.	G.	Sh.	H.	Sw.
335	Mercurialis *perennis*. Dog's-mercury, P IV. V.	o	1	1	n	n
336	Juniperus *communis*. Common juniper, T V.	n	1	1	1	n
337	Atriplex *laciniata*. Jagged ſea-orache, A VIII.	1	n	n	n	n
338	——— *haſtata*. Wild-orache, A VIII. IX.	1	n	n	n	n
339	——— *patula*. Narrow-leaved orache, A VIII.	1	1	1	n	1
340	——— *portulacoides*. Sea-purſlain, T VIII.	1	1	1	1	o
341	Fraxinus *excelſior*. Common aſh-tree, T III. IV.	1	1	1	1	o
342	Equiſetum *arvenſe*. Corn horſe-tail, P. III.	o	1	10	o	n
343	——— *ſylvaticum*. Wood horſe-tail, P IV. V.	n	1	n	1	n
344	——— *paluſtre*. Marſh horſe-tail, P VI.	n	1	n	n	n
345	——— *fluviatile*. River horſe-tail, P V.	10	1	1	1	1
346	——— *hyemale*. Rough horſe-tail, or ſhave-graſs, P VII. VIII.	o	1	o	n	10

§ III.

Plants that were eaten by three of the five animals, or only rejected by three of them.

347	Liguſtrum *vulgare*. Privet, or prim, T V.	1	1	1	o	o
348	Veronica *maritima*,	1	1	1	o	o
349	——— *ſpicata*. Upright-ſpiked male ſpeedwell, or flewellin, P VI.	1	o	1	o	n
350	——— *anagallis*. Long-leaved water ſpeedwell, P VII.	1	1	1	o	o

		O.	G.	Sh.	H.	Sw.
351	Veronica *becabunga*. Common brooklime, P VI. - - -	1	1	n	1	o
352	——— *chamædrys*. Wild germander, P V. - - - -	1	1	o	o	o
353	——— *alpina*. Stalked-ſpeedwell, P V. - - - -	1	1	1	n	n
354	——— *ſerpyllifolia*. Paul's-betony, little or ſmooth ſpeedwell, P V. -	n	n	1	n	n
355	——— *perigrina*, - - - - - -	n	n	o	n	n
356	——— *arvenſis*. Speedwell, or chickweed, A V. - - -	n	n	n	1	n
357	Elymus *arenarius*. Sea-lime-graſs, P V. VI. - - - -	1	1	o	1	n
358	Hordeum *murinum*. Wall barley-graſs, or way-bennet, A IV.—VIII. -	n	n	1	1	n
359	Plantago *major*. Great-plantain, or way-bread, A VI. VII. - -	o	1	1	o	1
360	——— *media*. Hoary-plantain, P VII. VIII. - - -	o	1	1	o	1
361	——— *lanceolata*. Narrow-leaved-plantain, or ribwort, P VI. VII. * Tab. XV.	o	1	1	1	n
362	——— *dubia*, - - - - - - -	n	1	1	o	n
363	——— *coronopus*. Buckthorn-plantain, ſtar of the earth, A VII. VIII.	n	1	1	n	n
364	——— *maritima*. Narrow-leaved plantain, P VI. VII. Tab. XVI. -	10	1	1	n	n
365	Lithoſpermum *officinale*. Gromell, or Gromwell, P V. VI. - -	o	1	1	o	n
366	——————— *arvenſe*. Baſtard-alkanet, A V. VI. - - -	10	1	1	o	o
367	Pulmonaria *officinalis*. Bugloſs-cowſlips, or long-leaved ſage of Jeruſalem, P V.	01	1	1	o	o

* Plantago *lancelata*. Cattle eat this plant very readliy, as I have often experienced.

		O.	G.	Sh.	H.	Sw.
368	Primula *vulgaris*. Common primroſe, P IV. V.	01	1	1	0	0
369	——— *farinoſa*. Bird's-eye, P V.	0	1	1	1	n
370	Samolus *valerandi*. Round-leaved water-pimpernel, P VI.	1	1	1	0	n
371	Lyſimachia *vulgaris*. Yellow willow-herb, or looſeſtrife, P VI. VII.	1	1	10	0	0
372	——— *thirſiflora*. Tufted looſeſtrife, P VI.	01	1	10	0	0
373	——— *nummularia*. Moneywort, P VI.	1	10	1	0	n
374	Lonicera *periclymenum*. Common honeyſuckle or woodbine, T V. VI.	1	1	1	0	n
375	——— *xyloſteum*,	0	1	1	0	n
376	Rhamnus *catharticus*. Buckthorn, T IV. V.	0	1	1	1	n
377	——— *frangula*. Blackberry-bearing aldar, T IV. V.	0	1	1	n	n
378	Herniaria *glabra*. Smooth rupture-wort, A VII.	1	0	1	1	0
379	Chenopodium *henricus*. Common Engliſh mercury, or allgood, P VIII.	0	10	10	0	0
380	——— *urbicum*. Upright blite, A VIII. IX.	0	1	1	0	n
381	——— *rubrum*. Sharp leaved gooſefoot, A VIII.	1	1	1	0	1
382	——— *murale*. Common gooſefoot, or ſowbane, A VIII.	1	n	n	n	n
383	——— *album*. Common orache, A VIII.	1	1	1	0	1
384	——— *hybridum*. Mapple-leaved blite, A VIII.	1	0	1	0	0
385	——— *viride*. Green blite, A	n	1	1	n	1
386	——— *glaucum*. Oak-leaved blite, A VIII.	1	n	n	1	n

		O.	G.	Sh.	H.	Sw.
387	Chenopodium *vulvaria*. Stinking orache, A VIII. - -	I	I	I	I	o
388	——— *polyſpermum*. Round-leaved blite, or all-ſeed, A - -	I	o	I	o	n
389	Athamanta *libanotis* Mountain ſtone-parſley, P VIII. IX. - -	o	n	I	n	I
390	Sium *latifolium*. Great water-parſnip, P VII. VIII. - -	o	o	oI	I	I
391	Parnaſſia *vulgaris*. Graſs of Parnaſſus, P VIII. - - -	o	I	IO	I	o
392	Statice *armeria*. Thrift, ſea-gillyflower, P VII. VIII. - -	o	I	IO	I	o
393	—— *limonium*. Sea-lavender, P VII. VIII. - - -	n	I	I	n	n
394	Allium *urſinum*. Ramſon, P V. - - - -	I	n	n	n	n
395	—— *ſcorodopraſum*, - - - - - -	I	o	o	n	o
396	—— *oleraceum*. Wild garlic, P VII. - - -	I	I	I	n	I
397	Aſparagus *officinalis*. Sparagus or ſperage, P VII. VIII. - -	I	I	I	o	o
398	Convallaria *majalis*. Cornwall-lily, or May-lily, P V. - - -	o	I	I	o	o
399	——— *multiflora*. Solomon's ſeal, P V. VI. - - - - -	I	I	I	o	o
400	——— *polygonatum*. Sweet-ſmelling Solomon's ſeal, P V. - -	o	I	I	o	o
401	Berberis *vulgaris*. Barberry, or peperidge-buſh, T - -	I	I	I	o	o
402	Acer *platanoides*. Maple-tree, T - - - - -	I	I	I	o	o
403	Papaver *dubium*. Long ſmooth-headed poppy, A VI. VII. - -	I	I	I	o	n
404	——— *rhœas*. Red corn-poppy, A VII VIII. - -	n	I	I	o	n
405	Euphorbia *helioſcopia*. Sunſpurge, or wartwort, A VII. - -	o	oI	oI	I	n

		O.	G.	Sh.	H.	Sw.
406	Euphorbia *peplus*. Petty ſpurge, A VII. - - -	o	n	n	10	n
407	——— *paluſtris*, - - - - - -	o	1	10	o	o
408	Delphinium *conſolida*. Wild larkſpur, A VI. - - - -	o	1	1	10	o
409	Trollius *Europæus*. Globe-flower, or Locker-gowans, P V. VI. -	o	1	1	o	1
410	Ajuga *pyramidalis*. Mountain-bugle, or ſicklewort, P VI. - -	10	1	1	o	o
411	Origanum *vulgare*. Wild marjorum, P VII. - - -	o	1	1	10	n
412	Mentha *arvenſis*. Corn-mint, P VIII. IX. - - - - - -	o	1	01	1	o
413	——— *aquatica*. Water-mint, P. VII. - - - - - -	n	n	n	1	o
414	Galeopſis *tetrahit*. Nettle-hemp, or hemp-leaved dead nettle, T VIII. -	o	1	1	o	o
415	Rhinanthus *criſta galli*. Yellow rattle, or cock's-comb, A VI. VII. -	o	1	1	1	n
416	Lathrea *ſquamaria*. Toothwort, P IV. V. - - - -	o	1	1	o	1
417	Alyſſum *incanum*, - - - - - - - - - -	10	1	1	o	n
418	Thlaſpi *arvenſe*. Treacle-muſtard, or penny-creſs, A VI. VII. -	1	1	o	o	1
419	——— *campeſtre*. Mithridate-muſtard, or baſtard-creſs, A VII. - -	10	1	o	o	1
420	Lepidium *perenne*. Dittander, or pepperwort, P VI. VII. - -	1	1	1	o	n
421	——— *oſyris*, - - - - - - - - - -	1	1	n	o	o
422	Turritis *glabra*. Great tower-muſtard, A V. - - - - -	1	1	1	o	o
423	——— *hirſuta*. Hairy tower-muſtard, B VI. - - - - -	o	n	n	n	n
424	Cardamine *pratenſis*. Common ladies'-ſmoke, or cuckow-flower, P IV. -	10	1	1	o	o

		O.	G.	Sh.	H.	Sw.
425	Cardamine *amara*. Bitter creſſes, or ladies'-ſmoke, P IV. V. - -	10	n	1	n	n
426	Fumaria *officinalis*. Fumitory, A IV.—VI. - - -	1	10	1	0	0
427	——— *bulboſa*, - - - - - -	10	1	n	n	n
428	Hypericum *quadrangulare*. St. Peter's wort, P VII. - - -	1	1	1	0	0
429	——— *perforatum*. St. John's wort, P VII. - - -	1	1	1	0	0
430	——— *hirſutum*. Tutſan, or hairy St. John's-wort, P VII. -	n	n	1	0	n
431	Chicorium *intybus*. Wild ſuccory, B VII. VIII. - - - -	0	1	1	0	1
432	Arctium *lappa*. Burdock, or clor-bur, B VII. VIII. - - - -	1	1	0	0	01
433	Artemiſia *vulgaris*. Mugwort, P VIII. * - - - -	10	10	0	10	0
434	——— *campeſtris*. Field ſouthernwood, P VIII. - - -	n	0	0	n	n
435	——— *rupeſtris*, - - - - -	1	0	1	1	n
436	——— *abſinthium*. Common wormwood, P VIII. - - -	0	10	1	10	0
437	——— *maritima*. Sea wormwood, P VIII. - - -	0	0	0	1	n
438	Gnaphalium *dioicum*. Mountain cud-weed, or cats-foot, P V. - -	0	0	1	1	1
439	——— *ſylvaticum*. Upright cud-weed, B VIII. - -	n	1	n	n	n
440	——— *uliginoſum*. Black-headed cud-weed, A VIII. - -	0	0	n	n	n
441	Senecio *vulgaris*. Common groundſel, or Simpſon, A V. - - -	10	1	0	0	1

* Artemiſia *vulgaris*—Sheep certainly eat the leaves of this plant when young, and are uncommonly fond of its roots.

of its roots.

leaves of this plant when young, and are uncommonly fond

		O.	G.	Sh.	H.	Sw.
442	Senecio *jacobæa*. Common ragwort, P VII. *	10	n	o	o	n
443	Inula *pulicaria*. Small fleabane, A VIII. IX.	o	o	1	o	n
444	—— *dyſenterica*. Middle fleabane, P VIII.	01	o	o	n	n
445	—— *helenium*. Elecampane, P VII. VIII.	o	1	o	1	o
446	—— *ſalicina*,	1	1	1	1	n
447	After *tripolinum*. Sea ſtarwort, P VIII.	o	1	10	1	o
448	Chryſanthemum *leucanthemum*. Greater daiſy, ox-eye, P V.	o	1	1	1	o
449	Anthemis *cotula*. Stinking May-weed, A VI. VII.	o	01	01	o	o
450	——— *arvenſis*. Corn-camomile, B VII.	1	n	1	10	n
451	——— *tinctoria*. Common ox-eye, P VII.	o	1	01	1	o
452	Cnicus *oleraceus*,	o	1	o	1	1
453	Calendula *officinalis*. Garden-marygold,	1	10	1	10	o
454	Zoſtera *marina*. Graſs-wrack, P	01	n	n	1	1
455	Sparganium *erectum*. Great bur-reed, P VII.	01	o	o	1	1
456	——— *natans*. The leaſt bur-reed, P VII.	1	n	n	n	n
457	Sagittaria *ſagittifolia*. Arrow-head, P VI.	10	1	n	1	1
458	Lycopus *Europæus*. Water horehound, P VII.	o	1	1	o	n
459	Salvia *pratenſis*. Meadow-clary, P	o	1	1	o	n

* Senecio *jacobæa*—Sheep likewiſe eat this plant greedily when young—Cattle ſeldom taſte it.

		O.	G.	Sh.	H.	Sw.
460	Valeriana *officinalis*. Great wild valerian, P VI.	o	1	1	o	o
461	——— *dioica*. Small wild or marſh valerian, P VI.	n	1	10	n	n
462	——— *locuſta*. Lambs-lettuce, or corn-ſallad, A IV. V.	n	1	1	n	n
463	Eriophorum *polyſtachyon*. Cotton-graſs, P VI. VII.	o	1	1	o	o
464	——— *vaginatum*. Hares-tail ruſh, P II.—IV.	n	10	n	n	n
465	——— *alpinum*,	n	o	n	n	n
466	Lolium *temulentum*. Annual darnel-graſs, A VII. VIII.	n	n	10	n	n
467	——— *perenne*. Perennial darnel-graſs, or rye-graſs, P VI. *	1	10	o	n	n
468	Potamogeton *natans*. Broad-leaved pond-weed, P VIII.	1	1	o	o	o
469	Symphytum *officinale*. Comfrey, P	1	o	1	o	o
470	Echium *vulgare*. Viper's bugloſs, P VII.	10	o	10	o	n
471	Androſace *ſeptentrionalis*,	o	1	1	n	o
472	Anagallis *arvenſis*. Male pimpernel, A VI.—VIII.	1	1	o	n	n
473	Verbaſcum *nigrum*. Sage-leaved black mullein,	o	o	10	o	1
474	Solanum *dulcamara*. Woody nightſhade, bitter ſweet, P VII.	o	1	1	o	o
475	Hedera *helix*. Ivy, P	o	o	1	1	n
476	Sanicula *Europæa*. Sanicle, P V. VI.	n	10	1	o	n

* Rye-graſs—The experience of almoſt every farmer in Britain can evince, that ſheep moſt readily eat this graſs when in leaf;—when in ſtalk, it is leſs palatable to all animals.

* Rye-grafs.—The experience of almoft every farmer in Britain can evince, that fheep *moft readily eat this* grafs when in leaf;—when in ftalk, it is lefs palatable to all animals.

		O.	G.	Sh.	H.	Sw.
477	Anthericum *ramoſum*,	n	1	10	n	n
478	——— *calyculatum.* Scottiſh aſphodel, P IX.	n	o	o	n	n
479	——— *oſſifragum*,	1	n	o	1	o
480	Rumex *aquaticus*,	o	o	10	o	10
481	——— *criſpus.* Curled dock, P VI. VII.	o	o	n	n	n
482	——— *acutus.* Sharp-pointed dock, P. VI. *	o	n	n	o	n
483	——— *digynus.* Round-leaved mountain ſorrel, P VI.	n	1	n	n	n
484	Daphne *mezereon.* Mezereon-tree, T II.	o	1	1	o	n
485	Paris *quadrifolia.* Herb Paris, true love, or one berry, P V. VI.	o	1	1	o	o
486	Andromeda *polifolia.* Marſh ciſtus, or wild roſemary, P III. IV.	o	1	1	o	n
487	——— *cærulea*,	o	o1	o	o	n
488	——— *hypnoides*,	o	o1	o	o	n
489	Scleranthus *annuus.* German knot-graſs, or annual knawel, A VIII.	o	1	n	1	n
490	Ceraſtium *viſcoſum.* Broad-leaved mouſe-ear chickweed, A IV. V.	o	1	o	1	n
491	——— *alpinum.* Mountain mouſe-ear chickweed, P VI.	1	n	1	n	n
492	——— *eupatoria.* Agrimony, P VI.	o	1	1	o	o
493	Sempervivum *tectorum.* Houſeleek, P VII.	n	1	1	n	n

* Dock.—Cattle ſeldom reject this plant, when it is cut and given them by the hand. They never taſte it when growing in the field.

		O.	G.	Sh.	H.	Sw.
494	Nymphæa *lutea*. Yellow-water lily, P VIII.	o	o1	o	o	1
495	——— *alba*. White-water lily, P VII.	o	10	n	o	1
496	Actæa *ſpicata*. Herb Chriſtopher, or bane-berries, P V. VI.	o	1	1	o	o
497	Aconitum *lycoctonum*,	o	1	10	o	n
498	Aquilegia *vulgaris*. Common columbine, P VI.	o	1	o1	o	o
499	Anemone *hepatica*,	o	10	1	o	o
500	——— *pulſatilla*. Paſcue flower, P IV.	o	1	1	o	o
501	——— *pratenſis*,	n	n	n	o	n
502	——— *nemoroſa*. Common wood anemone, P IV.	o	1	1	o	o
503	——— *verna*,	n	n	n	o	n
504	Ranunculus *flammula*. Leſſer ſpiderwort, P VI.—IX.	o	o	o	1	o
505	——— *ficaria*,	o	1	1	o	n
506	——— *auricomus*. Sweet-wood crowfoot, or goldilocks, P IV.	1	1	o	o	n
507	——— *ſceleratus*. Round-leaved water crowfoot, A V. VI.	o	1	o	o	n
508	——— *acris*. Upright meadow crowfoot, P. VI. VII.	o	1	1	o	o
509	——— *repens*. Creeping crowfoot, or butter-cups, P. V.	n	1	n	o	n
510	——— *bulboſus*. Bulbous crowfoot, or butter-cups, P V.	o	n	n	o	n
511	Caltha *paluſtris*. Marſh marygold, P IV.	o	1	1	o	o
512	Teucrium *ſcordium*. Water Germander, P VIII.	o	1	1	o	o

512 Teucrium *scordium.* Water Germander, P VIII.

		O.	G.	Sh.	H.	Sw.
513	Thymus *ſerpyllum.* Mother of thyme, P VII. VIII.	n	1	1	n	o
114	——— *acinos.* Wild baſil, A VII. VIII.	10	o	o	1	n
515	Clinopodium *vulgare.* Great wild baſil, P VIII.	n	1	1	o	n
516	Glechoma *hederacea.* Ground-ivy, P V.	o	o	1	10	o
517	Stachys *ſylvatica.* Hedge-nettle, P VII. VIII.	o	1	1	o	o
518	——— *paluſtris.* Clown's all-heal, P VIII.	o	o	1	o	o
519	Lamium *album.* White dead nettle, or archangel, P V.	10	1	1	o	o
520	——— *purpureum.* Red archangel, or dead nettle, A V.	o	1	1	1	n
521	——— *amplexicaule.* Great hen-bit, A VI.	n	1	1	1	n
522	Pedicularis *ſylvatica.* Common louſe-wort, P V. VI.	o	n	n	n	o
523	——— *paluſtris.* Marſh louſe-wort, VI.	o	1	o	o	o1
524	——— *ſceptrum carolin,*	1	1	n	o	n
525	——— *lapponica,*	n	1	1	n	n
526	Bartſia *alpina.* Mountain eyebright cow wheat, P VII.	n	1	1	n	n
527	Linnæa *borealis,*	o	1	1	o	o
528	Bidens *tripartitus.* Trifid water-hemp agrimony, A VIII. IX.	1	o	1	o	o
529	——— *cernuis.* Whole-leaved water-hemp agrimony, A VII. VIII.	n	1	n	o	n
530	Tanacetum *vulgare.* Common tanſy, P. VII.	1	o	1	o	o
531	Orchis *morio.* Female fool-ſtones, or orchis, P V. VI.	n	1	n	o	n

		O.	G.	Sh.	H.	Sw.
532	Orchis *conopſea.* Red-handed orchis, B VI. - - -	1	1	n	o	n
533	—— *latifolia.* Male-handed orchis, P V. VI. - -	1	n	n	o	n
534	—— *maculata.* Female-handed orchis, P VI. - - -	10	o	1	o	n
535	Ophrys *ovata.* Common tway-blade, P V. VI. - - -	1	1	n	n	n
536	Xanthium *ſtrumarium.* Leſſer-burdock, A VIII. IX. - -	o	1	o	1	o
537	Pinus *ſylveſtris.* Scottiſh fir, T V. - - - -	n	10	01	o	n
538	—— *abies.* Common pitch fir, T - - - -	n	1	o	n	n
539	Myrica *gale.* Gale, or ſweet-willow, T - - -	o	1	o	1	n
540	Taxus *baccata.* Yew-tree, T - - - - -	o	1	1	o	n
541	Rhodiola *roſea.* Roſewort, P VI. VII. - - - -	o	1	1	n	o
542	Polypodium *vulgare.* Common polypody, P - - -	n	01	o	n	n
543	——— *filix mas.* Male polypody, or fern, P - -	o	1	o	n	n
544	——— *fragile.* Brittle polypody, P - - -	1	1	n	1	n
545	Carlina *vulgaris.* Wild carline thiſtle, B VI. - - -	o	1	n	n	n

§ IV.

Plants that were eaten by two of the five animals, or rejected by four of them.

546	Salicornea *Europea.* Marſh-ſamphire, jointed-glaſſwort, or ſaltwort, A VIII. IX.	o	n	o	o	1
547	Hippuris *vulgaris.* Mares'-tail, P V. - - -	o	1	o	o	o

547 Hippuris *vulgaris*. Mares-tail, -

		O.	G.	Sh.	H.	Sw.
548	Circæa *lutetiana alpina*. Enchanters' nightſhade, P VI. VII. -	n	n	I	n	n
549	Verbena *officinalis*. Vervain, - - - -	o	o	I	o	n
550	Iris *pſeudacorus*. Yellow-water flower-de-luce, P VII. - -	o	I	o	o	o
551	Schoenus *albus*. White-flowered ruſh-graſs, P VII. - - -	n	I	n	n	n
552	Sagina *procumbens*. Pearlwort, or chickweed breakſtone, A VI. -	n	n	I	n	n
553	Myoſotis *paluſtris*, - - - - -	o	I	o	n	o
554	Hottonia *paluſtris*. Water-violet, P VII. VIII. - -	I	n	n	n	o
555	Hyoſcyamus *niger*. Common henbane, A VI. - - -	o	oI	o	o	o
556	Glaux *maritima*. Sea-milkwort, or black-ſaltwort, P VII. -	I	n	n	n	n
557	Aſclepias *vincetoxicum*, - - - - -	o	I	o	o	n
558	Gentiana *amarella*. Autumnal-gentian, or fellwort, A VII. VIII. -	n	n	I	o	n
559	——— *centaurium*. Leſſor centory, A VI.—VIII. - - -	Io	n	n	n	n
560	Tordylium *anthriſcus*. Hedge-parſley, B VIII. - -	n	n	n	I	n
561	Conium *maculatum*. Hemloc, A VI. VII. - - -	o	o	I	o	n
562	Æthanthe *fiſtuloſa*. Water-dropwort, P VII. - - -	o	n	n	o	n
563	——— *crocata*, - - - - -	o	n	I	o	n
564	Sambucus *nigra*. Common elder, T V. VI. - - -	o	o	I	o	n
565	Tulipa *ſylveſtris*. The tulip, P VI. - - - -	n	I	n	n	n
566	Aliſma *plantago*. Great water-plantain, P VI. - - -	o	I	o	o	o

		O.	G.	Sh.	H.	Sw.
567	Chryſoſplenium *alternifolium.* Alternate-leaved golden ſaxifrage, P IV. -	10	n	o	o	o
568	Adoxa *moſchatellina.* Tuberoſe moſchatel, P III. IV. - -	o	1	n	n	n
569	Pyrola *rotundifolia.* Common winter-green, P VI. VII. - -	o	1	o	o	o
570	—— *ſecunda.* Dented-leaved winter-green, P VI. - - -	n	1	o	n	n
571	—— *uniflora,* - - - - - -	o	1	o	n	n
572	Ledum *paluſtre.* Marſh-ciſtus, or wild roſemary, - -	o	1	o	o	o
573	Saponaria *faſtigiata.* - - - - -	n	o	1	n	n
574	Saxifraga *granulata.* White ſingreen, or ſaxifrage, P V. - -	o	1	o	o	o
575	Arenaria *ſerpyllifolia.* The leaſt chickweed, A V. - - - -	n	n	o	n	n
576	——— *trinervia.* Plantain-leaved chickweed, A V. - -	n	n	10	n	n
577	——— *peploides.* Sea-chickweed, P VI. VII. - -	o	n	o	1	n
578	——— *rubra.* Purple-flowered chickweed, or ſea-ſpurry, A VI. -	n	o	10	n	n
579	Aſarum *Europæa.* Aſarabacca, P V. - - -	1	n	n	n	n
580	Stratiotes *aloides.* Water-aloe, or freſh-water ſoldier, P VI. - -	n	o	n	n	1
581	Nepeta *cataria.* Nap, or cat-mint, P VII. - - - -	o	o	1	o	o
582	Betonica *officinalis.* Wood betony, P VII. VIII. - - -	n	o	1	n	n
583	Scrophularia *nodoſa.* Knobby-rooted figwort, P VII. - - -	o	1	o	o	o
584	Cochlearia *officinalis.* Common, or garden ſcurvy-graſs, B IV. V. -	1	o	o	o	n
585	——— *Danica.* Daniſh ſcurvy-graſs, - - - -	1	o	o	o	n

		O.	G.	Sh.	H.	Sw.
586	Iſatis *tinctoria*. Woad, B VI.	1	o	o	o	n
587	Arabis *thaliana*. Coded mouſe-ear, A V.	n	n	10	n	o
588	Raphanus *raphaniſtrum*. Wild charlock *.	o	n	n	1	n
589	Bunias *cakile*. Sea-rocket, A VI.	n	n	n	1	n
590	Eupatorium *cannabinum*. Hemp-agrimony, or Dutch ditto, P VII. VIII.	o	1	o	o	o
591	Filago *pyramidalis*,	o	o	o	n	n
592	—— *montana*. The leaſt cudweed, A VI. VII.	o	o	1	n	n
593	—— *arvenſis*,	o	n	n	n	n
594	Erigeron *acre*. Blue-flowered fleabane, P VII. VIII.	o	o	n	n	n
595	—— *uniflorum*,	n	1	n	n	n
596	Impatiens *noli me tangere*. Quick in the hand, touch me not, A VIII.	o	1	o	o	n
597	Satyrium *viride*. Frog ſatyrion, or orchis, P V. VI.	n	1	n	n	n
598	—— *nigrum*,	o	o	o	n	n

* Raphanus.—Cattle certainly eat this when green, if cut and given by the hand; they alſo eat it while growing. Sheep ſo readily eat it while growing, that ſome farmers formerly uſed to turn their ſheep among their turnips, to get it deſtroyed without hoeing:—if ſheep have never before taſted turnips, they prefer the charlock to them; but if ſheep have been accuſtomed to turnips before, they devour them with greedineſs, in preference to almoſt any other plant.

		O.	G.	Sh.	H.	Sw.
599	Cypripedium *calceolus*. Ladies'-slipper, P VII. - - - -	n	1	n	n	n
600	Typha *anguſtifolia*. Narrow-leaved cat's-tail, P VII. - - - -	1	n	n	n	o
601	Bryonia *alba*. White-bryony, P V. - - - - - -	o	1	o	o	o
602	Corylus *avellana*. The hazel-tree, T I. II. - - - -	n	1	o	n	o
603	Empetrum *nigrum*. Black-berried heath, crow, or crack-berries, P IV. V. -	o	10	o	o	n

§ V.

Plants that were not eaten by any of the five animals at all.

604	Pinguicula *vulgaris*. Butterwort, or Yorkſhire fanicle, P V.* - -	o	o	o	o	n
605	——— *alpina*. - - - - - -	o	o	o	o	n
606	——— *villoſa*. - - - - - -	o	o	o	o	n
607	Montia *fontana*. Water-chickweed, A IV. - - - - -	o	n	o	o	o
608	Potamogeton *perfoliatum*. Perfoliated pond-weed, P VI. VII. - -	o	o	o	o	o
609	——— *lucens*. Long-leaved pond-weed, P VI. - - -	o	n	o	n	o
610	——— *criſpum*. Greater water-caltrops, P V. VI. - - -	o	n	n	n	n
611	——— *pectinatum*. Fennel-leaved pond-weed, P VI. - - -	n	o	n	n	n

* Pinguicula.—This is the plant called by the vulgar, *rot-graſs*;—it is commonly imagined that ſheep eat it greedily, and that it occaſions the rot in them. I never ſaw it touched by any animal.

		O.	G.	Sh.	H.	Sw.
612	Myoſotis *ſcorpioides.* Mouſe-ear ſcorpion-graſs, P IV.—VIII.	o	o	o	o	o
613	——— *lappula,*	o	n	o	o	n
614	Diapenſia *lapponica,*	o	o	o	o	n
615	Datura *ſtramonium.* Thorny-apple, A VII.	o	o	o	o	n
616	Verbaſcum *thapſus.* Great white mullein, high-taper, or cows-lungwort, B VII.	o	o	o	o	o
617	——— *lychnitis.* Hoary-mullein, B VII.	o	o	o	o	o
618	Solanum *nigrum.* Garden-nightſhade, A VI. VII.	o	o	o	o	o
619	Salſola *kali.* Prickly-graſſwort, A VII. VIII.	o	o	o	o	o
620	Sambucus *ebulus.* Dwarf-elder, walwort, danewort, T VII.	o	o	o	o	o
621	Acorus *calamus.* Sweet-ſmelling flag, or calamus aromaticus, P V.	o	o	o	o	o
622	Polygonum *hydropiper.* Water-pepper, or arſmart, A VII. VIII.	o	o	o	o	o
623	Butomus *umbellatus.* Flowering-ruſh, or water gladiole, P VI.	o	o	o	o	o
624	Dryas *octopetala.* Mountain-avens, P VII.	o	o	o	o	o
625	Aconitum *nappellus,*	o	o	o	o	o
626	Ranunculus *aquatilis.* Various-leaved water-crowfoot, P IV. V.	o	o	o	o	o
627	Ballota *nigra.* Stinking-horehound, A VII.	o	o	o	o	n
628	Marrubium *vulgare.* White-horehound, P VII.	o	o	o	o	n
629	Cochlearia *armorica.* Horſe-raddiſh, P V.	o	o	o	o	o
630	Dentaria *bulbifera.* Coralwort, P IV.	n	n	n	n	o

		O.	G.	Sh.	H.	Sw.
631	Spartium *ſcoparium.* Common broom T V. VI.*	o	n	o	o	n
632	Onopordum *acanthium.* Cotton-*thiſtle,* B VII.	o	o	o	o	n
633	Bellis *perennis.* Common daiſy, P III.—IX.†	o	n	o	o	n
634	Calla *paluſtris,*	n	o	n	o	o
635	Myriophyllum *ſpicatum.* Spiked water-*milfoil,* P VI. VII.	n	o	o	n	n
636	Aſplenium *trichomanes.* Common maiden-hair, P	o	n	o	n	o
637	Acroſticum *ſeptentrionale.* Forked, or horned-fern, P	n	n	n	n	o
638	Chelidonium *majus.*	o	o	o	o	o

* Broom.—Sheep ſometimes eat this in winter;—but they are greedy of the bloſſom, which they pick off with care.—They alſo eat the young pods.

† Daiſy.—It is commonly imagined, that a field in which this plant abounds, affords fine paſture; which proceeds from inaccurate obſervation.—The flowers are not touched, and appear beautiful, the leaves remain uncropt and appear luxuriant, without the appearance of rankneſs, while the other more valuable graſſes are bitten cloſe to the ground.—I believe no animal eats this through choice, but as it is ſmall, and cloſely mixed with other palatable plants, it is ſometimes cropt through neceſſity among them.

From the foregoing Table, it appears,

	Eat	Refuſe	Total
That Goats	470	75	545
Sheep	422	111	583
Oxen	328	187	515
Horſes	293	209	502
Swine	119	180	305
			2400

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ON THE IMPROVEMENT OF WASTE LANDS, BY PLANTING TREES.

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Its extreme durability remarked by Dr. Pallas.
—— by Mr. Harte, and Admiral Greig.

—— by M. le preſident de la tour D'Aigues.
—— by Mr. Ritchie, Britiſh conſul at Venice.
—— by Mr. Evelyn.
—— by a modern gentleman on the Alps.
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No such flush of grass is perceived, where folding is not practised.

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Waſte incurred in hurdling off turnips by ſheep.

Turnips may be often more profitably applied in the rearing of ſheep, than the fattening them.

Swediſh turnip, or *Ruta baga*, its peculiar excellencies.

Turnips may be employed for rearing young horſes.

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POSTSCRIPT.

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TO THE PUBLIC.

DR. ANDERSON thinks himſelf unfortunate in having occaſion to complain of ſuch repeated acts of injuſtice done to him by Sir John Sinclair. He ſhould not, however, have troubled the public in conſequence of this injury he is now about to ſtate, had it reſpected himſelf alone; but as it tends to affect the memory of a man to whom he lies under the greateſt obligations, and for whoſe memory he bears the moſt reſpectful veneration, no conſideration whatever can prevail with him to become as it were a ſilent accomplice to a deed which tends to wound his reputation in the moſt inſidious manner. Theſe conſiderations induced him to publiſh the following advertiſement in the Morning Chronicle, for March 25th laſt; to which he has not as yet ſeen any anſwer. He now reprints it, to give it the greater degree of publicity, till he ſhould more deliberately determine what farther ſteps will be neceſſary completely to effect the purpoſe of reſcuing the memory of Dr. Cullen from the injury it has thus ſuſtained.

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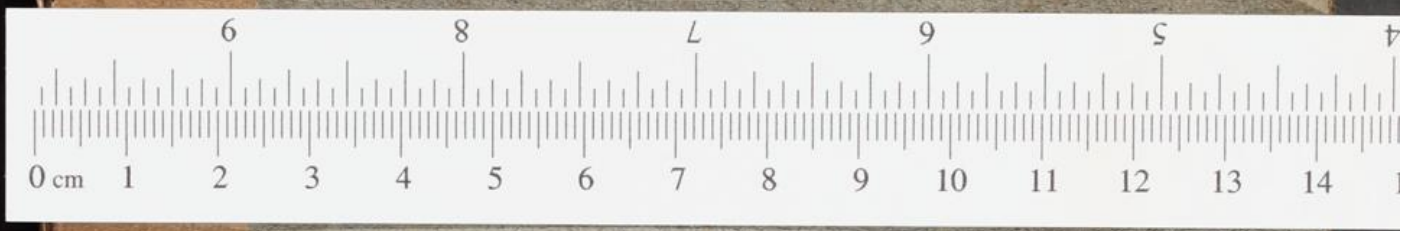
"WE are authoriſed by Dr. Anderſon, to inform the public, that a paper which has been printed and circulated by the Board of Agriculture, purporting to be written by the late Dr. Cullen, of Edinburgh, and commented upon as a genuine performance of that eminent man, is not a work of Dr. Cullen, who never wrote or corrected one ſyllable of it; that every word of that paper was written by Dr. James Anderſon, being the ſubſtance of very imperfect notes taken by him, while yet a boy of little more than fifteen years of age, from the extempore diſcourſes of Dr. Cullen, which was his firſt attempt to take notes of any kind. Conſcious of the extreme inaccuracy of theſe notes, the pupil took care not only to mark this particular in the very title, by the words, "*errores ſunt diſcipuli*," but alſo to ſtate it more clearly in a ſhort advertiſement prefixed (all of which have been ſuppreſſed in the printed copy) warning every perſon into whoſe hands it might fall, not to ſuffer the errors of the pupil to injure the character of the preceptor; but he farther took care never ſince to allow the MS. to be out of his poſſeſſion, unleſs to two of Dr. Cullen's ſons alone, to whom he lent it under the ſtricteſt injunctions, not to allow it to be ſeen or copied by any perſon whatever. Sir John Sinclair having heard that this MS. was in the poſſeſſion of Mr. Cullen (now Lord Cullen) applied to that gentleman, through various channels, for permiſſion to take a copy of it, which he poſitively refuſed to do, or to give his conſent to its being publiſhed, could a copy of it be even obtained. Sir John afterwards, however, found means (which it is ſuppoſed he does not deſire to have publicly developed) to obtain a copy of that MS. and immediately publiſhed it, to the no ſmall aſtoniſhment of Mr. Cullen, as well as to that of the owner of the MS. No ſooner did Dr. Anderſon ſee a copy of that publication, and came to an explanation with Mr. Cullen on the ſubject, than he ſtated his claim to the MS. in a letter to Sir John Sinclair, and ſoon after to the Board of Agriculture alſo, requiring that a farther publication of it might be ſtopped, as being his own private property; and alſo, with a view to do juſtice to the character of Dr. Cullen, requeſted that the Board would be pleaſed to make ſome public intimation of the miſtake it had inadvertently fallen into in aſcribing it to him. This the Board at laſt declined to do, in conſequence of which this ſhort ſtatement of facts is made public, in the mean time, till more effectual means for obtaining redreſs be adopted.

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