

tied up in turn from the fetlock to the *tail* by a rope which (hitched round *it*) the smith holds, and as occasion requires, he draws up the leg to a greater or lesser height according as the horse labours or kicks ; in short, the poor brute is made to hold up its leg by its own tail. The assistant smith ties up the horse in the same way if he has reason to apprehend difficulty in shoeing the fore-legs, as the best security against a kick from behind ; this is fair enough while the horse's hind leg is on the ground, for while it rests there quietly no pain is inflicted, and its submission is thus secured ; but the suspension of the leg from the tail while the smith pares the foot and puts on the shoe, must be distressing to the patient. Few horses, if any, are so vicious by nature as to require this harsh treatment ; it is a want of gentleness in the smith which causes a horse to resist what must always be a very alarming operation to a young horse ; if he be frightened at first, he resists, and then, to save himself trouble, the smith treats him with severity which is never forgotten. The next time he comes to the forge he trembles, and prepares for increased resistance ; an operation, which is to be repeated every month of his life, and ought to be rendered easy and familiar, is thus made a source of suffering. The twitching of his nose and his tail becomes a matter of course, and the apprehension of the torture renders him at last stubborn and violent. Had a system of soothing kindness been substituted, the stubbornness apprehended and complained of would probably never have been manifested. D.

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#### ON HILL-SHELTER.

By Mr D. BAIN, Edinburgh.

In the three preceding papers, though I have occasionally shewn the effects of shelter upon high grounds, as well as upon low, I have written more especially with a view to recommending shelter on the plains.

I must now turn more especially to the hills ; and considering the great extent of these in Scotland, the immense value of the animals at present subsisted upon them, and that might

by proper management be made to be subsisted upon them, the facilities for transport that are now afforded from every point by steam for either the animals or their wool, and above all, the growing wants of a rapidly increasing population, that give value to every increase in the means of subsistence, it is difficult to say which is the most important part of this subject, namely, the shelter of the valleys or of the hills.

The idea of sheltering hills, indeed, may appear at first chimerical, but I think it is rather the circumstance of having neglected them so long that is discreditable. There is certainly no reason for sheltering, cultivating, and otherwise increasing the productive powers of the plains, that does not apply equally to the hills, so far as management can be made available; nor can a reason be adduced in justification of having so long left the hills to nature, while every effort has been made to reclaim and fructify the plains. No doubt the idea of reclaiming, or in any degree improving the hills, is an overwhelming one, taken as a whole; but "what cannot man perform?" I am so sensible of the effect of a first consideration of the subject, that I may say it has slept with myself for twenty-seven years, distinctly from this cause. It was in 1814 that the idea of carrying shelter even into the highest hills first occurred to me; for then I travelled over great part of Scotland on foot, noting every circumstance that I thought might be made useful. Through many of the corn districts, especially the upland, and I may add, such as were adapted for cattle, I came to the conclusion that shelter was extensively wanted, and that impression was never shaken. I carried it far into the hills also. But, looking westward on the hills from Loch Lomond, under a beautiful afternoon's sun that gave them the appearance of an immense sloping plain of blue and gold, they appeared to me *so interminable*, rising hill over hill, for as it seemed hundreds of miles, till they mingled with; or rather seemed to support, the sky, that my mind sunk overpowered by the immensity of the speculation. Yet every one speaking of the breeding of sheep (and *they* are now, by general consent, considered the most suitable inhabitants of high hills), speaks of the desirableness of shelter; and the most moving tales have been told for centuries, of the catastrophes

to sheep and shepherds that often arise from the want of shelter, and of landmarks and inhabitants. But no one has thought of removing these terrible wants ; of substituting warmth and plenty for cold and sterility ; landmarks and inhabitants for trackless deserts. This has appeared to me wonderful and at last unbearable ; and this is the history of my long silence, and of my speaking now. Perhaps till now the time was not come. I hope it now is.

Considering, as I have already said, the value that now attaches to every product of hill or valley, I consider it quite possible, that by means of shelter, even within fifty years, the region of corn might, in many places, be made to take the place of black cattle ; the cattle be moved to the present region of the heavier sheep ; the Cheviot sheep be made to thrive where at present the black-faced only can, and the Black-faced be moved to the present region of the goats and eagles ; and that throughout the whole, the huts of the hardy Highlanders should rise, not thick and frequent, but oftener than they do at present, not only to the great benefit of their country, but with the approbation of even political economists. I shall proceed immediately to say how.

But I must say in the outset to the sheep-farmer and breeder, that I am aware of all their exertions, and that they are very great. But have they not begun at the wrong end ? They no doubt, with great care and at much expense, create (as it were) a superior race of sheep ; but let them abate their care, and where would all their improvements be ? They would go for nothing. They create fine sheep as in a garden they may create fine flowers ; but the moment they place the breed of the warm and rich plains of England on the bleak hills of Scotland, what follows ? This clearly, that the unhappy creature, placed in a climate destined for another species of animal, immediately begins to degenerate into an animal-suitable to the climate. The forcers of sheep, therefore, are, in their present conduct, what hot-house gardeners would be, were they, after raising their plants on a hot-bed, to plant them out on a hill ; with this difference, that in the conduct of the gardeners there would be only folly, for, though the vegetable would perish it would feel no pain, but the man who

transplants the animal of a temperate climate to one that is intemperate, is guilty of both folly and cruelty, for while the animal is deteriorating or dying, it is also suffering pain.

Let the sheep farmer and breeder provide a more genial climate, and more abundant food, and then he may hope that his improved breeds will prosper,—and not till then. But with this precaution, even as to his own Blackfaces or Cheviots, he will find that, by merely selecting the best of his own or of a neighbouring stock, for the purpose of continuing the race, he will have an animal much more valuable, because more natural, than any thing he can at present produce under any exertions; and every year, instead of deteriorating as at present, it would be improving by a natural process, that is, as the climate and pasture might improve. It is said by some, indeed, and I think truly, that under *such* treatment the Black-faced sheep would become a Cheviot, the Cheviot a Dishley, &c., as a colewort, by proper food and shelter, becomes a cauliflower, or a crab an apple. It is, in all events, wonderful, that while a man never thinks of raising a cabbage without first raising a wall, or any thing more delicate without providing a stove, farmers and sheep-breeders should go on attempting to raise Leicesters and Cheviots where it were more suitable to place goats, and wheat where naturally they should expect but thistles.

All good cultivation is only assisting nature, not forcing it; therefore it is quite clear, that if we can improve the quality of the food and climate for animals, that is the natural course to be followed; and doing this on the large scale is the only economy. What is farming but gardening on a large scale? Our fields should be as sedulously sheltered, according to their wants, as our gardens are. In like manner, breeding animals is but keeping a large menagerie; and has any keeper of a menagerie prospered or expected to prosper, but by furnishing his animals with the *climate* that is suitable to them, as well as the food?—Never. By dint of reasoning and example, farming has within the last fifty or sixty years been raised into something like a science, though far behind what it ought to be, considering that it is one of the first of sciences; and I say, that providing a climate for corn is just as indis-

pensable to its perfection, as providing it mould and manure, and therefore should be one of the elements of the science of agriculture. Equally necessary is climate to the perfection of animals; and though we may struggle on for a time without regarding this, or considering it hopeless, as our forefathers did to a much greater extent, in so far as we neglect it, we are not wiser than they; we take precautions a little less perfect, but this only from habit and accident, not from science and system.

But improve the climate of hills!—of mountains rather!—Yes. We have made first steps that shew its perfect practicality,—“*Et c'est le premier pas qui coute,*”—it is the first step that is difficult; after that we have only to observe and persevere. In a thick wood we are as completely sheltered on a hill as in a valley; and the sun that falls on a sheltered plain in the highest hills, is as pleasing and as powerful as in the valley. Even the fogs that constantly hang upon a cold and unsheltered hill, would not hang upon the same hill if made warm and sheltered, for there would be no power of refrigerating, and consequently arresting, the ascending vapours; they would move a stage higher. I move, therefore, that *Hill-Culture* should henceforth have a place in our language; that hills may henceforth be received into the pale of civilization, and be considered as suitable subjects of improvement and cultivation, as the space they occupy amongst us renders it desirable they should be.

And to render a hill really valuable, I think it should never be planted with trees, unless it can in no other way be turned to use. Wood is always beautiful, and to a certain extent it is valuable; but I think it should become an axiom, that in this country wood should never willingly be made a *crop*, but *the nurse of crops*. I would have no more wood in the plains than would shelter the crops, and no more wood on the hills than would shelter the pastures and cattle. But this I would have.

And how are these shelters to be devised? Exactly as in the plains. And, strange as it may at first seem, I think it is demonstrable, that hills may be more easily sheltered than even the plains; for the form of hills would exceedingly assist

the artificial means of shelter, by giving them prominence, and consequently power.

Let us take a regular hill, for example,—a blunt cone. Any line of shelter running down the eastern face of this cone in a direction slanting to the north-east, will shelter an *immense space* from any winds blowing from the north, north-west, and west; the convexity of the hill adding amazingly to the power of the shelter, by adding to its relative height. Again, a line in like manner running down the western face, in a direction slanting to the north-west, will shelter extensively from all winds blowing from the north, north-east, and east,—and these are in general the most piercing winds. On the sea-coasts of Galloway, the south-west winds are the most piercing, and in other quarters other winds may be severe. In those cases the policy must be a little modified; but in general, the two first lines I have indicated will shelter, and alone shelter, from every wind considered most destructive, except that blowing directly from the north. Of course, the shelters should be of wood, if possible, and rising within walls, particularly on the northern side. They should always have passages, at convenient intervals, to allow the flocks to pass from the one side to the other; and these passages should not be straight, so as to form *gaps* for the wind to pass through, but slanting or overlapping; and if the width of the belts were considerable, these passages would of themselves occasionally afford very valuable shelter.

The portion of the hill facing directly to the north must be treated differently. At the foot there might be a circular belt, especially taking advantage of any occasional eminences. Farther up, any hump might be taken advantage of, and planted with a slight belt; for in this way the natural height always assists the artificial. But if the face is a gradual slope, I should say that lines in the form of an open V, or obtuse angle pointing downwards, like the bars on the sleeve of a sergent, would appear to afford the greatest amount of shelter at the least expense; for on considering, it will be observed that such lines would shelter *in every direction*.

Of course, in regard to hills of a different form, different plans must be adopted; the great object being always to shel-

ter as much as possible of the ground exposed to the most scouring winds, at the least possible expense.

Professor Low recommends stells, or circular walls; but I should consider these no better than pounds;—and should the sheep instinctively seek them and find the opening; (neither of which is, I think, to be calculated upon), or should they be found and driven to them, though they might escape being destroyed by cold, they would run great risk from being blown over, or of perishing from hunger in a continuous storm.

An alternating recommendation is, clumps of four or five acres; but I should consider these as a useless waste of ground. If, indeed, the clumps were hollow, that is, having pasture in the interior, they might be very useful. Such places might be made to take the place of sheep-houses, by being made the depositories of preserved food,—hay, or straw; or they might have sheep-houses within them. But I conceive the coverts should in *all* cases be as natural as possible, so that the sheep might themselves find them. They should also be easily *left*, as well as found, in case of the attack of any hostile animals; and they should not too readily form deposits for snow, as circular clumps open in the interior would. The simple lines I have proposed would unite all advantages, and avoid all dangers; they would be easily found and easily left, and on one side or other always afford shelter and food.

They would also far exceed in safety the natural shelter of a crag or hillock; for, as I have already explained, a mere crag, or a gentle swell, gives no adequate shelter against wind or snow. They have not surface to break the force of the blast, and the snow, instead of being carried *from them*, is sure to lodge to their height immediately behind; thus *burying*, instead of preserving, either men or animals seeking shelter from them. But a wall with a proper coping, followed by trees, forces the gale, and whatever it carries, *high into the air*; and behind *them* there is consequently neither wind nor snow: there is a regular clear and calm.

By the plan I have ventured to suggest, therefore, of simple open lines, while the flocks would be protected, they would also have pasture; and were the edges of the belts planted with whins, broom, or any other shrubs or plants agreeable to

sheep (and this they should be), they might during a storm be improving instead of starving, and this without the aid of any carried food.

But it may be held that the comfort, and even occasional preservation, of such stocks as the ground will at present carry, would be too dearly purchased by such arrangements as I propose ; and so perhaps they would. But I have from the beginning contemplated, that *the pastures would be improved* far beyond any thing I would think it right to venture to state in figures. Mr Bates has stated the value of shelter on Shotley-fell at 500 per cent. ; that is, the sheltered land pastures *six times* the stock that it could sustain before being sheltered ; and Mr Bates is not a theorist, but a recorder of facts.

But that was on improved land. True ; but still the ratio holds good ; for the report speaks only of the land *after* improvement ; what it would have borne before was probably not worth mentioning. But supposing this instance not fit to be insisted upon as a general thing, I think the following will be *allowed* :

*First*, By these general lines the comfort of the flocks would be exceedingly increased, and the care of them rendered much easier, and still their power of ranging in no way restrained.

*Next*, Not only would the climate be improved to the animals, but also to the pastures. The pastures would consequently not only be rendered much earlier (a matter of great importance to the flocks), but much finer and more abundant. They would be completely altered in character, and the stock with them. In the improved climate the natural herbage of every description would not only be increased in amount, but improved in quality ; for it could be brought to perfection. Finer grasses of every description would rise, finer heaths, and other bitter or aromatic herbs. Even whins and broom, when present, would be softened and improved, for in sheltered situations they grow long and silky, full of succulence and bitter ; and these are not useless in such pastures, but in winter particularly are of the utmost value ; for they are, from their nature, accessible when no other food is ; they are not watery and subject to freeze, and must be well warmed in the



mouth before being sent into the stomach ; and they afford shelter at the same time that they give food.

But this is not all. A hill inclosed as I now propose would be so much improved in every way, that every spot would become valuable, and every capability be enhanced. I contemplate, also, that the shepherd on such a mountain should not thenceforth be a mere keeper of sheep ; or, if so, that he should have assistants sufficiently qualified. In short, I spoke of *hill-culture*, and this is my idea of that.

Supposing the hills sheltered, then, as I have proposed, there is still the internal improvement of the surface. I will give some examples, merely to make sure that I am distinct.

There are many plashy hollows, and even quagmires, that, by merely being opened at a proper spot, would be effectually drained, and much surface at present useless or dangerous rendered highly productive. This should in every case be seen to, as I conceive.

Again ; there are meadows that, being irrigated, might be made to produce natural hay, which, being mixed with many plants not to be found in artificial hay, would be of much more value to the sheep, and besides, it would be on the spot. It would be exceedingly important that this also should be seen to wherever it could be : and though in many places these may be carried to some perfection, in many more they are not so much as dreamt of, the ground in general being too valueless, from the total absence of shelter.

There are scalps often producing nothing, being continually oozing out or trickling down water, or scourged by the wind. A mere strip of sward being cut out on the top of these, would generally lay them dry, when they would soon become covered with grass ; or if not, a few perennial seeds being thrown into them, or a few seeds of whins or broom, they would even, if nearly precipitous, be rendered safe, and add both to the extent and variety of the pastures.

Then the juniper is a valuable shrub for sheep, both from its qualities as food and a digestive, from its being strongly aromatic, and one of the best and most natural shelters for sheep and lambs. It can hardly be said to occupy *any space*, for the pasture is increased about its roots from the shelter it

affords, and all its own produce is a farther clear addition. This shrub is supposed to grow only in tolerable land ; but it may be seen in the poorest situations, if only dry and sheltered. It may in some degree depend on the strata, but I think it might be propagated extensively with very little care.

The plant producing the crowberry is all edible ; but it requires a mild climate, growing only in the shelter of the ranker and less valuable heaths. The shelter I propose would encourage it.

The wild thyme also, and many other plants invaluable to sheep, would inevitably spring up under a climate moderately softened.

Even the wild mint might be easily introduced in situations occasionally moist, or on the sheltered banks of runnels ; and what so certain to add to the value of the flesh of the animals, as such pasture as these would give ? Animals so pastured might, if fully fed, be sold at almost any price ; nor should they ever, after being fattened on such pasture, be placed upon any other.

All the improvements I have as yet mentioned, excepting only the shelters, might be effected by the shepherds only, and render their time, at present in great part useless, in the last degree useful. But there are others not less essential, in which they must be assisted. The following are some of them :—

All over the hills there are occasional spots that might be made to produce either heavier natural crops, or, if it should seem necessary, artificial ones, in the last degree useful for sustaining a heavier stock in constant heart and comfort ; and it is clear that advantage should be taken of these circumstances ; the great object of all culture, and the only rational object of all cultivators, being to make each particular spot, by shelter or otherwise, produce the most it can ; every addition to the products of the soil being a certain addition to the income of the state. Not that any crops should be produced in those regions *to be carried from them*, but only to be consumed there. But that is a great purpose. I would consequently propose, that wherever a considerable number of such spots might be found in contiguity, a small hill-shealing should be

erected, for the express purpose of taking advantage of these capabilities; by enclosing them by stakes, for which there would soon be wood in abundance, or merely improving them for general use.

Again, in flat and cold spots (and there might be many such for long, in spite of any rational amount of shelter), the bruchar\* grows extensively; a grass so hard and coarse that even sheep refuse it. By simply ploughing it down, a delicate grass would spring up, first in the shelter of the furrows, and next over the whole. A plough might be constructed with movable stilts or beam, that could be easily transported to any quarter on the sides of a small active horse; who would also be sufficient for thus scarifying the ground.

There are occasional flows of moss at present not only useless but dangerous, for in the summer they produce nothing, and in winter are regular sinks. Yet were these laid dry, as by a little management they might often easily be, and only a pannier load of lime thrown on an acre, the result would be, a flush of natural white clover,—natural, and therefore perennial. A horse of very moderate value might assist in this. Were the ditches considerable, they might be dangerous to sheep; but care could be taken to have frequent slopes, to allow them to escape in case of falling in.

Where the pastures are thin or poor, peat, or any other such substance, saturated with the brine of outhouses, would prove an admirable dressing. These little mountain steadings, with their cow and horse, would be exceedingly useful for this.

Wood-ashes would also be valuable for this; and the thinings of the woods which I propose, the shepherds' fires, &c., would furnish them.

Many of these mountain valleys are not poor. They are, on the contrary, rich, from the *diluvia* of the higher grounds, exactly as the lower valleys are; and they would now be equally sheltered. They are so remote and small, it would be useless to cultivate them on the usual principles, but to improve them as grass lands must surely seem allowable; and what shelter might not do, the means I have mentioned would.

\* This name is probably provincial, as it does not appear in any dictionary. I think it is the *Aira caspitosa*, or turf hair-grass.

In winter, during a storm, occasional baits of even whins and broom would be preferred by the flocks to the finest meadow-hay in its preserved state; and from their nature, they would be safer than any species of grass, either saturated with frozen water or with melted snow. Whins and broom, therefore, should perhaps be cultivated.

In spring at yeaning, or in summer at weaning, or for the weak and delicate generally, a little green crop of any description, clover, tares, vetches, or barley, added to the other pasture, would be invaluable. In the yeaning grounds, what shelter more natural or useful than frequent clumps or bushes of juniper? And (in the hills always) nothing adding to the bulk of wholesome pasture can be counted a weed. My mountain shealings would assist in all these.

Therefore, in every spot favourable to these purposes—that is, convenient as a centre to the charge of a shepherd of five hundred or a thousand sheep—a shealing should be put down, with some meadow-ground about it, or some valleys capable of being turned into meadow, and of furnishing a suitable yeaning ground in spring, and a retreat from cold or starvation in winter; have its cow for the purposes of the shepherd's family, or for the lambs in spring, and a horse for the purposes of the pastures; but in other respects be as secluded as possible, though always comfortable as a human habitation. In this way, the hills would be no longer deserts, nor would they be the seats of a redundant population. There would be landmarks and shelter for man and for beast, and no dangers to either, such as at present afflict them.

But would these not infer a care too great, under any probable or almost possible increase of the amount and value of the stock? No care can be too great that is repaid by its results, and I think this would be so richly; for I think both the number and the quality of the stock would be improved beyond any thing we can easily conceive: and for the object, is it not more natural to create a climate and food for animals that would naturally and inevitably improve their quality, besides increasing their number and their comfort, than to go on endeavouring, at great expense, to produce *monsters*, (for all unnatural mixtures are so), that are only born to *deteriorate* or

*die*? Besides, though Culley and Bakewell tried many things, and succeeded in many, have they, or any, succeeded in going against climate? Neither the Merino on the one hand, nor the Black-faced on the other, have been made to impart any of their valuable qualities to stock in England; because the climate is too cold for the one, and too warm for the other. Their produce becomes, in spite of every thing, the creature of the climate, and the same has happened in Scotland as to English sheep. Therefore it is not only proper, but indispensable, that we should think of climate as a first thing. Without this, breeders are no better than doll-makers; producing animals admirable to be looked at, but wholly unfit to perpetuate themselves in the circumstances in which they are placed. We might just as wisely plant a plumb-tree on an unsheltered heath, and expect it to produce or perpetuate itself in that situation, as the fine sheep of Lincoln or Leicestershire, or even off-shoots from them, in the unsheltered hills of Scotland, the regions of the Black-face and the goat.

What is to be done then, but immediately, and with the vigour of conviction, to set about the shelter, and, in concurrence with it, the culture of hills, so far as these measures can be prudently carried? There is no question,—there can be no question,—that much *may* be done in this direction; can there be any question, therefore, whether it *ought* to be done? I think not.

Every farmer, then, should impress it upon his landlord, as *indispensable to their mutual interests*, and in every way seek and facilitate it; engaging, if his landlord will not, to improve as far as he can, on receiving a lease of suitable length, and suitable ameliorations at its expiry. And every landlord should deliberate with himself, whether every improvement he sees about him has not proceeded from shelter and care? and whether these do not demonstrate to him, that what has proved useful in the valleys, must also prove so, to a greater or less extent, in the hills? The conclusion cannot be doubtful, nor his resolution in consequence. He *must* prefer being the master of sheltered and cultivated hills, bearing in comfort the utmost amount of stock they can by rational management be made to bear, and paying L.5 for L.1 of income, to being

the lord of a parcel of hills in a state of nature, bearing in misery a starved and worthless stock, not more numerous or valuable than they might have borne at the creation ;—a sort of *Esquimaux landlord*, living on the miserable products of a miserable climate, instead of the abundant and vigorous products of a climate corrected by intellect and industry. At least, the landlord of an unimproved hill, is no wiser than the landlord of an unimproved valley ; that is, if hills are capable of improvement, and of this there seems to be no rational doubt.

And how is this improvement to be gone about ? I think thus : First, by drawing the great external lines in whole or in part ; for even the smallest part would do good : next, by adding the occasional shelters ; and lastly, by gradually filling up the internal and more limited details. In this way only can full justice be done to the scheme. It may be varied in many particulars in the way of testing its utility ; but shelter general or partial, and if not general, then, so far as it goes, complete, must always precede any other improvement, to be at all considered as following up this idea.

To follow out this idea in all its extent would not only cause a good deal of immediate labour, but the permanent population of the hills must be increased at least a little. This is contrary to the doctrines of late economists ; but I could never respect those economists who would separate the people too completely from the soil ; for it affords the best measure of their numbers, and their surest footing as a State. In particular, I could never look on the green spot that had once been a human habitation, now gradually returning to its original valueless state, without thinking, that, for the pasture of half a sheep, the owner had sacrificed a human family ; a moral accession to the state, succeeded perhaps by a moral nuisance ; and a military one of such value, as being wanted, might one day render the whole of the possession valueless, except to the invader. Though we should desire anything, therefore, but to see the hills overpeopled, I think there could be no reason to regret seeing them peopled to the extent of a shepherd and his family for every 500 or 1000 sheep.

I know of what value it is, or at least of what value it is

considered, that sheep should have considerable freedom of range ; and I have provided for it accordingly, by suggesting that the shelters should all be permeable. This is indeed necessary to their acting *as* shelters and not as prisons ; therefore that point is conceded in the mean time.

But what disturbance could possibly arise to the sheep from the circumstance of the shepherd having, in some sheltered nook, a cottage, perhaps a little garden for pot-herbs, and a paddock for a cow, or even a considerable field enclosed and cultivated for the purposes of the flock ? Would not the wildest sheep, if they found superior pasture there, or even superior shelter, resort to it with pleasure at any time, and particularly in a storm ? And if in that neighbourhood there were the yeaning-ground, with its shelter and more succulent pasture, and there not only the lambs found care and protection, but occasionally the whole flock, both from the weather and from pursuing animals, would the shepherd's cot prove such an eyesore ? On the contrary, it would prove the most useful part of the improvement.

But I believe there is little doubt that sheep only seek *variety of pasture*, and *not excessive wandering* ; and that, could they find variety without wandering, they would as certainly settle down into fat contented denizens of a dozen acres, as any sportsman, placed in a preserve, would cease to insist on wandering through the birdless hills. In short, the black-faced, long-shanked, stag-like denizens of the bleak and barren mountains, would, if they could find suitable food without wandering, settle down into the heavy and short-legged Dutch-built mutton-makers we wish to see them. I have suggested many plans for giving them both variety and abundance, coupled with just such exercise as would add to their value, without delaying their maturity as it is delayed under the present system. I have proposed, by the abundance and value of their summer pasture, to hasten them during that period ; and by providing shelter in spring and winter, and by every precaution against want, to prevent them from either being deteriorated or lost during those seasons. These, it will readily be admitted, are very proper ; the only question is as to how they may

be effected, and upon that point I have endeavoured to give my best advice.

I need only say farther, that the very little, and, I think I may add, inadequate attention hitherto paid to the comfort of sheep, both at the period of their bringing forth, and to the lambs after being brought forth, and to the preservation and full subsistence of the flocks in general in winter, must be regarded as something akin to the miserable state of things that existed as to black cattle before the introduction of a productive agriculture and winter crops; when their existence during the winter was a lingering death, and summer was half spent before they were restored to vigour, to be followed in a few months by a repetition of the horrors of winter. Were not this the case, how should we hear of the havoc caused among lambs by a cold or wet spring, or among ewes by rot by a wet autumn, or the losses and deterioration of sheep stock in general by a severe winter. We hear of nothing like this *now* as to black cattle, except among the poor Highlanders; because more ample provision is now made as to cattle against every probable contingency. Sheep equally deserve this care, and upon every well-ordered farm it should be made; and I have very little doubt it speedily will be made, as regularly as to sheep, and even hill-going sheep, as already it is in the case of black cattle.

In the mean time, it is no wonder if the animals fed on our hills are not considered mature for three or four, or even five years, while, in the case of what may be termed the Lowland breed, maturity is reached in half the time. Which is the most humane system? which the most profitable?—full feeding and quickness of product, or starvation and delay?

And even in regard to the Lowland breed, the arrangements are any thing but perfect. A regular principle of keeping them in comfort, and of preparing them for the table, is perhaps not known. The most incongruous food is, I believe, given, and this without exercise or variety. The character of the animal, its habits, and natural food, are equally disregarded. A creature that delights in dryness is left to wander in plashy meadows, or in wet cultivated, perhaps fallow land;—that delights in variety of food, (being a sort of save-all of herbage),—



is barbarously confined to *one* food, and that certainly not natural to it, and of necessity often breathed upon, which all animals abhor. I can never pass a flock of such animals, suffering under what may be termed a turnip-diarrhoea, without thinking of the poor gruel-fed inmates of English poor-houses; nor see the hard, stringy, juiceless, savourless matter so produced, at table,—neither beef nor mutton, but a sort of turnip-leather,—without wishing that people would give premiums for discovering the fit food of men and animals, instead of for finding out stars whose rays would not yet have reached the earth, (according to calculation), if they had begun to send them forth some thousands of years before its creation.

At least there is a want of *perfect* arrangement in this matter. It is probable, that, by-and-by, keeping the animals dry, and giving them at least a degree of exercise, and greater variety of food, will be considered indispensable; that a food more suited to the character of sheep has yet to be discovered for them, while in the pen; and that, by following nature more closely in this particular, and in all particulars connected with the treatment of animals, the comfort of the animals will be increased, as well as the profits of their owners; and competition with them in their own markets rendered impossible. One of the greatest steps towards this natural arrangement would unquestionably be, procuring them the natural food, or that great mixture of the natural food, and the air and exercise, that shelter would give.

I therefore very earnestly recommend to consideration the shelter and improvement of our hill-pastures. I think it is an evidence of deficient sagacity in the owners of those hills, that they have not anticipated the demand that will now certainly be made for the free importation of all articles, forming merely accessories of agriculture. Had they done this in time, no imported article could have competed, almost in any degree, with the wholesome and tasteful produce of our own mountains. But a taste once formed, or at least debased, even to garbage, may with difficulty be reclaimed.

I had almost omitted to notice a circumstance which to most will seem secondary, but not exactly so to some whom it is important to interest in this matter, and whom I have sedu-

lously been addressing ; and that is, that those woods I have been recommending as shelters, and the other consequences of their existence, would exceedingly increase the food, and of course the quantity, of *game*, and this of every description. Wherever there is plenty of heath, crowberries, fir-tops, &c. there also there will be plenty of grouse, blackcock, and pheasants, &c. ; and the pastures of the woods would encourage even deer, if the woods were open, and we would suffer them to live.

Having thus exhausted my own ideas, I sought for their confirmation by a practical friend ; and I am happy to say that he has not only declared these opinions in general to be in accordance with his own, but has in some particulars where I most doubted, enabled me to be explicit.

I doubted whether hill-cultivation of any description might not seem too speculative ; and he supplied me with evidence of the advantage of ploughing down coarse pasture from his own experience—he having done so with the best success.

I doubted whether the idea of erecting hill-shealings, and of cultivating crops never to be ripened, but used in the green state for the stock, might not seem exceeding the general ideas of practical sobriety ; and he mentions that an experienced sheep-farmer of his acquaintance, having taken a large holding in Strath-Tay, has selected 200 acres of land, on which he is to erect, *not* merely a hill-shealing but a regular farm-steading, where steading never was before ; and not to cultivate crops for the market in any part, but, as I have instinctively suggested, for the use of his stock ; and he expects, with the utmost confidence, that, by thus aiding the natural pastures, and by such shelter as can be afforded even by *sheep-houses* in convenient situations, he shall be able greatly to increase his stock, as well as improve its character.

I did not venture to urge improvements so expensive as this ; I looked forward to mere hermitages for the accommodation of solitary shepherds, or at farthest a shepherd and a labourer ; though I knew that in many situations sufficient land fit to be cultivated for many purposes might be found in contiguity. Neither, perhaps, has this enterprising man thought of *shelter* upon the principles I have been for some time recommending, nor

of the *discursive* hill-husbandry I have now ventured to recommend. But hearing what I have now heard, I think it probable that the two systems may be combined; that, with a considerable steading for improving the lower pastures in a regular manner, subsidiary outposts may be considered proper in the hills; particularly if, by shelter, the climate can be so ameliorated as to change, as I have anticipated, the relative characters of these regions; shifting as it were the temperature a stage higher; and making even the highest pastures a scene of improvement, and of comparative warmth and abundance.

Meantime it is but doing justice to these suggestions to state, that the friend to whom I have just referred has for years been sheltering his own farm, though not on any regular and comprehensive plan; and that, from what he has done, he has been enabled both to improve the pastures, and to provide a degree of winter-food; and, in consequence of both, is enabled to keep, not only a much heavier stock, but also one of a much improved description. Though we have been acquainted for many years, I had not heard of this, for it is a recent pursuit; but, so far as he has gone, he completely confirms my impressions; and if seconded by his landlord in the way of more substantial shelter, would, I have every reason to think, confirm them still farther.

These statements will doubtless draw forth the opinions of some other friends; and if these shall supply any thing material, or in any thing materially controvert me, it shall be given; if not, my labours in this department are ended. I cannot but look back on what I have said with satisfaction, as tending, as I think, to recommend and assist in a most important subject. If I have been too full and earnest for men acquainted with the subject, it is because I have been addressing more than one class; by which I mean, landlords as well as tenants, and to the first it was necessary to be very explicit. It was necessary to shew them, first, that the thing is really wanted, and would be desirable if attainable; and next, that it would certainly be successful and profitable.

In this view, I continue to say that I believe hills, at present the most bleak and barren, might very soon be turned

into comparatively abundant and comfortable pastures, valuable alike to the owners and to the State; and that I consider the idea of improving the comfort and productiveness of hills, as claiming more immediate attention than even that of the valleys: for in the valleys much is already done, and, by one accident and another, is every day doing; enclosures of a better description, belts of wood, &c., being in continual progress, though rather for ornament and defence than for shelter, though that also follows. But, in the hills, nothing has been done, or it has in many instances been done amiss; that is, by clothing them completely. The idea of looking to the hills, as subjects of systematic improvement, and of cultivation in the way suitable to hills, is untried; but if followed out with caution and judgment, it cannot, I think, fail to be successful, and therefore I sincerely trust it will be adopted and tried.

To be as specific as possible, I would gladly give a few examples of where I think the system might be tried with advantage; although I think I might in this view place almost in any quarter of Scotland, and say "*Circumspice*,"—look around you.

*All Sutherlandshire* would seem to me very susceptible of improvement upon these principles. It is true the shepherds of Sutherlandshire must at present drive their flocks many miles to be clipped, because there are no carriage-roads for their wool; but this should not be necessary. Roads once made in these remote regions are very easily kept in repair; and a chain of lakes runs almost across the country from Dornoch to Laxford, or to Loch Kyle, offering an easy opportunity of water-carriage; for they might, in all probability, be easily rendered navigable from sea to sea, and so at once carry commerce into the heart of the very extensive and important district of Sutherland, and save the horrors of navigating the Pentland Frith. Writers have hitherto trifled with this subject, describing Loch Shin as looking like a great ditch, &c.—that is, as being unpicturesque, from want of romantic head-lands, foliage, &c. This very tameness, however, may be its greatest recommendation, as indicating the want of those features that occasion flaws of wind, and consequently

opposition to navigating it for useful purposes ; and we hope no topographical survey will henceforth be considered complete, that does not convey an accurate knowledge of the capabilities of the country described, *for economical purposes* ; that is, a distinct description of the extent of reclaimable heaths, as well as of the valleys that have been reclaimed ; an account of the state of hills and mountains, at the various heights considered capable of being rendered available for the pasture of different animals ; and of the existing depths of lakes and rivers, or the depths that might be given them for adequate purposes ; how far they might be made navigable if necessary, or must be assisted by canals.

The slope of Stratharrock on the bank of Loch-Ness, and, consequently, in the immediate neighbourhood of steam navigation, seemed (in 1814 at least) a very suitable subject for shelter. On the very summit there is a very beautiful lake, and near that lake the height terminates abruptly on the west, and you look down on a comparatively low valley leading to Fort-Augustus at the head of Loch-Ness. The evening sun was shining upon this height and lake when I saw them ; and I thought that were the district sheltered and cultivated, and a town built there for the manufacture of the wool of the surrounding country, it would be as picturesque as the finest of the old Latian towns.

From Fort-Augustus to Corryarrick, at the source of the Spey and opening of the vale of Badenoch, there is a very high plain of eighteen miles, of which I have already spoken as bare and tenantless, but which, from the remains of a remarkably large tree there, I have every reason to think has at one time been the scene of the noblest forests, and which by shelter I am sure might be made fertile and useful again. It is, as I have said, eighteen miles in length, and in some places probably little less in breadth,—a space of great importance in a country so limited as this, and, it seems, peculiarly calculated to receive benefit from shelter ; for though lying positively high, it is relatively low, being surrounded by higher hills.

Dalnacardoch-moor, in the way from Dalwhinnie to Trinafour, is another moor of very considerable extent, and very suitable as a subject for shelter. It is especially open on the

east; but being sheltered on that side and on the north, it would then lie beautifully to the sun.

But there is hardly a district, east, west, north, or south, in which hills or plains might not be found offering the greatest capabilities of improvement by shelter, at least to the eye of one intent on finding them, and that, in twenty years from the date of their enclosure, might carry beeves, where they cannot at present carry sheep.

This, as lawyers say, is my case; and if this is *possible*, should it not be inquired into? I should say it were worth testing, even at the public expense; but in Scotland there are many landlords who have only to believe the thing feasible to give it the fairest trial at their own expense; and I hope this may fall under the eye of some such, or obtain the good opinion of some equally spirited farmers.

ON INSECTS MOST INJURIOUS TO VEGETABLES AND ANIMALS,  
AND THE MEANS BEST CALCULATED TO COUNTERACT THEIR  
RAVAGES.—NO. X.

By JAMES DUNCAN, M. W. S.

Besides the formidable enemies of the pine tribe described in our last paper on noxious insects, there are others belonging to the same order which likewise assail these valuable trees; but fortunately their depredations in this country are not so considerable as to require a lengthened notice. A member of the genus *Lyda* (*L. erythrocephala*) sometimes occasions no small damage to them on the Continent, but, although the insect is a native of this country, we have not heard of it having proved injurious to any extent in our plantations. It is pretty closely related to the *Lophyri*, but is distinguished from them, as well as from all the other genera of the tribe, by having the antennæ from 19 to 36 jointed, slender, and setaceous, the wings with two marginal and four submarginal cells, the four hinder tibiæ with three spurs. Its mode of attack, as well as its manner of life, are essentially different from those of the *Lophyri*. The caterpillar does not openly frequent the foliage, but resides in a kind of closely-woven cocoon attached