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AGRICULTURE.

APPROPRIATE FOOD, PURE AIR, AND EXERCISE, NECESSARY TO THE HEALTHY CONDITION OF DAIRY CATTLE.

That the natural temperature of food for ruminant animals is the most appropriate, is perhaps too plain a proposition to be disputed; but in the general management of cows in the vicinity of populous places, this important fact is entirely disregarded.

Man, it is true, is omnivorous. His stomach is nearly equally well adapted to the digestion of animal and vegetable food, of solids or fluids. He is also a cooking animal, and can receive his food at varying temperatures. But it is different with ruminant animals. They are essentially herbivorous, and should receive their kind of aliment at a natural temperature, before it has undergone certain chemical changes, and not as is the case in the form of stow, cooking food from the distillery. Their immense complex connecting organs must have something else to employ them, besides receiving some thirty or forty gallons of slush per day, which contains but a small quantity of vegetable matter in the form of bran disseminated through it. To fulfill the obvious design of nature, they must have food which requires mastication. Without the power of rumination, or in familiar phrase, without a *belly*, they will languish and die. Hence a little grass or hay cannot be dispensed with. But a little is not enough. They must have solid food in sufficient quantity to fill their stomachs. The cow that is fed on distillery slop, so far as we know, uses but one of her four stomachs; all the rest are idle; or, of course, there must follow great functional derangement. And when this kind of diet is received into the system, it is rapidly sucked up by the thousand and absorbent vessels, and thrown into the blood; and before it becomes animalized, probably in the course of ten minutes, it begins to be strained through the organs of the liver, in the form of a blue, watery, insipid secretion, called urine.

Now, very different is the process of forming milk out of solid food. By the complicated apparatus already described, the food undergoes various modifications and changes. First, it is partially chewed and mixed with the saliva; it then descends into the rumen, where it gradually traverses its various compartments, and is probably retained several hours, until it is thoroughly macerated; next it passes into the reticulum in small portions, and there being softened and covered with mucus, by a kind of antiperistaltic action it is thrown into the mouth. Here, by a compound motion of the lower jaw, half lateral and half vertical, leisurely repeated from thirty to forty times, on each end or pellet, the second process of mastication is completed; and being reduced to a proper consistency, it is again swallowed, and glides directly into the omasum, where it sustains some changes not well understood. It next passes into the abomasum, or last stomach, where it is mixed with certain fluids equivalent to the gastric juice in the human stomach, and this is converted into a soft pulpy mass called *chyme*, from which the small vessels of a portion of the digestive tube, still lower down, called *lacteals*, by a peculiar power which may be denominated vital chemistry, manufacture that bland fluid, chyle, which contains in itself all the ultimate elements of animal bodies. This, then, is an elaborated animalized product, containing an abundance of oxygen and carbon, with some nitrogen, and fitted for conversion into albumen, gelatin, fibrin, or any of the proximate elements of animal bodies. The blood formed from it is consequently rich in all the elements which are required to supply the waste, and build up the various organs of the system. Of course, the milk separated from it is highly animalized, and essentially a vital product; and its separation from the blood is not a mere mechanical straining, as has been supposed, but an essential process, and one that is highly probable there is very little if any chyle formed,

without which the body cannot subsist in vigor. And in order to this healthy action of the vital function, it is not sufficient that exercise be taken occasionally and at long intervals, but when the season permits, it should be taken daily. Common sense and observation, independent of physiological knowledge, might lead us to the conclusion, that any other management of cattle than that here suggested, must lead to the derangement of health, and fatal diseases.—*Hartley's Essay on Milk.*

CULTURE OF COTTON.

There are many around us who think the surface-culture of cotton, or of crops, a new-fangled notion, and scout at the idea. All encroachments on established usages and customs are received in this very way. There are others who think it has done and will do for the north, but will not in the south. I will state one circumstance, and close by citing one fact. In 1833, I think, I planted in the same field, about twenty acres of cotton, as usual barred off and scraped. The subsequent culture was entirely with the hoe and sweep, the latter merely shaved the surface, probably to the depth of one-half to one inch; also three acres, and cultivated as was customary; plowing three times and hoeing. There was but a path of eighteen to twenty-four inches dividing. Land as near similar as could be, only the first piece had been cleared five years, and the second piece only two years; therefore, the latter should have resisted the drought best. Mr. William Montgomery, my neighbor, a practical farmer of some thirty years' standing, ridiculed my notion, as I had been but recently from school. I took him into the field to look at it. He admitted that the unploughed land was the best crop, and had sustained itself the best through the season, but could not account for it. Now every gardener knows the fact, that his garden returns him a greater income than any other spot he can cultivate. The plough never enters, nor is the earth disturbed two inches from March till July. He cultivates the surface only, having previously spaded deep and manured well. Then, if this be so in relation to raising vegetables of the tap-root and horizontal root families in the garden, may it not be well to try it elsewhere, especially as more land can be cultivated and kept cleaner?—*Western Farmer.*

From Sinclair's Husbandry.

There is perhaps no country in Europe, where calcined lime is used to so great an extent, and in such quantities, as in the more improved and improving districts of Scotland. This may be partly owing to the total absence of chalk, which abounds in so many parts of England, and which renders calcined lime less necessary there; but it is principally to be attributed to the great benefit that has been derived from its use. In bringing in new or maiden soils, the use of lime is found to be so essential, that little good could be done without it. Its first application, in particular, gives a degree of permanent fertility to the soil, which can be imparted by no other manure. Its effects, indeed, are hardly to be credited, but their correctness cannot be disputed. Maiden soils, in Lammermuir, of a tolerable quality, will, with the force of sheep's dung, or other animal manures, produce a middling crop of oats, or rye; but the richest animal dung does not enable them to bring any other grain to maturity. Pears, barley, or wheat, will set out with every appearance of success; but when the pears are in bloom, and the other grains are putting forth the ear, they proceed no farther, and dwindle away in fruitless abortion. The same soils, after getting a sufficient quantity of lime, will produce every species of grain, and in good seasons bring them to maturity, in all future times, always supposing the ground to be under proper culture, and the climate adapted to the crop. This fact proves, that oats and rye require less calcareous matter than what is necessary for other grains; that lime acts as an alternative, as well as an active medicine, and that the defects in the constitution of the soil are cured, even after the stimulant and fertilizing effects of the lime have long ceased to operate. Lime is also peculiarly beneficial in improving marshy soils, by making them produce good herbage, where nothing but heath and other unpalatable grasses grow formerly. The expense of this article in Aberdeenshire is stated to be enormous, very little of it being produced in that country; yet lime is there considered to be absolutely necessary, and, indeed, the foundation of all substantial improvements. It is supposed, how-

ever, not to be so useful on the sea-shore, as in the more inland districts, from the soil being perhaps mixed with sea-shells.

The importance of lime as a manure is strikingly exemplified by the following information from Mr. Walker of Mellendean: He entered into the possession of that farm twenty-five years ago, and then gave the whole farm, (with the exception of a few acres of the richest soil in different fields, which had for ages been manured as infield), a good dose of lime.—From the newly-limed land, his returns were fully equal to his expectations, and greatly superior to those from the richest spots that had received no lime. Being very desirous to ascertain how long the limed land would maintain its superiority, he kept both the limed and unlimed under the same management in every respect, during his first lease of twenty-one years; and he can affirm, that at the end of that period, his crops upon the limed land were equally good, and as much superior to those of the unlimed land, as they were at the commencement thereof. Having got a new lease of that farm, he proposes laying lime upon every spot of ground that was not limed formerly, being convinced that he has been a considerable loser by his experiment. How long therefore the effects of lime may last, he will not take upon himself to foresee; but he can safely say, that there is land upon his brother's property at Woodan, that was limed by his father upwards of thirty years ago, where the effects of the lime, upon every crop, are still as apparent as when it was first laid on the land.

It is proposed, in discussing this subject, very shortly to explain the following particulars: 1. The soils to which lime is applicable; 2. The distance from which it has been carried; 3. The quantity used; 4. The best mode of slacking; 5. The common modes of application; 6. The plan of top-dressing the surface; 7. The price; 8. The use of powdered limestone; and 9. The causes which may occasion its failure.

1. This manure is certainly well calculated for clay lands. Some recommend laying on a certain quantity of it, to the amount of 20 bolls of shells, or 120 bushels to the Scotch, or 90 to the English acre, and as hot as possible, every time the land is fallowed. This plan, however, is objected to from respectable authority; and it is contended, that so small a quantity of lime shells is quite unfit for stimulating any kind of soil, except where it is of a dry marshy nature, and not formally limed. To lime land every time it is fallowed, seems unnecessary, more especially if a sufficient quantity were applied in the first instance. From 60 to 70 barley bolls per Scotch acre, or from 390 to 420 bushels per Scotch, that is, from 288 to 356 bushels per English acre, are quantities frequently given in East Lothian. In regard to loams, if they are in good condition, and in good heart, perhaps liming once in the course of two rotations will be sufficient. It is a rule, however, in regard to the application of lime, and other calcareous manures, that they should only be applied to land in a dry state, and well drained.

2. It is astonishing the distance from which lime is carried in some parts of Scotland. Mr. Blackie, of Holydean, in Roxburghshire, drives it twenty-two miles, and the carriage, when hired, is 7s. 6d. per boll of shells. In the parish of Moffat, where of late considerable improvements have been carried on, and corn, turnips, and clover, raised in great perfection, 1000 feet above the level of the sea, the lime is carried from Douglas, at twenty-seven and thirty miles distance. It is sometimes carried on the borders, but in no great quantity, about thirty, or even thirty-two miles; and in Aberdeenshire, it is driven that distance inland, after being imported from Sunderland.

3. The quantity used varies much. It is evident that strong deep soils require a greater quantity than those which are light and shallow. Baron Hepburn is of opinion, that it should be applied frequently, and in small quantities at a time, especially on gravelly-bottomed loams, which are apt to become too open and pliable by an over dose of lime; by following this practice, he finds his crops wonderfully improved, both in regard to quantity and quality. Mr. Robertson of Ladykirk states, that he has never seen lime used to so great a quantity, if the land is judiciously cropped; if otherwise, it will ultimately hurt the soil. He has laid on less a quantity than 100 bolls of shells, 4 Winchester bushels each, per English acre, and frequently with much success. On dry fresh land a less quantity will do. Mr. Blackie of Holydean considers sixteen bolls of shells, on such land, a sufficient dressing. Dr. Coventry is of opinion, that in general, about 6 tons of unslacked or newly-burnt lime, of ninety or ninety-five per cent. of purity, may be sufficient for the statute acres of land that has never been limed; but if the lime be impure, a greater proportion will

be requisite. Several intelligent farmers are of opinion, that not less than 60 or 70 bolls of fine shells per acre, should be laid on a strong clay soil, and that this quantity, with judicious cropping, will be sufficient for a lease of nineteen or twenty-one years.

The information transmitted to me by Mr. Walker of Mellendean upon this subject, is of peculiar importance, as he has limed perhaps more land than any individual in the whole island, and in the course of thirty years has tried various experiments in regard to the quantity that should be applied per acre. On newly broken-up land from old turf, he has laid on from 20 and 25 to 40 and 45 bolls of shells, of 4 Winchester bushels each, per English acre. On light and thin (outfield) soils, the crop on that part of the field that was limed at the rate of 20 and 25 bolls per acre, was as rough, and appeared equally good, with the crop on the land that had received 40 bolls per acre; but when it came to be thrashed out, the grain was found very inferior in quantity, and still more so in quality. Upon clay soils, the effects of the lime, where a small quantity was laid, were hardly discernible; while that part of the field that received 40 and 45 bolls produced an abundant crop. Finding the produce of the land that was limed with a small quantity so very inferior, he laid on, (when the land came to be re-fallowed), 20 or 25 bolls more, the effects of which were never perceptible. He is therefore decidedly of opinion, that every kind of soil should have a good dose at once, in which case he considers no repetition to be necessary for a long time after; but if repeated at all, the second liming should be considerably greater than the first, which seems to be the general opinion of the Scotch farmers. As to repeated liming in small quantities Mr. Walker is convinced, that whatever is laid out in that way, after the first dose, is so much money thrown away. He can give no stronger proof, of his conviction in that respect, than his practice upon the farm of Rutherford.—He entered to that farm in June, 1805, and since that time has gone over eight hundred and fifty acres; and though a great part of it consists of a light dry soil, and the lime has to be carried twenty-four or twenty-five miles, consequently at a great expense, yet on no part of the farm has he laid less than 40 bolls of shells, or 240 Winchester bushels per English acre, and on many places fully 50 bolls. Nothing, in his opinion, assimilates the produce of outfield, to that of infield land so much, as a good dose of lime laid on at once. The consequence of this liming has been, the most productive crops, of every description, to be seen in all that neighborhood.

Mr. Aitchison, of Clement's Wells, also has found that lime answers every purpose he could wish, in promoting the improvement of his estate in Peeblesshire, where the climate is cold and moist. He began to improve that property in 1800, and in October, 1811, he had laid on it, 10,388 bolls, or 62,316 Winchester bushels. His ridges are 18 feet broad; and according to the quantity he wishes to put on per acre, his overseer has the following table to conduct the operation.

If it is proposed to lay on 25 bolls per acre, betwixt each heap, of one first load each, there ought to be a distance of

If 30 bolls,	24
35 do.	22
40 do.	19
45 do.	17

And in the same proportion as high as 50 bolls. He never puts on less than 25 bolls, or 150 bushels of shells, per Scotch, (130 bushels per English acre), and on heavy land he has gone the length of 70 bolls. The day the lime comes to the field, a man follows the carts, and covers it up immediately with earth, by which, generally in a few days, it is reduced to powder. When in that state, it is spread on the land. After trying several other methods, this was found to be the best.—The improvement effected by lime on that property has been very great.

4. The slacking of lime completely is a most important operation. The common mode is, to lay it in heaps from the kiln upon the ground intended to be limed; but this, although the most expeditious, is by no means the most advantageous method. In the first place, if the lime is not all of the same quality, (which is seldom the case), the best lime commonly divides first, and the inferior quality continues unslacked; so that it must either be spread in that state, or the good lime must be allowed to receive too much moisture, or again to re-absorb its fixed air, both of which should be prevented. The best mode of slacking, is to lay down the shells in a heap near to water, and by once turning and watering the whole mass, it is reduced to a complete powder; in which state it should be applied to the soil, and ploughed in immediately with a shallow furrow, when there is no doubt that it will mix more intimately with the soil, than by the former method. This plan, however, is attended with an additional expense of considerable magnitude.

The necessity of slacking enclosed lime, as soon after it is burnt as possible, is obvious. If any sudden rain should fall, it

would be covered with water, and the lime being of the least impurities, should be the course of repeated ploughings. Patterson, of Castle Huntly, has obtained pieces of hard lime, come up, as he says, as if they had been pieces of an old building.

Considering these circumstances, I was much pleased to find, that a mode had been discovered by Mr. Neil Ballingal, in Fife, which obviates those difficulties. His plan is, to lay the enclosed lime down on any thick head-ridge of good earth within the field where it is to be applied, and the instant it is so, two men are ready to make up a compost of the lime shells and earth; three cart-loads of earth to one cart of shells, raised to a ridge long and narrow, five feet high, that rain may not enter it. The moisture in the earth slacks or reduces the lime to a powder; it swells to a considerable bulk, and then all cracks and openings are closed with a spade, and a little more earth put over the whole. In this way, he has had it frequently mixed up for six months, and in one particular instance fifteen months, before it was carted away, and yet when carried on to the land and spread, the whole mass put on the appearance of white lime, flying with the wind, as if newly from the kiln.—This mode he means always to follow, being certain of its advantage. It can be mixed as intimately with the soil as if new from the kiln, and he has had crops from it, in this way, superior to an equal quantity of hot lime, both mixed without dung. The application commonly is to the summer-fallow; he has also applied it to pasture, quite hot, and in compost as above described, and found both to answer well; but the time of application was July, and he soon found that it ought to be at least one year or more before the field was ploughed.

Mr. Ballingal having used from 500 to 100 bolls per annum, for several years, his experience may be confidently relied on. He remarks, that lime, if exposed to rain, or even to frost, and slacked like mortar, loses half its effect; no care can then mix it intimately with the soil. His lime is wet, and often when the lime is driven unfit for carting upon the field, nor are the ridges prepared for spreading the lime; without having fallen upon such a plan, therefore, he could never have used lime to equal advantage. He adds, that an intelligent neighbor of his, brings his lime from the kiln, lays it in small heaps, about a firlo of shells in each heap, or four heaps per boll, on the fallow; covers those instantly with earth, which slacks the lime, and when it is completely so, he spreads it in powder, quite hot, on the fallows, and ploughs it in with a light furrow. This saves labor and expense; he never uses water in slacking lime, and the effects of his practice are very good; the earth, or rather the moisture in it, slacks the lime most completely, and no water is necessary. This is an excellent practice, and very common in many counties, and many intelligent farmers prefer it to the other plan, which they think would be attended with too much expense to be generally imitated. At the same time, an intimate mixture with the soil is of the utmost importance in the application of lime; any plan that contributes to that object merits attention.

4. Mr. Dudgeon, of Primrose Hill, considers it to be the most advantageous mode of applying lime, to lay it on in a powdery state, upon ground when under summer-fallow, before the fallow receives the last furrow, and then to mix it intimately with the soil, by harrowing before it is ploughed in. In regard to liming fallows, Mr. Rennie of Phantassie observes, that it is the most profitable mode of application, if it is laid on at a proper season. He has been in the practice, for those ten years past, of laying lime on his fallows, from the 1st of April to the 1st of October, and always found, that the first laid on produced the best crops, which he ascribes to its being more intimately mixed with the soil, by the more numerous ploughings and harrowings, and of course the fermentation more complete, than what is laid on late in the season: June and July and August, therefore, are to be preferred, so that the lime may be completely mixed with the soil before the crop

* This is an important fact, it being generally supposed that when inclosed in the form of hot lime, in a state of perfect powder, its effects are greater and more immediate than in any other way. By Mr. Ballingal's plan, the lime can be carried to the field in autumn, or even in winter, which, though an old practice, could not be done with equal safety, as under the proposed system.

† A correspondent contends that lime is best laid on the land in small heaps, and immediately covered with earth, which in a damp or moist season slacks or falls it; but he frequently puts on water from a water cart, which slacks it directly, and it is immediately spread in that quick state, harrowed, and ploughed in, when it mixes most intimately with the soil. Lime should be in powder, and the land in a powder-like state, when it is laid on.

‡ Mr. John Shirreff remarks, that to specify a quantity for all lands is impossible, so much depends upon the depth and quality of the soil; also on the quantity of calcareous matter, either previously applied or originally in the soil.

§ Communication from George Paterson, Esq. of Castle Huntly.

¶ Communication from Mr. Walker of Mellendean.

There must, remarks Addison, be frequent motions, agitation, to mix, digest, and separate the juices contained in the body, as well as to expel and cleanse that multitude of humors and strainers of which it is composed, as to give their solid parts a more firm and lasting tone. Exercise ferments the humors, casts them into their proper channels, through the reins, and helps nature in those secret distributions,