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NEWCASTLE FARMER.

VOL. II.—NO. IV. COBOURG, NOVEMBER 1, 1847. TERMS.—2s. 6D. PER YEAR.

From the Albany Cultivator.

PEAT OR MUCK FOR MANURE.

Peat, or "muck," may be described as vegetable matter in a state of decay.—Its origin is somewhat various, being sometimes derived from the branches and leaves of trees, and sometimes from mosses and aquatic plants. It is not found in so large bodies in this country as in the British islands. It is quite common in England and abundant in Scotland; while in Ireland it includes large districts, and even extends up the sides of mountains, covering the earth to the depth of forty to fifty feet, and, by computation, embraces nearly a seventh part of the surface. In those countries it constitutes the fuel of a large portion of the population. That which is used for this purpose, is formed chiefly by mosses, which for ages have continued to grow on these localities. Persons who are acquainted with peat bogs or mosses, understand the process of accumulation; others may not so readily comprehend it. There is a continuous growth from year to year, but the under strata die, are more or less decomposed, sink down, and by pressure are converted into the state which is called peat. We have but few bogs in which peat of so solid a nature as that used in Ireland for fuel has been found. But in some instances our bogs have been dug for the purpose of procuring fuel, to good advantage.

The greatest value of bogs in this country, however, consists in their affording *manure*. We shall enter into no particular discussion, at this time, in regard to the specific operation of peat or muck in benefitting vegetation—whether its action is wholly mechanical, producing in the soil the requisite physical texture, or whether the substance is actually "dissolved" and absorbed by growing plants—its utility in augmenting the yield of various crops, has been abundantly demonstrated.

It is, perhaps, proper to make a distinction between peat and muck, though the terms are frequently used synonymously. Peat should be considered as referring more particularly to the composition of bogs, and which has become so solid that when it is cut in pieces they will retain their form; and muck to the loose matter which has been accumulated from leaves, or the washings of woods and fields.

The value of these substances as manure, especially for immediate use, varies greatly, according to their origin.—The muck found in ash, maple, or elm swamps, or which is formed by the leaves and small branches of hard-wood trees, is usually far better than that found in pine, cedar, or hemlock swamps, or in legitimate peat bogs. The former will generally produce excellent effects on most crops as soon as it is applied; the latter must have time for decomposition, and generally requires to be mixed with some substances which will assist the development of its fertilizing qualities. It is frequently remarked, that muck from the localities last mentioned, is *sour*; and chemical investigation has shown that it does in fact contain an acid, which is called *tannin*. The bark of oak, and of most hard wood trees, contains this principle; but when the bark or trees decay, the acid is soon dispelled by the action of the air and rain. With the remains of resinous trees, such as pines, cedars, &c., it is not so. Either from the acid being combined with resin, or from some other cause, it is much less soluble; and muck which is mixed with the rubbish of these trees, produces at first rather injurious effects. The refuse of wood-piles, composed of chips and bark chiefly from pine, is sometimes applied to land as manure; but the yellow colour and stunted appearance of vegetation in such cases, shows that the application was rather poisonous than beneficial.

In many situations, we believe that the substance of swamps and bogs constitute the best and cheapest material which can be used, to a certain extent, for enriching the soil. Its application is attended with the greatest benefit on such lands as contain least vegetable matter; and it so happens, fortunately, that those portions of the country which are most deficient in this respect, are generally best supplied with the article to which we refer. The question is, how can it be used to the best advantage?—We have before remarked that some kinds of muck operate beneficially as soon as they are applied, and without admixture with any other substance.—Such, however, is not very abundant, and with that which is ordinarily met with, the case is different. The acid must be got rid of, and the vegetable food which the peat or muck contains, rendered soluble. There are several ways in which this article may be usefully compounded, some of which are the following:—

1. Composted with animal manure. This mode has been practiced more or less for many years. Lord Meadowbank's experiments, more than forty years since, proved the value of peat compost. He found that any substance which would occasion a fermentation of the peat, would render it good manure; but stable or barn-yard manures were mostly used. He found that one load of manure would ferment three loads of peat; but it is evident that the proportions must vary, according to the strength of the manure and its tendency to heat, and the *sourness* of the peat. The peat and manure are laid in a pile, in alternate layers. It is best to dig the peat in autumn, when the bogs are usually driest. The compost may be formed in spring, and will ferment sufficiently to be used for crops in three or four weeks, according to the state of the weather—the change being, of course, most rapid in a high temperature.

Elias Phinney, Esq., of Lexington, Mass., one of our most judicious farmers, has ascertained that a cord of green dung will convert twice its bulk of peat into manure of equal value to itself.*

The beneficial action of the manure in this case is ascribed to two causes.—The ammonia of the manure being an alkaline salt, neutralizes the tannin, and the heat, in connexion also with the ammonia, renders the vegetable nutriment of the peat soluble. It is undoubtedly one of the best modes in which the farmer can use peat or muck. But he should never lose sight of the importance of using a sufficient quantity of muck in his stables and yards, to absorb and prevent the waste of all liquid manure.

If vats or reservoirs are formed for the reception of urine, the liquid may be used with excellent effect on peat; urine is richer in ammonia than dung, and its action on peat is consequently more powerful. Cheever Newhall, Esq., of Dorchester, Mass., prepares large quantities of peat in this way, and considers a cord of peat saturated with a hogshead of urine, more valuable for any crop, than a cord of any kind of dung made on the farm.

2. Doctor Dana, in his *Muck Manual*, observes that "the power of alkaline action is alone wanting to make peat good cow-dung,"—that "by the addition of alkali to peat it is put into the state which ammonia gives to dung." The effect of alkali is undoubtedly similar to that of the ammonia of manure. Its chief value probably consists in its neu-

* Dana's *Muck Manual*.

tralizing the acid of the peat, though, as Dr. D. observes, "the solubility of gemo (vegetable mould,) is wonderfully increased by the action of alkalies."

Of the alkalies to be used, Dr. Dana gives the preference to wood ashes, soda, (or white ash,) and potash; and the proportions in which he recommends these substances to be used, are—for a cord of peat, 16 to 20 bushels common house ashes, or 92 lbs. of pot or pearl ash, or 61 pounds of soda. The alkalies to be dissolved, and the solution applied to the peat in layers, as the heap is being made up.

Leached or spent ashes may be used instead of the articles above named, but the quantity must be proportionably greater. Dr. Dana refers to Geo. Robbins, of Watertown, Mass., who used for four years no other manure than one part of barilla spent ashes to three of peat, mixed together. The peat was dug in the fall and mixed in the spring. Mr. R. kept eleven horses, four cows, and one hundred hogs, but sold all their manure, and used only the compost on his land, which was a sandy loam. The effects are said to have been excellent, Mr. R.'s crops being equal or superior to any grown round him.

The "salt lye" from soap-boiling establishments, and soap boilers' waste of every description, can be used with great advantage in the preparation of peat.

Dr. Dana greatly prefers ashes, or the articles above named, to lime. He does not, he says, "go for lime, but for soluble alkali Carbonate of lime alone is not expected to produce immediate results, and seldom has, nor can be expected to produce visible effects in the first year of its application. * * * * * Alkalies and peat or swamp muck, are within the command of almost every farmer. Lime is not [always] within reach, and besides, requires no small skill in its management."

Dr. D., however, recommends that experiments be made with what he calls a "soluble salt of lime," which is prepared by mixing lime with salt. He advises the manufacture of a compost as follows:

"Take one bushel of salt and one cask (four bushels) of unslacked lime; slack the lime with the brine made by dissolving the salt in water sufficient to make a stiff paste with the lime, which will not be quite sufficient to dissolve all the salt. Mix all the materials then well together, and let them remain together in a heap for ten days, and then be well mixed with three cords of peat; shovel well over for about six weeks, and it will be fit for use."

Twice turning the heap over would probably be sufficient. The cost of this compost,—reckoning the peat at fifty cents per cord in the bog, and charging one dollar per cord for digging and carting it, the salt at sixty cents per bushel, the lime at one dollar and twenty cents per cask—would be $3.80 for three cords, or $1.10 per cord. In general, however, the peat would be of trifling value before it was dug, which would make the cost of the compost less.

3. The mixture of peat with animal bodies, where they can be obtained, forms a compost of the most powerful kind.—In some instances, slaughter-house offal, fish, the carcasses of horses, and other animals, may be obtained with little or no expense. They should be at once surrounded by peat, if that substance can be had—if not, vegetable refuse and earth will absorb the gases which are disengaged in putrefaction. Dr. Dana says, "it has been actually proved that a dead horse can convert twenty tons of peat into manure more lasting than stable dung." Without vouching for the absolute correctness of this rule, the writer can say that his own experience has convinced him of the great value of animal matters in preparing peat for manure.

4. When the substances above named cannot be obtained to advantage, *charring* peat has been found a useful process. Peat and peat rubbish, such as tussocks, and turf mixed with the roots of bushes, may be either burnt, and the ashes spread on land, or they may be only partially reduced by fire, so as to admit of their being used for manure. Clear peat may be charred in large quantities at a small expense. The peat should be first partially dried; then a fire may be kindled, and the lumps of peat gradually placed round. When the fire is fairly kindled, it should be kept in a smothered state, because if it breaks out in a blaze, it will reduce the peat to ashes, instead of leaving it in a charred or half-burnt state. Two hundred bushels of this peat charcoal per acre, is considered equal to a dressing of ten to fifteen tons of yard manure. This, however, no doubt depends much on the quality of the peat. The heat which the peat goes through, dissipates its acid, and reduces it to a pulverized state, in which it benefits vegetation immediately.

From Bell's Weekly Messenger.

FARM-YARD MANURE.

The improvement in the quantity and quality of the manure of the farm-yard is an object of too much importance to the cultivator, to render any apology necessary for our again recurring to the subject, and we can hardly select a better period than this, when, at the commencement of the farmer's year, his yards will speedily be again filling with straw.—This great agent of all the farmer's success has, there is no doubt, for a long period been generally improving in the farm-yards of England, both in bulk and value. This was a necessary result, as soon as the introduction of turnips and other green crops enabled the farmer to keep, during all periods of the year, a much larger live stock than was possible with the husbandman of the olden time, who was compelled, for want of winter green food, to kill off at the close of autumn a large proportion of his live stock; and what he did preserve of these, from the poverty of their food, yielded to him a manure of very inferior value. The introduction of the practice of feeding stock on corn and on linseedcake, was another great advance in the improvement of the value of ordinary manure. It was long, however, before the farmer was enabled to reason with useful accuracy upon this subject, and to see the true principles so clearly laid down by the German chemist Sprengel, when he remarks on this head (Jour. R.A.S., vol. i., p. 458):—

"When animals are so badly kept that they daily lose flesh, their excrements also become lower in quality in the same proportion, since the body in such case not only expels fewer of its own worn out particles, but the food itself becomes more powerfully exhausted by the digestive organs. If, on the contrary, the animals are kept on abundant and nourishing food, their excrements also are very strong in quality, but these will not only contain much refuse animal matter, but the food itself is also less exhausted. Hence the manure of fattening stock is best. Animals immoderately fed give, indeed, for reasons which do not require explanation, the most powerful manure, with the disadvantage, however, that the food has undergone a proper change. Accordingly, the more nutritious in general the food is, the better the excrements resulting from it, supposing the animals to obtain so much of it, as to gain instead of losing flesh and fat; for the excrements resulting under these circumstances are abundant in phosphorus, sulphur, soda, potash, chlorine, lime, magnesia, and nitrogen. Fatting stock, as we learn by experience, yield very strong manure when they are allowed the free use of salt. It is likewise maintained that the excrements of oxen fed on scalded fodder are of superior quality to those of stock fed in the ordinary manner: this, however is scarcely possible; they must, on the contrary, with equal quantity and quality of food, be inferior, for by the process of scalding, the materials are so prepared for the digestive organs as more easily to yield their best portions. For this reason we give cows a less quantity of the scalded fodder, than of that which has not been so prepared. The excrements of oxen fed on scalded food come sooner into effective operation, since the woody fibre and the hardened vegetable portions of the food are softened by the process of scalding, and, consequently, when in the state of excrement, are decomposed more rapidly. On account of this quicker effect, the excrement of cattle fed on scalded food is supposed to be the best, though it is not really so."

We have added what Sprengel says about the imaginary alteration in the riches of the manure by previous boiling the food of the stock; and this may be true, provided the same food is given in both cases; but we are not to confound this state of things with the result pro-

duced upon the manure by boiling only pretty similar food—food which, without this previous preparation, would not, perhaps, be available by the feeder. To such a class we may assign the plan of boiling linseed as food in the way recently described by Mr. J. Marshall, of Bedale, in Yorkshire (Jour. R. A. S., vol. vii., p. 394), who remarks, when speaking of its effects on the manure of the yard—"The increased quantity and superior quality of the manure thus derived have doubled the produce of my farm. Independently of other matters, the main source from which the feeder of stock should look for remuneration is his manure heap. He cannot grow corn without manure, nor have manure without cattle. Whoever can feed the largest quantity of stock, and thus secure the most and the richest manure at the cheapest rate, is the best able to augment the produce of his farm and thus to meet competition in the market. Up to this time, linseed cake, given in large quantities along with roots has been considered to yield the best manure. But why should linseed unadulterated be inferior in its manuring properties to linseed, from which all its richest, and most feeding matter has been extracted, and which has afterwards in many cases been adulterated with rubbish of any kind and every description? The effects of this system have been so apparent, in the increased fertility of the farm where it has been practiced, as to induce my neighbours to follow my example." And at p. 395, Mr. John Hutton, of Sowber Hill, near Northallerton, states as the result of his practice, "the manure is of the best quality, and very soon fit for use. No manure I have seen has equalled in efficacy that derived from this process." And at p. 397, Mr. T. S. Walker bears his testimony to the same fact—"From this mode of feeding cattle (with linseed) the manure produced will probably contain more oil, and less of the phosphate of lime, and other saline matters of the linseed than the manure produced from cake-fed stock." The accurate observation, therefore, will be very valuable, which shall determine the comparative fertilising duration of both It is certain that the saline and other portion of the linseed, are of very considerable value, but we are not inclined to go the length of M Kulhman, when he concludes (Trans. High. Soc. 1847, p. 622) that if all this oil was extracted from linseed oilcake "it would not be diminished in fertilising effect upon the land." And he admits that the practice of the Belgian farmers does not accord with his opinion, for he tells us that, "in the neighborhood of Lisle the farmer makes a distinction between the oilcake of the town and that of the country. He gives the preference to the latter, because, being manufactured by the less powerful presses of the windmills, they retain more of the oil than the oilcake made in the manufactories, where the presses are driving by steam power." And this is the more remarkable, because the Flemish farmers are in the habit of mixing oilcake with the excrements of cattle in their liquid manure tanks. This would appear to support the idea that it is to the oil of the linseed-cake that its manuring powers must be attributed. The analysis of Professor Johnston, however, shows that the oilcake contains not only a larger proportion of oil than is commonly supposed, but also double the amount of albumen and gluten, which from these containing nitrogen must form a valuable portion of the manure; now these more abound in the cake than in the same weight of linseed.

PASTURES.

From Bell's Weekly Messenger.

That "the grasses are nature's care," was the observation of a by-gone generation of philosophers, and in that conclusion they were much too readily joined by the farmers of their time. It is a doctrine, however, which is now happily exploding on all sides by the agriculturists of our day, who are pretty generally aware that much more is yet capable of being accomplished in adding to the profitable cultivation of grass land than was once deemed practicable. We notice in a recent letter addressed to a contemporary journal, that Mr. Hewitt Davis has been addressing himself to a very important question in the management of grass lands, viz., the depth at which permanent pastures should be drained. This, in other words, means to what distance from the surface should the water line of the land water be removed. On this head he remarks—and we are always glad to benefit by the evidence of a clear-headed energetic farmer, even if we deem his conclusions too sweeping—"Although no one can be more sensible than I am of the importance in draining of going to the depth of at least four feet in arable land, I am very far from thinking that the reasons for going to this depth in the cultivation of corn are equally applicable to grass land. Indeed, I have latterly been led to think such deep drainage may be injurious to pastures, by depriving them of that cool bottom on which the summer growth so much depends. I readily admit (for I know it is so) that deep drains draw further, and raise higher the temperature of the soil, and afford a larger space for the cereal grasses and legumes to root in, advantages of immense importance to the early growth and ripening of corn; but with grass land, where we desire a continuance of succulent vegetation, and a succession of plants to continually rise through July and August, a cool bottom is an advantage which I imagine should be carefully preserved; and with this view, and at the same time that I have been considering the advisability of going deeper than four feet in arable land, I have been reducing my drains in pastures to three feet; for while I would free the surface from all stagnant water I wish not to place the reservoir of moisture so low that it shall not cool and moisten the surface in the summer, for on preserving this moisture much valuable pasturage at that season depends." The farmer will justly deem this investigation of the very highest importance. We are by no means, we confess, assured that the results of thus keeping the roots of the grasses cool are of a nature the most beneficial to the production of the greatest weight of grass. In our long continued observations upon the improvement of natural pastures we have noted on several occasions that the produce increased with the depth of the drains, and we have seen them laid at a greater depth than four feet. We have remarked, too (and we note this not as decisive of the question, but as one of Nature's own hints—always too valuable to be disregarded), that in some of the peculiarly situated watermeads of Berkshire the produce of the grasses on some of those resting on a deep bed of loose broken flints, from which in consequence the flood waters are rapidly and *deeply* removed, as soon as the drains are opened, are always remarkable for their luxuriance and rapidity of growth, and not only is the produce excellent, but the grass itself is very sweet and wholesome; for the holders of these peculiar meads are aware of the fact, that on these lands they may safely trust their sheep in all seasons and periods of the year; for on them the rot never attacks their stock, even at periods when that disease is peculiarly rife on the less deeply drained meadows around them. And this remark is not confined to any peculiar locality; the great meads of the chalk valleys of Hampshire often rest upon deeply drained beds of peat; those watered by the town sewerage of Edinburgh rest upon deep beds of coarse shingles thrown up by the sea; and although the enormous produce of these grass lands must be chiefly attributed to the richness of the waters with which they are irrigated, yet the hollow nature of the stratum on which they rest, it is quite clear, has neither retarded the growth, nor prevented the annual production of several heavy crops of grass. We cannot but deem therefore, the research as one very likely to amply reward the experimental investing farmer. In considering the most beneficial degree of moisture adapted for the produce of pastures, a very valuable portion of the inquiry must not be omitted, viz., the quality as well as quantity of the grasses which form, in popular language, the grass of natural pasture. Now this grass, it is well known, is composed of a very large number of distinct grasses varying not only in the amount and quality of the nutriment which they afford, but in the degree of moisture in which they thrive the best. Every farmer knows this; he finds certain alterations in the treatment of a pasture are invariably attended with a corresponding variation in the plants which tenant it. By deeper draining the rush tribe and those grasses which are found in stagnant waters dis

appear, and others take their place. He sees that if he applies to his meads certain fertilisers, that fresh grasses soon make their appearance—that white clover and the wild trefoil follow the application of gypsum or crushed bones, or the other manures which contain the sulphate or phosphate of lime; and that the same results are even produced by feeding the live stock depastured upon these lands with oilcake or other food which abounds in the phosphate of lime.

* * * *

In the improvement of pasturage by the application of manures, we have been recently making some trials and observations upon the *period of the year* in which the fertiliser should be applied.—On this head we should be glad of the practical observations of some of our readers. We rather incline to the opinion at present, that even organic manures cannot be applied to grass land at a better period than when the hay is just off, and this in spite of the fact that, at that period of the year, the sun and winds must exert a prejudicial effect upon the ammoniacal salts and other volatile matters of the manure. We think, indeed, that more valuable information might be acquired by an examination of the effect produced on grass by top dressing, at varied periods of the year, than is generally supposed. The irrigator applies his liquid manure the moment the hay is off; the Belgian farmers do the same. The Staffordshire farmers find that if they apply bones to grass, it must be done when the soil is softened by moisture; and every English farmer is well aware that in the case of some of his grasses, to which gypsum is so powerful a manure, the period of its application is a most material consideration; thus in the majority of soils it is useless to apply it if a wet day is not chosen, so that the white powder of the sulphate of lime may adhere to the leaves of the grass. The farmer who considers with sufficient attention facts like these, will very readily see that in the case of grass lands there still remains a field of profitable research which will probably not be exhausted by the most skilful and patient efforts, during many seasons of careful observations.

To protect Grain from Rats.—An individual of much practical experience, states that green elder deposited in and about the mows of hay or grain will prove an effective preventative against the depredations of mice or rats. These animals are frequently very destructive in their ravages, and if a remedy so simple and easy of attainment is so efficacious, it deserves to be known and remembered by all. We have long known that the leaves of the common mullen will drive rats from their haunts. There is something in the odor of this plant that is disgusting to their ratships, as was the leek to the ancient Pistol; they cannot "abide it."

From the Farmers' Gazette.

PREMATURE STARTING OF CROPS.

Sir,—Among the many casualties that affect the growth of vegetables, the following complaints are frequently presented to our notice—viz., carrots, mangel-wurzel, and different plants starting too soon for seed, and hence the caution of too hasty a thinning of biennial roots, the seed of which it is necessary to detect in the propagation of the various species.—The causes assigned for this are, not having a due regard to the selection of roots set apart for seed, gathering indiscriminately, and also the unskilful application of too much exciting manures, such as guano, soot, or artificial composts.

I sowed my principal crop of white Belgian carrots the first week of May, and they are much given to start for seed; the Altringham carrot, sown same time, show no sign; and the white Belgian sown again in the first week in June, show no sign of starting either. The season here has been most propitious. From my experience of casualties, I thin all my crops cautiously, and cultivate for carrot by trenching 18 inches deep, turning in farm-yard manure between the two first spits; the last spit I loosen but do not throw up. This work is done two months previous to sowing the seed. I lay the land out in beds 4½ feet wide, which is then brought to a fine tilth. The seed I sow across the bed in drills, 15 inches asunder, then rolled with a heavy roller. I find it needless to trench deeper as their growth would be lost in mining. When the red Altringham come over the ground, I mould them to prevent their turning green. When fully thinned, they grow at from 4 to 5 inches apart. By this mode of cultivation I sent carrots to your office last year which you were pleased to acknowledge the largest you had ever seen.

In this locality the potatoes are visited with the like pestilential disease of last year. As its attack this year is six or seven weeks later, the potatoes planted early are nearer maturity. Last year I commenced lifting my potatoes on the 1st of September. The weather at that time was good, consequently I dried the crop well on the ridge. After being dried, I picked them, rejecting all the diseased ones, and then stored them in a cool apartment, sprinkling well amongst them lime rubble and turf-mould. I give this hint merely because a difference of opinion exists about taking potatoes so early from the land. Mine kept perfectly sound up to July. Let those who are annoyed with rats, have their potato floor paved or flagged, their potatoes stored in narrow piles, and sight holes in the walls, which can be occasionally thrown open to see in what state the potatoes are. Cover the potatoes with furze (gorse or whins,) leaving the roots to them for moving them when occasion requires, and lay on a light board to keep close.—Yours, &c., J. L.

Lurganboy, August 30, 1847.

From the Farmers' Gazette.

ARTIFICIAL MANURES.

Various compounds, under the name of "artificial guano," have been offered for sale, and, in many cases, very successful results have followed the use of them; but it is much better for the farmer who wishes to use such manures, to manufacture them himself, than to trust to any dealer of manures. We do not mean to cast any imputation on the character of the many respectable parties who have manufactured such compounds, but we say that there have been so many worthless articles sold under this designation, compounded by unprincipled parties, that very little dependence can be placed on such *manufactured manures*. A few years ago, we had occasion to inspect an article sold under the name of "British guano," and of which a considerable quantity had been disposed of at £10 a ton, whilst the actual value of the compound did not exceed £3. No one need be imposed upon by such stuff, unless he is so foolish as to grudge the trifling expense of a *protective analysis*; but it is no very difficult matter to compound a mixture of substances which will serve the purpose as well as the best and most honestly manufactured artificial guano. Indeed the mixture given in last week's article, and described by Mr. Gardner, might very properly be termed an artificial guano, and it is evidently an improvement on a suggestion made some years ago by Professor Johnston, in the appendix to his Lectures on Agricultural Chemistry and Geology (p. 32). He writes thus:

"The following mixture contains the several ingredients found in guano in nearly the average proportions; and I believe it is likely to be at least as efficacious as the natural guano, for all the crops to which the latter has been applied in this country—

315 lbs. (7 bushels) of bone-dust.	
100 ,, of sulphate of ammonia, containing 35lbs. of ammonia.	
5 ,, of pearl ash.	
100 ,, of common salt.	
11 ,, of dry sulphate of soda.	
531 ,, of artificial guano.	

"The quantity here indicated may be intimately mixed with 100 lbs. of chalk, and will be fully equal in efficacy, I believe, to 4 cwt. of guano, (Peruvian)."

That the anticipations regarding this artificial guano were well founded, we find from Mr. Hannam's Report on Special Manures, where it is stated that whilst 2 cwt. per acre of natural guano, at a cost of 34s per acre, produced 20 tons, 5 cwt., and 4 lbs. of Swedes, the same quantity of artificial guano, prepared according to Johnston's *recipe*, and at a cost of 21s. per acre, produced 19 tons, 10 cwt., and 2 lbs. of Swede turnips.

In like manner, various preparations of night-soil and urine have been made, and very satisfactory results have followed such trials as have been made with them, but, of course, their efficacy must

depend on the honesty of the manufacturer. It is to be hoped that these public companies, who have now undertaken to prepare these hitherto neglected, but valuable manures, so far as the sewerage of towns is concerned, will take every means to guard against the possibility of adulteration; because such manures, which might otherwise be of the greatest importance to the agriculturalist, will have lost their value, from the mere fact that confidence cannot be placed in them.

From the Albany Cultivator.

REMEDY FOR SLUGS ON CHERRY TREES.

Editors of the Cultivator—Some three or four years ago I observed, for the first time, a small slimy insect upon the leaves of the cherry tree, which made sad havoc of the leaves, and materially injured the quality of the fruit. They grow to the length of one-third of an inch, and at first view look much like the common polly-wag, but are provided with some twelve pairs of stumps, which enables them to travel over the surface of the leaf, and very little more—one among the millions of examples which go to show the beautiful fitness and adaptation of organs to the necessities of the animal. They make their appearance in June, and continue their stay till August. Their appearance is extremely disgusting, especially when they take up their residence on the fruit. They eat out the parinchyma of the leaf, and from their vast numbers, often five to six on a leaf, in a little time the tree looks as if it had been burnt over.

So far as I can learn, they are a new creation. I have taken some pains to ascertain the routine of their existence, but as yet with little success. A short time before they made their appearance I observed millions of small white flies or millers, buzzing through the tops of the trees. These disappeared after two or three days, and in a week or ten days I found the leaves swarming with these insects.

The object of this communication is to present to all who may be interested, a remedy, easily applied and infallible in its operation. This year my cherry trees blossomed profusely, and I determined to preserve the fruit if possible. After the insects made their appearance, I sifted dry slaked lime over the leaves, and from the *moist, slimy* constitution of the insect, every particle of lime adhered to them that came in contact with them. The consequence was, they soon gave indications of distress, rolled up and fell to the ground. They are almost always found upon the top of the leaf, rendering it very easy to reach them; and I believe they generally die, even from the effects of a minute quantity of the lime. I applied lime twice only to my trees; and although a few insects escaped, yet I have a fine crop of cherries, and my trees have a good covering of healthy leaves. Had I left my trees to their fate, probably every leaf would have fallen off, and left a small, half-perfected berry upon the otherwise naked branches.

SAMUEL GUTHRIE.

Sacketts Harbor, July 20, 1847.

P. S. Since writing the above, a neighbour who has a good number of cherry trees, informs me that his trees are dead and dying—that the slugs, as they are called here, have left scarcely a live leaf upon them, whilst the fruit is stinted, sour, and worthless. Although I sifted lime but twice to save my fruit, yet it is obvious that it should be done so often as may be necessary. With a small ladder, set up on the windward side of the tree, and three or four quarts of dry lime, any one may in a few minutes save both the tree and its fruit.

SEEDING TO GRASS IN AUGUST.

A new practice has obtained among some farmers in this section, derived first from Mr. Buckminster of the Massachusetts Plowman, of seeding down to grass upon the green sward furrow, in the latter part of August or first of September. When a piece of land becomes "bound out," as the phrase is, or ceases to yield a good swath, it is very carefully and nicely turned over by the plough at this season, and rolled down. Fifteen to twenty loads of fine compost are then spread to the acre and harrowed; first lengthwise the furrow, and then diagonally. The grass seed is then sown and covered with a brush harrow. The new seeding will be fit for the scythe the next season, although a little later than the old fields.

Among the advantages advocated for this practice are the following:—

1st. In those localities where hay commands a high price, the land may be kept highly productive in grass with less manure, than by the system of ploughing and planting one or two years, and then seeding with a grain crop.

2nd. It is generally considered that the enriching or vegetable matter in an acre of green sward that will cut three-fourths of a ton of hay, is equal to a dressing of at least fifteen loads of manure. This is turned under, where it is free from the dissipating influence of the sun and wind, and there remains to enrich the land.

3rd. It is well known to the farmer that, by the old practice of planting one or two years and seeding with grain, before he can get round to renovate all the lots, as fast as needed, much of his land in grass will not yield a full crop. By this method, requiring as it does less manure, he can visit his different fields oftener with the plough and manure cart, and thus keep his entire tillage ground in a more productive state.

4th. Almost every farm has some fields in grass too low or wet to be ploughed and planted in the spring. These lands can generally be ploughed in August, and thus as often as they become bound or overrun with wild grasses, can be turned smoothly over, manured and reseeded, and a good quality of hay continually obtained. Of course, land to be managed in this way, must be so free from rocks and stumps, that the plough can turn it well.

I have thus given the practice and its recommendations, and although they will not apply in full extent, except in the localities named, still this practice in part, would be useful on most farms, in this region at least.

F. HOLBROOK.

From the Farmers' Gazette.

BOILED FLAXSEED v. LINSEED MEAL.

In answer to a correspondent on this subject, we have been favoured with the following paper, on "Linseed, Linseed Cake, and Linseed Meal, for Fattening Cattle and Rearing Calves," by Messrs. McAdam and Co., general millers, Donegal street, Belfast, who have for some years seen it practised with the best results:—

"Almost every person in the habit of feeding cattle for the butcher, is acquainted with the fattening qualities of linseed cake, but rearing calves with linseed meal has only been introduced in this neighborhood within the last three or four years; it is now quite established, and a great saving is the result.

"Half a pound of this meal is sufficient for a calf daily, and this costs from one halfpenny to three farthings, while a quantity of milk, containing the same proportion of nutriment, would cost eight pence to ten pence per day; a saving would thus be effected of at least six pence a day on each calf, which is 3s.6d. per week for one calf, and £3 10 per week for 20 calves; and this for three or four months amounts to a sum worth saving.

"The linseed meal is the cake ground; the best way of using it is to steep at the rate of a quarter of a pound for each feed, in cold water, for 20 to 24 hours; then to dilute with warm water to the temperature of new milk, making a gruel about equal in bulk to the milk usually given—if any milk be added, a pint each feed is quite enough.

"The general report of our farmers and dairy men, who have continued the use of this meal for rearing calves during the last three or four years is, that the calve are more healthy when fed on it, than formerly when fed on milk, and that there are fewer deaths; it is very nutritive, and at the same time keeps the stomach and intestines in a cool and wholesome condition."

WALES.—A hint to the farmers of the principality is given in the North Wales *Chronicle* of Tuesday. The editor of that journal, in an article upon the prospects of agriculture, and on the necessity that exists for farm improvements now that protection is withdrawn, says:—

"Model farms, got up by the landed proprietors for the instruction of their tenantry, are effecting quite a revolution. One of these experimental farms, in the immediate vicinity, we may refer to.—The swampy coursing-ground upon the Penrhyn property, near Aberogwen, called Glanmore, in extent about 120 acres, within the memory of man a source of vexation and loss to tenants, was about two years back, selected as the site of a model farm on which fairly to test the efficacy of draining, subsoiling, &c., without regard to expense. Accordingly, Mr. Wyatt, of Lime-grove, took it in hand. Two main drains, or tunnels rather, emptying into the sea, were established in the first instance, and the next step was a process of draining and thorough-draining. The subsoil plough did its good office, and rushes, mosses, and other like dropsical symptoms, quickly disappeared. By dint of good management the soil was brought into tilth, and last year's crops were sufficiently encouraging. The object in view was steadily followed up, and this year magnificent crops of wheat, barley, and oats were realised, while the green crops, the swedes especially, are very promising. The harvest on this farm was got in on Saturday se'nnight, leaving all the neighbouring farms full three weeks behind. Now surely this is something to brag of. The ground is now being prepared for a large breadth of wheat, to be got in forthwith."

ASPARAGUS.—A correspondent of the Farmer and Mechanic, raised asparagus very successfully as follows:—"I selected a warm, sunny spot; and mixed in freely sand and coarse manure, saturating it with brine to the depth of two feet.—On the top I put three inches of fine loam and vegetable mould; planting my seeds after steeping them in warm water 24 hours, the seeds about 8 inches apart, and the rows one foot." Every autumn fine manure is mixed with the surface soil, and a coat of coarse manure protects the whole through winter. Two quarts of salt on a bed 5 feet by 30, are sprinkled every spring, and water freely applied every evening in dry weather.

EXPERIMENT IN PORK MAKING.—B. Dinsmore, states in the *Genesee Farmer*, that he made an experiment in fattening hogs with Indian corn and barley, by which the hogs gained one pound, live weight, for every four and a-half pounds of grain eaten. The food was cooked by boiling from six to twelve hours. The corn was boiled whole, but the barley was first ground. He thinks grinding is of no benefit, provided the grain is cooked enough.*

* And a very unprofitable method of Pork making too, for supposing the grain in equal proportions, the average weight would be 54 pounds, for which just 12 lbs. live weight or 10 lbs. dead would be produced, at a cost of 2s. 6d., or five dollars per hundred—giving Piggy, with all the trouble of his previous nurture, into the bargain. Pork making is a poor trade.—ED. *N. F.*

ON THE ADVANTAGES AND DISADVANTAGES OF BREAKING UP GRASS LANDS.

By JOHN CLARKE, *of Long Sutton, Lincolnshire.*

A large breadth of land of medium quality, near the writer's residence, has within the past few years been broken up. The tenants, when under grass, stocked them thus:—In one case, five hoggets per acre, and a young steer to five acres, and in the winter one shearling per acre; in another case, two ewes suckling lambs, and two hoggets per acre, and a young steer to three acres; in other cases the same or very similar courses were pursued, the land carrying about one sheep per acre in winter. These lands have been broken up and planted with potatoes the first year. The labour expended in the setting and lifting these crops has been great, but the produce has abundantly repaid the outlay, the crops averaging from 350 to 600 bushels per acre of regents and other not very prolific, but very marketable, varieties. These have been followed with wheat, which course, under ordinary care, may be thrice repeated. Inferior grass lands cannot do anything in comparison! The return upon grazing such land is trifling, but the profit under culture is ample; and they can with comparative ease be kept up to the mark, or in truly good heart, as already shewn, land must in this state be worth more to rent as arable than as pasture lands. By adopting the usual course of seeding, they may be made to produce *much more animal* food for the consumption of the public than before. Lands of first-rate quality pay still better. The crop of brown mustard are frequently very valuable; and though the price is fickle—having varied, within the writer's recollection, from 8s. to 50s. per bushel—yet it is good policy on these lands to take a crop or more previous to wheat, which usually succeeds it, and often repeated to an incredible extent. The writer can point out several fields which have had three, four, and one as high as six crops of wheat in succession;* he in one instance had two crops successively, averaging forty-six bushels per acre; and many similar facts might be mentioned, and these have continued under cropping without in any degree impairing the fertility of the soil; indeed, after taking *woad*, it is a common practice to keep on cropping for many years, only varying the rotation, and with excessive yields. Lands of this quality can readily be replenished, and their productive powers kept up [illegible]

It is, in fact, impossible to prescribe bounds to the productive powers or capabilities of such soils, if kept clean, properly cultivated, and supplied with dung. It is an important inquiry whether such lands should, under any circumstances, remain under grass. They are exceedingly valuable as pasture, but under culture, far more so; and the expense of labour in cultivation being by no means excessive, a great amount of food is produced at a small cost to the farmer. It is objected that these lands, being capable of producing so much animal food, ought not to be disturbed. The converse of this is, however, the case; the better the land, the greater the produce under arable culture. It might be shewn very readily that, if such lands were merely and solely devoted to the growth of the best artificial grasses, and these mown or given to cattle or sheep in *hammels* or *byres*, the result or proof in weight of beef and mutton would be quadrupled, and the manure thus made would keep it in fertility. It must be remembered that the lands here alluded to are the deep, open loams, not the loamy clays; these may probably be best under pasture, but the deep friable loams ought to be brought into cultivation, and would in such way best pay the tenant, and yield a higher rent to the landlord.

In respect to the *very poor* or *inferior grass lands*, it may be questionable how far they will pay for cultivation. That they are of but little value under grass is very certain. The cold and wet mountain pastures, and low, swampy valleys, or lands incapable of efficient drainage, cannot be brought into profitable culture; but the cold, heavy, and thin clays, moorlands, and heath-lands, &c., will, under the alternate course of Husbandry, be most profitable to the Farmer, supposing their locality easily accessible. The heath lands of Lincolnshire, which are synonymous with the down-lands of the southern counties, have, by judicious cultivation, become some of the most productive in the kingdom. One recently brought into cultivation, (Welby, warren, near Grantham) is now producing beautiful crops of turnips, barley, seeds, and wheat.

* One field has sustained forty-five years' cropping without a fallow or fallow-crop.

GATES.—Every field on the farm should be entered by a good self-shutting and self-fastening gate. How long does it require to take down and put up a set of bars? At least two minutes, which, if repeated three times a day for a year, amounts to thirty hours, or three days of working time—which would nearly pay for a good gate! Or examine it in another point, three times a day is eighteen hundred times a year; now is there any man between Halifax and California who would take down and replace a set of bars eighteen hundred times in succession in payment for a farm gate? Hardly—yet this is the price yearly paid by those who use bars that are constantly passed, and the gate is not obtained by it. Again—how much better is a gate well hung than one half hung!—or one with a good self-fastening latch, than one with a pin crowded into an auger hole? Try it by dragging a badly hung gate over the ground, eighteen hundred times in succession, securing at each time with a pin, and see if you do not think this labor would pay for good hinges and a latch.

Newcastle Farmer.

COBOURG, NOVEMBER 1, 1847.

The prospect for the Canadian farmer of remunerating prices for his breadstuffs, is certainly far from satisfactory. The year of scarcity is succeeded by one of plenty on the whole European continent, and the consequences of the Free Trade movement will be an abundant supply to the British Isles from all those countries, where labour is on an average about one third the amount of price the Canadian farmer pays. These countries also possess greater facilities of communication, and consequently are subject to fewer charges on their consignments; and with a reduced rate of freight will inundate the markets of England, to the serious embarrassment (in some cases ruin) of both landowner and farmer, until after many years things shall again have found their level (such as it will be,) at the expense both of landlord and tenant; and we mistake greatly if the manufacturer, operative and mechanic, are not eventually compelled to suffer under a pressure from which there is no panacea to relieve them. It remains to be seen whether those countries which are to be so especially benefitted by the Free Trade measure, will in return take sufficient of the manufactures of Great Britain to meet the amount required for the payment of these foreign supplies. The manufacturer of England counts greatly on the vast improvements in his machinery, to enable him to hold the foreign markets; but it must be remembered that *even now* that machinery may be exported, and the foreigner can also procure the machanist, and as for the raw material, it is in nearly all cases as accessible to one as the other; indeed in many instances the manufacturers are already forestalled in their own markets; and the operatives, who were to live at ease in the midst of plenty, are without the employment necessary to procure a bare sufficiency. It would be idle folly to expect that those British Colonies which are either partially or entirely agricultural, can by any possibility continue to take of British manufactures to the same amount as formerly, when one-third or one-half of the means of payment for them is lost. We have no hoarded wealth, no mines of precious metals, to meet the deficiency or support our credit. It is true, we may take our produce to *any* market, but where is the market with which we can compete? there is none; our position is such, that there is *not* a nation on the face of the globe which cannot either grow or import the greater portion of our produce at a less price than we can send it them.

Certain it is, that an experiment will have to be made to ascertain whether some other produce than wheat or flour, on which we have mainly depended, cannot be found more profitable as an article of export, and this can only be effected by lessening the amount paid for labour, and throwing a portion of the land out of tillage into pasture, for the produce of the Stall and the Dairy.

It is vain for our merchants to say, "go to, ye are idle," *improve your lands*, and double their produce by industry and science. We admit this could be done to a great extent, if we had the means; thousands of acres are either partially or wholly unproductive for want of that first principle in good farming, DRAINAGE; but however remunerative the process would prove, it cannot be done with a three months' bank discount. We cannot make bricks without clay.

We shall assuredly have to enter into the calculation of, What are necessaries? and we shall soon be let into the secret that many, which we have deemed such, are mere luxuries and superfluities; and well will it be for us to economise, and content ourselves, more particularly in the article of clothing, with such manufactures as our country can produce; for now that those denizens of the forest have disappeared who used to furnish the leathern hunting-shirt and continuations, and the circulating medium scarcely come at-able, it will be well if we have not to adopt that exceedingly primitive, though deucedly inconvenient full dress for a Canadian winter,—*a bunch of fig. leaves.*

In the *Sun* of the 20th ult., we noticed an entomological article over the signature of S. H., evidently from the pen of a scientific gentleman, treating on the vexatious question of the destruction of the wheat plant, and the consequent comparative failure of the crop. We are truly glad to see the subject engaging the attention of persons qualified to convey information to the farmer, whose subsistence mainly depends on his success in raising the wheat crop in particular, as well as the other cereal grains. We fear there is very great confusion caused by confounding one of the numerous enemies of the wheat plant with others, differing entirely in their habits and mode of operation. The nomenclature is wholly unimportant to the unscientific farmer, who only knows of the devastation without being acquainted with the remedy.

The writer states the destruction which came under his own observation, and notes it as occurring principally in late sown Spring wheats on light sandy lands, but from our own observation, confirmed by others, we are compelled to differ from him as to the particular devastating insect, and its mode of operation. The greatest amount of mischief was caused (on such lands,) *not* by the larvæ of the fly, which deposits its eggs on the first or upper joint of the seed stalk, but by a maggot at a point much lower down, at the very crown of the plant, the lower joint of the straw. This was seen in innumerable instances, the whole of the stalk falling to the ground previous to the filling of the ear, whereby all vitality was destroyed; the field presenting the appearance of having been run through in all directions, as if some animal as large as a rat or squirrel had perambulated the whole enclosure. But a vast amount of mischief came from another source still, and in a very different manner, evidently caused by an insect widely distinct in its habits and mode of operations. The plant in this case wore the most promising appearance; even the head arrived generally at maturity, the grain nearly or entirely ripened, and until rubbed out no suspicion arose of a failure, as some heads from the same root were perfectly sound, while others (and a large portion of some sorts) contained the maggot feeding on the partially or wholly ripened kernels of the grain; the depredators in this instance, we believe to be the genuine Hessian fly. In the case of the insects noticed by S. H., and which are unfortunately too numerous, the effects are totally distinct from those before mentioned.* The fly in this case, as stated by him, deposits its eggs in the sheath of the *upper* joint of the stock,—the larvæ of which immediately com-

* In a six acre piece of Spring wheat we had this year, one portion (Black Sea wheat) was attacked by the Fly at the joint very generally, while the adjoining part (Siberian,) presented only one solitary head so attacked; nor did we discover any worm at the root of either, while a piece on the next lot suffered in that way severely.

mence operations at the junction of the stalk with the joint, which they completely sever, and ensconce themselves *within* the straw itself, there to undergo their transformation to their next stage of existence. (We have found hundreds of them varying from one-eighth to three-eighths of an inch in length.)—In this case, although the lower portion of the plant is vigorous as ever, all communication being cut off from the lower straw or stalk, vitality at once ceases, and the unfilled ear immediately assumes a ripened appearance, but contains only the shrivelled remains of the embryo grain. We would observe that this insect is never seen on the leaf, but only within the straw.

S. H states that the chrysalis requires a heat of 75 degrees to enable it to emerge again into life as the devastating fly, to go through the operations of its progenitors. Now, as the period of these insects' appearance (we speak from repeated observations) is from about the 10th to the end of June, it would follow that the heats of July and August would produce a second edition of the plague. From this (and we do it with every respect for S. H.) we are compelled to dissent, and for this reason: Nature, the most studious of all careful mammas, endows all creatures with sufficient instinct to perpetuate their species, by placing their progeny (or the ova from which they proceed) in a situation the best suited to afford the needful nutriment for their earliest wants and immediate support on entering into existence, taking into account time and season when such nutriment is abundant. But let the new race make their appearance in July and August, and the saccharine substance is lost in hard woody fibre, and the consequence would be the extirpation of the race; no such luck we fear, but perhaps S. H. will set us right, as all we wish is to elicit facts.

Our friend S. H. next adverts to the Potato insect, which he entomologically describes, and which he is "confident injures the plant." The insect named, we have noticed repeatedly, and have no doubt of its materially retarding the growth of the plant; but unless it takes away its vitality, we doubt its *destroying* the potato or tuber, and still more its capability of conveying so destructive a virus to the potato; indeed could such be the case, how are we to account for sound and unsound tubers on the same plant?

If in arraying "a host of chemical professors" against Professor Smee, he means to deny the Professor's theory of the disease originating in the top and descending to the tubers, which his language seems to imply, he has himself fallen into the same error, for he says "keep off the fly, and you have healthy plants and no rot in the potato." A maggot is then mentioned as the devastator, which generally kills the plant *completely* in August; from the chrysalis of this maggot proceeds a moth, after 30 days' suspension of vitality—the result of whose operations is that no potatoes are to be found. Surely there must be some mistake here, for the tubers even in late potatoes are fully formed long before this moth makes its appearance, which cannot be earlier than September. Do we misunderstand S. H.? or does he mean us to infer that the maggot proceeds from the bug with fluted wing covers, and which "destroys the potato," and furthermore, that from the chrysalis of this maggot a night-flying moth makes its appearance, to render nugatory all the labours of his precursors, as the result of his visits seems to be that there are no potatoes to rot? Really, (to our obtuse comprehension) as it now stands, we are forcibly reminded of the famous sugar-kettle case, wherein a Yankee lawyer defends his client in some such manner as this:—"Gentlemen of the Jury—This is an action of trover, wherein the plaintiff seeks to recover damages for a loss alleged to have been sustained in a certain injury done to a sugar kettle, said to have been borrowed by us of the Plaintiff. My learned friend on the other side has sought to prove, (very unsatisfactorily to you, I do not doubt,) that said kettle was perfectly sound and whole when we received it, and that when returned by us it was irrecoverably injured, and rendered valueless by being cracked. Now, gentlemen, I will convince you by irrefragable proof that the said kettle, when we got it, had a crack in it as large as the worst flaw in an Attorney General's Indictment,—and I shall moreover show by equally veracious witnesses, that when we returned it there was *not* a crack in it sufficient to contain so small a matter as a lawyer's conscience; but, gentlemen, we have still more tenable ground of defence, for we shall call witnesses whose testimony must satisfy the most incredulous, who will prove most clearly that we never had the *darned old kettle at all!!!*"

But to return to the potatoes (as we shall have to do), we must say that we have no faith whatever in Professor Smee's theory; and with all due deference to S. H., *we believe* that fly, flea, bug, maggot and moth, are the *result*, and not the *cause* of the disease at all; and whatever be the cause, that it has yet to be fathomed. We have potatoes this year, on which, though closely examined, none of the above were found; the tops exhibited vegetation in its utmost luxuriance, and still the tubers were unsound; while others, whose stems and leaves never from the first bore a healthy appearance, and on which the flies were abundant, are now (the tubers) as far as our scrutiny can extend, perfectly sound. We shall not enter on the electricity question further than to state, that we were informed that the potatoes on the farm wrought by Mr. Mason in Cobourg, were destroyed immediately after one of our most terrific storms of lightning.

Is Farming Progressive?—From an interesting experiment, lately published in the *Times*, it appears that one grain of wheat, sown in July 1842, produced four plants *(by division)* in August, 32 in September, and 50 in November. These were harvested in August 1843, and produced 1970 ears, 98,600 grains. A similar experiment was made in the botanical garden at Cambridge many years since. One grain of red wheat, sown on the 2nd of June, produced 18 plants in August, 67 in October, and 500 in the following April. These plants when harvested, produced 21,109 ears, which yielded 3¾ pecks of clear grain, weighing 47lbs. 7oz. The number of grains estimated by average, was 576 840.

Water proofing Fluid.—This preparation is used for preserving and softening leather, and repelling snow-water: linseed oil, three pints; yellow rosin, four ounces; common do., two ounces; bees-wax, twelve ounces; melt and add cod oil, two pints; oil of turpentine, one pint; mix, and it is ready for use.

Enormous Pumpkin.—We observe that Mr. Pegler, fruiterer to her Majesty, 101, Union Street, has received into his stock a pumpkin weighing 175½ lbs., and measuring no less than 7 feet 6 inches in circumference. This is probably the largest pumpkin ever grown.—*Scottish Farmer.*

A Farmer in the neighbourhood of Paisley has, for some time past, placed garlic at the bottom of his grain stacks and cows, and since adopting this plan has never been troubled with rats or mice, although they abounded before.

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