

products of the decomposition are taken up by the soil, and thus waste is in a great measure prevented. But in very light and open soils, this absorption of the products of decay does not take place so completely. The rains wash out some portions, while others escape into the air, and thus by burying the recent manure in such soils, less of that waste is prevented which when left in the open air it is sure to undergo. It may even happen, in some cases, that the waste in such a soil will not be greatly inferior to that which necessarily takes place in the farm-yard. The practical man, therefore, may question whether, as a general rule, it would not be safer in farming very light arable lands, to keep his manure in heaps till it is well fermented, and to adopt those means for preventing waste in the heaps themselves which science and practical skill point out to him.

It may be regarded indeed as a prudent general opinion to hold—one, however, which must not be maintained in regard to any particular tract of land in opposition to the results of enlightened experience—that recent farm-yard manure (*long dung*) is not suited to very light soils, because it will render them still lighter, and because in them the manure may suffer almost as much waste as in the farm-yard;—and, therefore, that into such soils it should be ploughed in the compact state (*short dung*), and as short a time as possible before the sowing of the crop which it is intended to benefit.

4. But upon loamy and clay soils the contrary practice is recommended. Such soils will not be injured, they may even be benefited by the opening tendency of the unfermented straw, while at the same time the products of its decomposition will be more completely retained—the land consequently more enriched, and the future crops more improved by it. On such soils, the recent dung ploughed in, in the autumn, has been found greatly more influential upon the crops of corn which followed it, either in winter or in spring, than a *proportional* quantity of well fermented manure. By such treatment, indeed, the whole surface soil is converted into a layer of compost, in which a slow fermentation proceeds, and which reaches its most fertilizing condition when the early spring causes the young corn to seek for larger supplies of food.

5. But the nature of the crop he is about to raise will also influence the skilful farmer in his application of long or short dung to his land. If the crop is one which quickly springs up, runs through a short life, and attains an early maturity, he will apply his manure in such an advanced state of fermentation as may enable it *immediately* to benefit the rapidly growing plant. In this case, also, it may be better to lose a portion by fermenting it in the farm-yard, than by applying his manure fresh, to allow his crop to reach nearly to maturity before any benefit begins to be derived from it.

6. So also the *purpose* for which he applies his manure will regulate his procedure. In manuring his turnips the farmer had two distinct objects in view. He wishes, first, to force the young plants forward so rapidly that they may get into the second leaf soon enough to preserve them from the ravages of the fly—and afterwards to furnish them with such supplies of food as shall keep them growing till they have attained the most profitable size. For the former purpose fermented manure appears to be almost indispensable—if that of the farm-yard is employed at all—for the latter, manure in the act of slow and prolonged decomposition, is the most suitable and expedient.

It is because bone-dust is admirably adapted for both purposes, that it has become so favourite a manure in many districts for the turnip crop. The gelatine of the outer portion of the bones soon heats, ferments, and gives off those substances by which the young plant is benefited—while the gelatine in the interior of the bone decays, little by little, and during the entire season continues to feed the maturing bulb. Rape-dust, when drilled in, acts in a similar manner, if the soil be sufficiently moist. It may be doubted, however, whether its effects are so permanent as those of bones.

The considerations I have now presented will satisfy you that the disputes which have prevailed in regard to the use of long and short dung have arisen from not keeping sufficiently distinct the two questions—what is *theoretically* and *practically* the best form in which it can be applied to this or that crop, or for this or for that special object?

Of top-dressing with fermenting manures.

If so large a waste occur in the farm-yard where the manure is left long to ferment—can it be good husbandry to spread ferment-

ing manure as a permanent top-dressing over the surface of the fields? This, also, is a question in regard to which different opinions are entertained by practical men.

That a considerable waste must attend this mode of application there can be no doubt. Volatile matters will escape into the air and saline substances may be washed away by the rains, and yet there are many good practical farmers who consider this mode of applying such manure to be in certain cases as profitable as any that can be adopted. Thus.

1st. It is common in spring to apply such a top-dressing to old pasture or meadow lands, and the increased produce of food in the form of grass or hay is believed to be equal, at least, to what would have been obtained from the same quantity of manure employed in the raising of turnips. Where such is really the case experience decides the question, and pronounces that notwithstanding the loss which must occur, this mode of applying the manure is consistent with good husbandry. But if the quantity or market value of the food raised by a ton of manure applied in this way is not equal to what it would have raised in turnips and corn, then it may as safely be said that the most economical method of employing it has not been adopted.

But theory also throws some interesting light upon this question. Old grass lands can only be manured by top-dressings. And if they cannot continue, and especially such as are meadowed, to yield an average produce, unless there be now and then added to the soil some of those *same* substances which are carried off in the crop, it appears to be almost necessary that farm-yard dung should now and then be applied in some form or other. It is true that hay or straw or *long dung* contains all the element which the growing grass requires, but if spread on the surface of the field and then allowed to ferment and decay, the loss would probably be still greater than when, for this purpose, it is collected into heaps or strewed in the farm-yard. Thus the usual practice of laying on the manure in a highly fermented state may be the most economical.

2nd. Again, where the turnip crop is raised in whole or in part by means of bones only, of rape dust or of other artificial manures, as they are called, it is usual to expend a large proportion of the farm-yard dung in top-dressing the succeeding crop of clover. Thus the land obtains two manurings in the course of the four years' rotation—bones or rape dust with the turnips—and fermented dung with the clover. This second application increases the clover crop in some districts one-fourth and the after-crop of wheat or barley very considerable also.

Here, also, it is clear, that if manure be necessary to the clover, it can only be applied in the form of a top-dressing. But why is it necessary, as experience says, and why should farm-yard manure, which is known to suffer waste, be applied as a top-dressing rather than rape-dust, which in ordinary seasons is not so likely to suffer loss? I offer you the following explanation:—

If you raise your turnip crop by the aid of bones or rape-dust alone, you add to the soil what, in most cases, may be sufficient to supply nearly all the wants of that crop, but you do not add all which the succeeding crops of corn and clover require. Hence if these crops are to be grown continuously, and for a length of time, some other kind of manure must be added—in which those necessary substances or kinds of food are present which the bones and rape-dust cannot supply. Farm-yard manure contains them all. This is within the reach of every farmer. It is, in fact, his natural resource in every such difficulty. He has tried it upon his clover crop in the circumstances we are considering, and has necessarily found it to answer.

Thus to explain the results at which he has arrived in this special case, chemical theory only refers the practical man to the general principle upon which all scientific manuring depends—that he must add to the soil sufficient supplies of everything he carries off in his crops—and, therefore, without some such dressing as he actually applies to his clover crop, he could not long continue to grow good crops of any kind upon his land, if he raise his turnips with bones or rape-dust only.

It might, I think, be worthy of trial, whether the use of the fermented dung for the turnips, and of the rape dust for top-dressing the after-crops, would not, in the entire rotation, yield a larger and more remunerating return.—Prof. Johnston's Lectures.

In South Holland the summer produce of a cow is reckoned at about 200 lbs. of skinned milk cheese, and 80 lbs. of butter; or in a week 10 lbs. of skinned milk cheese, and 4 to 7 lbs. of butter.