

judge by the thicker and greener appearance of the wheat in its young state, forgetting that there are nearly double the number of grains in an equal measure of this as compared with a bold fine sample, and when dibbled in a wet soil and season, plump grains are more apt to rot than shrivelled ones.

Taking potatoes, again—Small unripe tubers from Fen land were formerly preferred in Scotland, as preventing the "curl," although, in my opinion, plenty of room in all directions, a good quantity of manure, and the use of large potatoes for seed, would be the proper means of increasing productiveness. Our varieties gradually deteriorate from using for seed those not large enough for table purposes.

The points of consideration in my next paper will be,—what are the limits of productiveness in the cereal and other crops? and an examination of the idea that, as in mechanics, what we gain in time we lose in power, and *vice versa*: so in agriculture, what we gain in productiveness we lose in time—or in other words, that quickness of growth and early maturity are incompatible with large crops.—*W., June 26th.*

ON THE MANUFACTURE, PRESERVATION, AND APPLICATION OF FARM-YARD MANURE FOR ROOT CROPS, AND THE BEST ARTIFICIAL SUBSTITUTES, OR AUXILIARIES.

FARM-YARD manure, or natural dung, has been and is held in great estimation by good husbandmen of all civilized nations. Some soils are so rich naturally as to require little or no manure; but the greatest part of the surface of the globe seems incapable of yielding repeated good crops without it. The necessity of manure, is, then, quite a settled point. But it is a question of great difficulty to say how the supply of fertilising matter is to be obtained at the least cost. The general introduction of such enormous quantities of artificial manure now imported and manufactured in this country, with the ever fluctuating value of the produce resulting from their application, renders it impossible to assign any exact value to either a ton of guano or a ton of dung. We know the cost of artificial manures, and in many cases their worth has been pretty clearly defined. We may readily learn that if £10 worth of manure produces corn worth £12, that there is a profit by it; but if £10 worth of manure only yield a crop worth half that sum, there is a loss by its use. In other words, if the cost price of manure is not covered, either directly or indirectly, over a short space, or over a few years, the price has been too high; it was not worth what it cost. If a ton of dung was worth 5s. when wheat made 10s. a bushel, it appears evident that dung should cost less now than then. There is a great deal of corroborative evidence to show the comparative commercial value of the best known manures. It appears, then, that in an average of trials five cwt. of the best guano produced as good crops through two rotations as twenty tons of common dung. That twenty bushels of fine bone-dust are equal to either twenty tons of dung or five cwt. of guano. Dung, guano, and bones, are almost the only kinds of manure which contain every thing required for our common crops. They are the only kinds of manure to be wholly depended upon, or the mixture of others which jointly contain substances similar to them in composition. Bone-dust has now stood the test of practical trial for many

years—the crops have continued to improve by it over a period of twenty five years, to our own personal knowledge. Bone dust or superphosphate, is the safest artificial manure which is used. Guano is comparatively cheaper, but more dangerous to apply in the hands of the careless or inexperienced. It is astonishing that at the present day there are many so ignorant of the effects of guano as to place it in close contact with the seed or close beside the roots of tender plants. It is remarkable to think that guano is yet frequently sowed in lumps as it comes in the bags that the whole pounds are dropped down by the hand, which kills everything where it falls. It is frequently sown on bare pasture in dry, hot weather, where its best qualities are dissipated in the air. No wonder, then, that guano has been more frequently condemned than any other standard manure. Since so many faults are committed by its mis-application. Good guano, properly applied, can never fail to improve all kinds of crops which dung would be useful for. But more of the application of manures by and by. Our first consideration is how to make dung.

The most universal method of making dung is to feed cattle upon hay, straw, and roots, and to litter the beasts with straw to receive the excrements. Where straw is plentiful, and cannot be sold at what is considered remunerating price, the principle object in making dung is to tread as much straw as possible into a state ready for decomposition. A good quantity of water is considered a benefit rather than an objection for the manufacture of dung on some farms. It is advisable to have a tank attached to every yard, or at least so that any excess of water passing through the dung, in the name of liquid manure, might be saved in the tank, either for applying near the premises, or for being pumped up over the dung in very dry seasons or times of the year. In almost every yard where dung is made, there are as many tons of rain water fall in it throughout the season as there are tons of dung carted from it in six months. It will seldom pay to cart liquid manure a quarter of a mile. A hundred tons of dark looking water very often do not contain one ton of solid matter, so that in carting a hundred tons of liquid manure a quarter of a mile, there are 25 miles each way out and in, or 50 miles to walk a man and horse, for perhaps 5s. worth of goods. That is not always so; but frequently there are more costly cases of liquid manuring to be met with than that. It is scarcely possible to say whether it is most wasteful to allow the ozings of the dung to run into the nearest pond, or to run a hundred miles away with it, because it is a pity to lose anything. If dung is manufactured in open yards, the less water which is allowed to fall or pass from it the better. That is evident if quality be wanted. There is no loss, or very little, by making dung in the open air, when it is trod down well. There is nothing lost but water by evaporation until fermentation takes place. There is a great loss when dung is thrown up in heaps in the yard, and allowed to ferment strongly. The outsides of the heaps are dried up; the most forcing part of the manure is carried away by the atmosphere. Dung thrown up in March into heaps, either in the yards or road-sides, and allowed to lie for some months exposed to every pernicious influence, loses enormously in many cases. Dung carted out and laid down in loads in a loose manner, in odd corners, suffers a waste very frequently from a variety of causes, and the owner also suffers a