

the soil, as that for every abstraction by the growth of a crop, a transfer of equal amount may be made by the solvent powers of atmospheric agents from the dormant stores within it, to those which are immediately available for the use of plants. It is upon an abundance of the latter description that the current fertility of a soil depends, and this may be maintained in spite of the continued robbery occasioned by selling crops, provided the balance be made good. Now the efficiency of the system of cultivation adopted at Whitfield, in maintaining fertility, notwithstanding heavy sales of farm produce, may be accounted for in great measure by the frequency of fallow crops, whose cultivation is attended by such constant and repeated stirrings of the soil, that rain water will have peculiar facilities for acting as a solvent upon its substance. In addition to this there must be considered the purchase and consumption of considerable quantities of cattle food, and the preservation of the manure made from it.

These are the three points to which we must look for the maintenance of arable farming. As regards the second, I may just state how far the matters annually brought on to this farm go to balance the loss it sustains of the matters annually carried off it. The account stands thus:—There is an annual abstraction from the soil of about 500 quarters of wheat—the produce of 120 acres of land; and on an amount of beef and mutton equal to the increase during five months on 33 or 40 three-year-old oxen, and during eight months on 250 to 300 shearing sheep, as well as of the substance of some 20 or 30 bacon hogs, bred and fattened on the farm; in addition to this, there has lately been an annual sale of about 50 tons of Belgian carrots, and about 40 tons of potatoes. The mineral portion of all this matter is annually taken out of the soil. In the sales of vegetable produce alone, it thus sustains an annual loss of about 4 tons of its most valuable portion. But this is compensated by the purchased cattle-food which is consumed upon it:—About 200 quarters of oats, 10 to 20 tons of oil-cake, and 40 to 50 quarters of linseed, barley, and beans, are thus consumed. The weight of their mineral constituents may be about 33 cwt. This reduces the amount of robbery committed to 2½ tons; and we must suppose that the land is annually suffering an abstraction of this quantity of its best part, not to speak of the mineral portion of about 40 tons of butchers' meat also taken out of it. And all this, and more—for the land, so far from suffering from the treatment it receives, is exhibiting every year great ability to grow the heavy and bulky crops it has hitherto yielded—all this and more must be manufactured and prepared as vegetable food, by the agency of the air and rain, out of the very substance of the land.

But this obviously cannot last for

ever—the land must ultimately be exhausted;—So he will say who has not duly considered the origin of the soil and the means by which it is maintained. The mineral part of the soil is obviously the result of the disintegration of rock; and in the subsoil below it an endless store of similar matters exist. We may see here the great advantage of any system by which the rain-water shall be enabled and induced to sink through the land down to the subsoil below it, there to effect the solution of those substances occurring there, which in their present state are useless to plants. And probably one great cause of the barrenness of undrained land is to be found in the circumstance that its crops, after using up the limited stores of food which it contains, are afterwards dependent upon the very small portion which the rain-water, under the unfavourable circumstances in which it is there placed, can provide for them. Undrained lands send the water off their surface; they do not permit it to penetrate, and thus it has no chance of performing that which may be called its appointed office—no chance of preparing from the substance of the soil a sufficient supply of nutriment for the plants growing on it.

The third point referred to above is also a most important one in the general scheme of permanent arable culture. It will be seen that, as it is, under our plan of cultivation (and the same will be found to a greater or less extent under every other plan in operation,) a large draught is annually made upon the substance of the soil, in order to maintain its fertility; and it is not desirable unnecessarily to increase this call by carelessness in using the means we have of supplying the wants of the crops. The management of manure is obviously a most important branch of the Farmer's business, and one to which a great deal of attention has of late years been directed.

Nevertheless, on a farm of any extent, my experience, so far as it goes, is entirely opposed to the alleged economy attending the use of the liquid-manure cart, which has been so extensively advocated. It is no doubt of the greatest importance that the urine of the animal fed on the farm be all saved; but this advantage is dearly bought by the labour which attends its direct application on distant fields. I believe that the cheapest and best method of consuming cattle-food, both as regards the manufacture of butchers' meat and the management of manure, is Mr. Warner's system of box-feeding. In it the straw used a litter accumulates under the cattle for many weeks together, the urine is entirely absorbed, and no water falls on the mass to wash out any of its soluble parts. This is the plan adopted here. The boxes are cleaned out when they become conveniently full, which may be at intervals of twelve to fourteen weeks; and the manure, which is of the richest quality, is then at once taken

to the field where it is to be used, laid upon a bed of earth, and thickly covered with the same. The manure from the sheep is prepared in the same way; it is removed, perhaps twice in the winter, from the sheds under which it accumulates. That, however, which is made in the stable is of course daily carried out to a heap yard by, and the urine of the horses is collected in a tank near the place, and from this it is pumped, to soak the half-wetted straw.

It must be acknowledged, that here, as on every other farm that I have seen, there are many cases of waste in operation. The rain, as well as the liquid manure, falls upon the dung-heap; and if the latter enriches, the former impoverishes the mass, which is alternately saturated by them. Large open yards, too, necessarily receive an immense quantity of rain-water in the course of the winter. Upwards of 27,000 cubic feet annually fall during that season on ours; a quantity and weight which it is impossible, with profit, either to collect in tanks or to carry to the fields. A large portion of this water must therefore run to waste, and it carries with it the soluble part of whatever manure it washes. We endeavour to prevent this as much as possible; and in consequence of our system of box and shed-feeding, we doubtless sustain less loss in this way than many other Farmers; but a certain injury is no doubt suffered—one, however, which we think cannot be remedied by any application of the cumbersome machinery of water-carts and tanks.

It is to these three departments of farm-management, then, that we must look to keep up the fertility of land under arable culture: the alternate system of Husbandry, by which the land receives almost every other year a thorough fallowing and cultivation; the consumption of large quantities of cattle-food, by which the loss sustained by the soil in consequence of sales of farm-produce is in great measure balanced; and the careful preservation of the manure that is made. Let the pitch of fertility be what it may, and whatever its cause, I have no doubt that attention to these particulars will preserve it. It may be owing to the natural character of the soil; it may be due to the skill of a former tenant; or it may be the extraordinary effect of *rotting or burning an old sward*—of bringing old pasture into cultivation. However it has arisen, there can be no doubt that ordinary energy will maintain it, if attention be paid to the points above alluded to.

No reference has been made to the use of artificial manures, as they are called. I believe that they are rarely necessary to the maintenance of fertility; no doubt they may often be advantageously used to increase fertility, but that is hardly ever desirable in the case of newly-broken-up land; good crops may generally be obtained in such a case without much assistance, and that they