

On the two lands which had received mineral manures, and where the turnips and all the other crops grown had been removed since the experiment began, there was no disease whatever. On the portion where the turnips were plowed in there was some slight disease, though the crop appeared the most vigorous of the two; the yield, however, was slightly below the other, as the first yielded 2 tons 2 cwt. of clover hay per acre, and the other 2 tons 4 cwt. per acre. Upon the unmanured portion the plant may be said died of starvation, plantain and coltsfoot having taken its place. The plants that remained were barely high enough to cut with a scythe, and the whole produce, including the weeds, amounted to only half a ton per acre in the two cuttings.

The interest of the question lies now in the two manured plots. For all practical purposes the fertility of the manured land has been so much reduced by the removal of thirty-eight crops, that it has ceased to grow either turnips or clover. If we compare the condition of the land where there was no disease, and where the disease was the worst, we find that where there was no disease, no organic or nitrogenous manure had been applied, and all the vegetable matter grown had been removed; while the mineral manures applied contained more phosphoric acid and potash than what was carried off in the crops.

The land where the disease destroyed a large portion of the crop received, with the mineral manures, every fourth year, 2,000 pounds of rape cake, and 200 pounds of salts of ammonia, the large crop of roots and tops being also plowed in. As compared with the other soil, the soil contains vegetable matter in a different stage of decay, and provides suitable food for a great variety of under ground life. We find that the application of rape cake is followed by an immense increase of wire-worms; it is said among farmers that where the corn crops are attacked by wire-worms an application of rape cake will kill them the fact being that they cease to eat the young corn and feed upon the cake.

The analysis of the soil of these two plots shows that the land which had been highly manured contains far more organic matter and nitrogen than the other plot, while at the same time it contains very much less of these substances than the garden soil. The evidence points to a destruction of the clover plant by living organisms in the soil, a large increase in this life having been encouraged by the liberal supply of organic and nitrogenous matter. This does not however explain—supposing we have taken another leguminous crop, say beans, at the end of the fourth and the eighth year, followed by the red clover in the twelfth year—why the crop would, in all probability, escape the attack of the living agencies, and be free from disease. It is at this point that the difficulty of finding a satisfactory solution is the greatest, and it can only be met by assuming that the clover plant requires, as part of its food, a special organic compound.

It must be understood that on our experimental land, whether 4, 8, or 12 years elapse before the clover is repeated, the same operations are completed every fourth year. Instead of one application of rape cake and ammonia, there will be two or three, two or three crops of roots will be plowed in, and more corn crops will be grown. The only distinction that I know of will be that the earlier applications of manure will have gone through longer periods of decay, and have formed compounds, of which we know little or nothing. These compounds, however, when we arrive at further knowledge upon the subject, may explain much which is obscure at the present time. That such compounds are formed, we have very strong evidence in another field, where we endeavoured to grow beans for a long series of years upon unmanured land. The crop became very small, the growth being only a few inches high. Analyses of the soil showed that it had lost a large amount of organic nitrogen, and it was very poor in nitric acid. The experiment was therefore given up; and the field was sown with barley