

top of which is the problem.

In the first place, we have grown red clover continuously for 35 years upon an old garden soil without the application of fresh manure. The soil and sub-soil to the depth of 18 inches was exceedingly rich in nitrogen, and it is evident that dung in large quantities had been trenched to this depth into the soil. The top soil has lost an enormous amount of its nitrogen, but it is still very much richer than the soil of the farm. The sub-soil, in fact contains much more nitrogen, even now, than the surface soil of the farm. This large reduction in the fertility of the surface soil is contrary to what takes place when red clover is grown on the farm, although the crops grown are made into hay and carried off the land; and even when the roots of the clover are, as far as possible picked out of the soil, we still find an increase of nitrogen to have taken place.

Although the crops of clover grown on this garden soil are equal to, if not larger than, those grown on the farm, they are very inferior to those grown in the earlier period of the experiment. At first the clover did not require to be re-sown for four or five years, now it is re-sown every alternate year. We have evidence here that, while red clover has been grown for 35 years without the appearance of disease, on the farm it is hardly safe to repeat the crop until from eight to twelve years have elapsed since the previous crop was grown. (1)

We have a field which has been under experiment for nearly 40 years. Part of this field received no manure during the whole of the period. Another part received mineral manures (phosphate of potash), and a third part has been very highly manured with rape cake, salts of ammonia, and minerals. Turnips are grown, or rather an attempt is made to grow them, every fourth year, but the unmanured turnips

grown with mineral manures yield 8 or 9 tons per acre, and the highly manured turnips yield over 20 tons per acre. Upon one half of each experiment all the turnips are carried away, and on the other half they are cut up and plowed in. The wheat, barley, and clover or beans which are grown during the other three years of the four rotation crops, are all carried off.

The soil which has only received mineral manures, and from which the turnips, as well as all the other crops grown, have been removed from the commencement of the experiment in 1848, must be, so far as organic matter and nitrogen are concerned, in a very impoverished condition. Where the turnips were plowed in once in four years, the condition of the land would be a little better, while upon the highly manured land the soil must be full of fertility, both where the turnips are removed and where they are plowed in, and in the latter case the fertility would be much the greater.

In 1874, and again in 1882, we grew crops of red clover over the whole of this land which was under experiment. In both years the crop was very large. Upon the highly-manured plot it amounted to 4 tons of clover hay each year; upon the land receiving minerals it amounted to nearly 3 tons each year, and upon the unmanured land it amounted to rather more than 1 1-4 tons each in four years. Wheat was grown in 1883, turnips in 1884 and barley in 1885. The clover was sown in the spring shortly after the barley. There was a very good plant upon all the plots during the autumn and winter, but in the spring, disease began to show itself on both the highly-manured plots, being rather the worst where the turnips were plowed in. As is usual in these cases, the plant died off, bearing bare patches. Sometimes considerable strips were not attacked, in which case the plants that remained were very strong and vigorous, and the yield of hay in two cuttings amounted to 1 1-2 tons per acre. It is probable that more than one-half of the crop was destroyed.

(1) The East of England farmers have followed this rotation ever since the clover-plant began to fail:

1st time round, clover;
2nd time, pease or horse-beans;
3rd time, trefoil; equal to 12 years in the rotation. Ed.
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