

digested plant food, and at the same time by its decomposition in the soil, it sets free locked-up mineral elements. While referring to the matter of green manures, it would be probably wise for me to mention that in my report for 1895 I give the analyses, as regards the nitrogen content of clover of one year's growth, and of two years' growth, of the nitrogen contained in the leaves, in the stems, and in the roots to a depth of 4 feet. These results were obtained in connection with an experiment which was inaugurated by the director of the farms, and I dare say he brought this matter somewhat at length before your attention. However, you will be interested to learn that we found that the first year's growth, comprising leaves, stems and roots to a depth of four feet, contained, per acre, 172 pounds of nitrogen. The second year's growth (leaves, stems and roots) in our experiment gave 116 pounds of nitrogen per acre. All the nitrogen in the clover crop may not be taken from the atmosphere. If a soil is rich in nitrogen the clover shows but very little ability to use this power which it has through the agency of bacteria, of assimilating atmospheric nitrogen, but if we assume that a fair crop of clover will take from the atmosphere 70 to 75 pounds of nitrogen per acre, and the value of that nitrogen to be between 10 and 15 cents a pound, you will see that we have a clear gain in assimilable nitrogen, approximately, of the value of \$10. This of course is in addition to the vegetable matter, or humus, and the store of plant food which has been rendered available by the growth of the plant supplied by the clover when ploughed under. When possible it is always most profitable to feed the first cutting to animals. It will prove a nutritious food, and the resulting manure will be rich in nitrogen. The mechanical benefits which are derived from this method of fertilizing may be epitomized as follows:—The amount of humus which is supplied to the soil by turning under a green crop serves to increase the retentive power of the soil for moisture. We are more and more beginning to understand that the productiveness of the soil is as much dependent upon its ability to hold moisture as upon any other feature. Consequently, anything that will serve to increase the retentive power of light soils for moisture will be of benefit and will increase the fertility of the soil. Then again the presence of the humus serves to regulate the soil's temperature against extremes of either heat or cold, another matter of great benefit to crops. Further, it opens up and mellows soils, that is to say, that it improves the mechanical condition of it, so that the air and the moisture may freely permeate and the roots penetrate throughout the mass of the soil. And lastly, by its decomposition it furnishes carbonic acid gas, which acts as a solvent just in the same way, or a similar way we will say, to the root sap upon the mineral constituents or the inert rock matter of the soil.

By Mr. Carpenter :

Q. Have you made a comparative estimate of the value of barnyard manure and a crop of clover per acre?—A. The two manures are scarcely comparable. In the first place, barnyard manure has a value assigned to it from the amounts or percentages of nitrogen, potash and phosphoric acid which it contains. I do not mean to say that the whole value of barnyard manure rests solely upon these amounts or percentages, but nevertheless the chief value of barnyard manure is regulated by the amount of potash, phosphoric acid and nitrogen which it contains. On the other hand, in the case of clover, we have this:—The only distinct gain to the soil arises from the fact that it adds to the soil a large amount of nitrogen gleaned from the atmosphere. The other constituents—the potash and the phosphoric acid—which the clover crop contains have been derived from the soil. They nevertheless are more available than they were in the soil because they have been digested by the clover plants, and assimilated into their tissues; consequently, when we turn the crop under, these constituents are more or less soluble and readily available for the use of future crops. So, although we may have increased the fertility of the soil by turning under clover, with potash and phosphoric acid, we have not increased the total amount of potash and phosphoric acid there. The distinct gain is in nitrogen. We cannot therefore expect any very close comparison between these two fertilizers. A dressing of 10 tons of barnyard manure will contain about as much nitrogen as an ordinary crop of clover per acre. There are soils that would be more benefited by turning under clover than by a light application of barnyard manure,