

more economically than one who knows nothing on the subject. It is probable that much of the labour and expense wasted in manuring some lands with lime and plaster, as well as many of the differences of opinion on these manures, have been owing chiefly to ignorance on this subject.

He had time only to allude to the third, yet most important consideration, the nature and application of the manure itself. In some parts of England, where much seed wheat is raised, and where seeds of vegetables and herbs are grown to a large extent, he had seen compost heaps as follows:—a layer of four or five inches of good loam and turf, then about eight or twelve inches seaweed carted up fresh from the beach, then an equal quantity of farm-yard manure, then loam again, and these layers repeated, until the mass was several feet high, the last layer being loam and turf. This is left eight or twelve months to decompose; is turned over and applied to the land. The grains raised are large, plump, beautiful, and heavy. Now, here the ingredients are, clayed loam to absorb, seaweed containing soda and a good proportion of the phosphates, and the barn-yard manure, which, besides its soluble salts, contains ammonia; its solid parts are, by fermentation, converted into charcoal and humus, which absorb the ammonia, and preserve it for the use of the crops; the whole mass being well protected by an ample covering of turf and loam. Here, then, is not only nearly every ingredient the plant requires, but also the storehouses of alumina and charcoal, from which it fetches its food, as wanted. He alluded to a discussion on the subject, whether manure was better used in a green state or after it had been kept a year or more, and had become a black saponaceous mass. The question appeared to be settled in favour of this latter state, and this agreed with his own experience. If a manure heap be fermented under a good cover, it is converted into a black, carbonaceous mass, containing nearly all the ammonia, condensed in its pores, and is a most powerful manure.

SECOND EVENING.

He wished now, in the most concise manner possible, to give his ideas on the separate value to vegetation, of some of the ingredients of manures—and here, as before, he would omit all detail of the various experiments on which he had formed his judgment, merely offering these remarks on his own opinions on this subject, which, however, he could not help considering of much importance.

Ammonia he considered as the great promoter of luxuriant growth of stem and leaves; by its means a large surface of healthy dark-green vegetation is produced, which, exposed to the action of the atmosphere and light, matures the various juices, such as gum, starch, sugar, &c.,

contained in the plant. But all the ammonia which can be got into a crop, unless there be also abundance of the phosphates, sulphates, and other inorganic substances, will give nothing but a worthless vegetation, and no grain of value. Those who have raised crops by the application of nitrate of soda alone, unless the soil contained of itself a sufficiency of these inorganic salts, have found that, however beautiful they appeared when green, they were comparatively of little value when dried.

So with trees: superabundance of ammoniacal manure will give beautiful looking, thick, long shoots; but they will be spongy, long-jointed, and will neither bear fruit in quantity or quality at all resembling those which are manured with abundance of inorganic salts combined with the ammonia. In these latter the shoots are hard, very short-jointed, and full of fertile blossom-buds; the fruit also has a much better flavour, although perhaps, not quite so large as the other. The reverse of this is also true, that inorganic salts alone, without ammonia to give a healthy breadth of vegetable surface to the maturing influences of the light and air, will afford nothing but barrenness. This he had repeatedly proved, and preserved specimens of various growths. It seems very easy to comprehend that, if a tree or other plant has all the requisite ingredients to feed on, as soon as the light and air induce in the juices the necessary changes of ripening, a bud [blossom or otherwise] is formed, vegetation proceeds; in another short space, another bud is formed. Now, if one or other of these ingredients is insufficiently supplied, vegetation must go on, until from this niggardly supply sufficient thereof is obtained to form a bud. Ammonia increases the vegetable growth rapidly, and this continues until sufficient inorganic salts are procured thereby to form first a leaf-bud, or, if more is procured, a blossom-bud; if in forming a blossom-bud these salts are exhausted, leaf-buds will next be formed, until the supply is again obtained for blossoms. He had made many experiments with flowers and their seeds, which appeared to him to confirm these views thoroughly, but still he merely offered them as his own individual opinions.

Dr. Krocke, in Giessen, had analyzed many soils, some from the western parts of this country; in all he had found large quantities of ammoniacal salts, in some as much as eight thousand pounds to the acre, twelve inches deep. From these experiments an opinion had prevailed, and was now held by many, that it was quite unnecessary to put ammoniacal manures on the soil. Now, theory alone, unless confirmed by practice, was not only useless but injurious. Large quantities of inorganic salts were prepared in England, with exact instructions from Liebig, under the idea that they alone were necessary to produce luxuriant crops; but they