

so necessary an ingredient. A due admixture of this sand with the clay renders the latter sufficiently porous to admit moisture, and absorb manures. Thus, while sand renders the soil light and porous, clay gives it body and consistency. But just as too much clay makes a poor soil, too much sand, by its non retentive character, is equally unproductive, and where clay is altogether absent the sand is so light and dry, as to be utterly useless for agricultural purposes in its natural state. Besides, the above properties of those two chief constituents of soils, both furnish to plant life, and even to animal life; through the plants, certain elements without which they could not exist. Silica in a soluble form, hydrous silicate, enters into the stalks and stems of plants and bones of animals. It is the material which gives rigidity to all trees, grasses, etc. The soda and magnesia, contained in the clays are all necessary to plant life.

VALUE OF LIME.

Lime is an exceedingly important, I might say absolutely necessary ingredient in all soils, so much so, that no soils destitute of it can possibly produce good crops, and their fertility or otherwise greatly depends upon their containing the necessary proportion of this valuable commodity. Its presence exerts, perhaps, more marked influence on the growth of vegetables, than any other constituent of the soil. This influence is manifold. It blends the qualities of clay and sand, occupying, as it were, a place between the two. Its extraordinary affinity for carbonic acid, which it absorbs with avidity from the atmosphere, and from manures, is one of its chief recommendations. This acid, which is a most important factor in the nourishment of plant life, is held in reserve in the soil by the presence of lime. In its caustic state (that is when burnt so as to expel the moisture naturally contained in the rock), it becomes most efficacious as a manure, not so much from its inherent qualities, as from its influence on other manures. In this state it is a powerful promoter of putrefaction, or decomposition of animal and vegetable matter. It fixes the carbonic acid in the soil, generated by the fermentation of the manures, which would otherwise escape into the atmosphere, and in great part be lost. Together with the moisture which it so eagerly absorbs, it readily imparts those nourishing properties to plants. The latter having separated the carbon contained in the acid and appropriated the same, give back the oxygen again to the air.

PLANT RESPIRATION.

In this manner the leaves and roots of plants, by absorbing and decomposing carbonic acid gas, perform in the economy of vegetable life, just the same functions as the lungs do in the animal economy, while an all-wise Creator has so ordained that just those substan-

ces in the atmosphere, most conducive to vegetation, are those most detrimental to animals. If it were not that the vegetable world so eagerly appropriated these deleterious substances, the air would, in a short time, become so vitiated, as to render animal existence an impossibility. Besides the above-mentioned absolutely necessary ingredients, there are often present in soils small quantities of phosphoric and sulphuric acids, nitrates, vegetable matters, etc., all of which greatly enhance their productiveness, and when not naturally present, some at least, especially the phosphates, have to be supplied by means of manures. All manures contain these in greater or lesser degree. Fish manures, guano, bone dust being especially rich in phosphoric acid, no grain crops or leguminous plants, such as peas, beans or vetches can come to perfection without this latter ingredient, and soils destitute of it, or not supplied artificially, are only capable of supporting but scanty vegetation. In fact, silica in its soluble state, lime, carbonic acid, and phosphoric acid, are the principle food of the vegetable kingdom, and just in proportion to the presence or absence of the necessary quantities of these substances will the crops mature or otherwise. The presence of considerable quantities of decomposed vegetable matter in soils necessarily implies a certain amount of carbonic and phosphoric acid. Most peats for instance, contain these substances, besides small quantities of lime, magnesia, potash, silica, oxide of iron, alumina and water. Hence the application of peat to soils of a dry, sandy nature, is very beneficial. I am perfectly aware that all our farmers recognise this, and are in the habit of composting large quantities of peat with fish offal for manure.

APPLICATION OF PEAT.

But, if I may offer a suggestion, I think peat might be applied to much greater advantage than it is at present. I don't think I am far astray when I say most of the peat now used is simply spread out on our meadow lands, where it dries up, or is broken into fine powder by bush-harrowing, and afterwards, what has not been blown away is raked off. No doubt a certain amount of it becomes incorporated with the soil; but in my humble opinion where this peat carted out to the fallow land, allowed to dry and become pulverized, and then ploughed in with the more silicious substances, so as to give body and consistency to the latter, much benefit would result; even very dry sandy soils could thus be rendered fairly good and retentive of moisture. While by reversing the process, peaty soils, when first properly drained, can by the application and incorporation of considerable quantities of sand, gravel and lime be converted into probably the very best hay-growing lands. These, and such like experiments have been carried out in England, Scotland and the United States, with marked success.

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