

Phosphoric acid occurs mostly as phosphate of lime and phosphate of iron, though generally in small quantity.

The sulphuric acid, which is required in small proportion, is derived principally from sulphuret of iron or iron pyrites. Chlorine combined with sodium, forming common salt, appears to exist in spring water as well as in rocks and soils in extremely small proportion.

It appears, therefore, that next to sand and silicates of alumina, the mineral matters of the soil are mainly made up of the silicates above mentioned, all of whose bases are essential to plants. They are regarded as insoluble in pure water, and but very sparingly soluble in water containing carbonic acid.

There is good reason to believe that these silicates are in sufficient amount in the greater part of the soils of Maryland (except in those few districts which consist almost entirely of sand) to furnish potash, soda, and magnesia for an indefinitely long period with a judicious system of cropping. In addition to silicate of lime, it seems that there is a necessity for carbonate of lime, which being much more soluble than the silicates is more rapidly abstracted from the soil.

By reference to the tables it will be seen that phosphoric acid constitutes about half of the ashes of corn and wheat, the grains we most export; and yet this important element existed in extremely small proportion in most of the original soils of this State. The plants which have in all time flourished upon these soils have withdrawn the phosphates. The decay of the plants, including of course the original forests, left the phosphates and other minerals on and in the soil as well as vast stores of organic matters. In this way nature stored up in the soil the accumulations of thousands of years. We know too well how rapidly our predecessors exhausted them.

In addition to the loss of phosphoric acid and other inorganic matters, the organic matters called vegetable mould or humus, were in a great degree exhausted by almost incessant cultivation in grain and tobacco crops.

This "*vegetable mould* or *humus*" has been investigated by many able chemists, who have given names to the various matters composing it, which need not be stated at this time. It is sufficient to say that by the action of oxygen it furnishes carbonic acid to the roots of plants, and also absorbs and furnishes them with ammonia.