

fact has within the last few years led to many important changes in the use and application of the so-called chemical fertilizers.

The amount of water used by crops in their feeding, that is, absorbed by their roots and lost by transpiration through their leaves, is enormous, equalling several hundred of tons per acre. Taking the mean of a number of determinations, Hellriegel found that for every ton of dry matter produced in plants, in the neighbourhood of 325 tons of water were required. An acre of Indian corn probably uses in this way during its growth 1,000 tons of water.

Notwithstanding these considerations, it is, from the practical standpoint, those elements, or rather compounds, other than water, withdrawn from the soil that, as agriculturists, we must regard as most important. It is their removal by successive cropping without any concomitant return, that results in soil exhaustion and reduces the yield below the mark of economical production.

What are these elements? First, there are the mineral or ash constituents. These comprise calcium, magnesium, iron, potassium, sodium, silicon, sulphur, phosphorus and chlorine, and occasionally traces of several of the rarer elements. As already explained, these are found in the plant variously combined, and not in the elemental condition. They form, say, from .1 per cent. to 3.0 per cent. of the weight of fresh plant tissue, the proportion depending largely on the part examined. Though crops differ in their demands for ash constituents, the amount withdrawn per acre by average yields of farm crops usually lies between 200 lbs. and 300 lbs.

Now with regard to the above-mentioned elements, the majority of them are present in soils in quantities so abundant, and the amounts required by plants by comparison so extremely small, that their return to the soil by the farmer may be neglected. Indeed, as the result of scientific research as well as of practical experience, it is known that to maintain fertility—as far as these inorganic constituents are concerned—it is only necessary generally to replace two or, at most, three of them. They are commonly spoken of in agriculture as potash and phosphoric acid, with lime as third in importance.