

another, in each of the three great divisions of nature, and handed on, from the world of vegetable existence to that of animal life, before being finally returned to inorganic nature, thenceforth to be subjected to a number of chemical changes, preparing them for a new round of usefulness. But, in order to enable this great principle to operate completely and effectually, one thing is necessary; for, owing to the concentration of populations in towns and cities, one link, so to speak, in the chain, becomes faulty, and the return of phosphates to the soil must be aided by artificial means.

From whatever lands vegetable matters are removed in the annual crops, there is a constant withdrawal of the necessary mineral constituents of the plant, including, of course, the phosphoric acid; and, although poor or exhausted lands do not shew the entire absence of phosphates, yet they have become deficient in such phosphorus salts as are available for the use of the growing plant; and do not, especially, contain enough to suffice for the cereals, containing, as they do, a larger proportion of phosphoric acid than any other family of plants.

The grain of wheat contains about 8-10ths per cent. of phosphoric acid, which proportion amounts to 16 lbs. of the acid to each ton (=2,000 lbs.) weight of wheat. Now the amount of phosphoric acid in soil may said to average 0.2 per cent.; although, except in clays the proportion is usually less. Taking 0.2 per cent. as the average quantity, and assuming the specific gravity of soil to be 2.5, there exists in the soil covering one acre of land, to the depth of 12 inches, about 68.6 lbs. of phosphoric acid; or only enough to supply the phosphates to 4.16 tons of wheat. The total weight of wheat, (whether as grain, or in the state of flour) exported from the port of Montreal in 1869, amounted to about 292,534.5 tons*; or a weight requiring the total abstraction of phosphoric acid from 70,320.8 acres (=109.8 square miles) of good average land. This withdrawal of phosphoric

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