

year by the removal and sale of corn and cattle, which collects in the neighbourhood of towns, this loss must be remedied, which is effected in good farming, by allowing the fields to lie in grass in a system of rotation.

Fields might be kept in a state of constant fertility by replacing every year, as much as is removed from them in the form of produce, but an increase of fertility and consequent increase of crop can only be effected by adding more than we take from the soil.

Substances containing the essential constituents of animal excrements may be substituted for them as manures. In Flanders the ashes of wood or bones have been employed as such a substitute, as they contain a large proportion of the phosphates of lime and magnesia. They have also been found very beneficial in the light siliceous soils of Long Island, Connecticut, and other parts of United States, and of course would be equally beneficial upon similar soils in our Provinces. Ashes contain also silicate of potash exactly in the same proportions as in straw. The value of ashes depends upon the tree from which it is obtained; those from the oak wood are the least, and those from the beech are the most servicable. 100 lbs. of lixiviated ashes of the beech spread over the soil, furnishes as much phosphates as 460 lbs. of human excrements. Lixiviation is the process of dissolving by water the soluble parts of the ashes; the ley of ashes is an instance of it; and every 100 lbs. of ashes from the beech supply a field with phosphoric acid sufficient for the production of 3,820 lbs. of straw or 15 lbs. and some fractionals of corn.

Bone manure possesses a still greater importance in this respect. The primary sources from which the bones of animals are derived are the hay, straw, and other substances, which they take as food. From analysis, it follows, that 8 lbs. of bones contain as much phosphate of lime as 1,000 lbs. of hay or wheat straw; and

2 lbs. of it as much as 1,000 lbs. of the grain of wheat or oats. "These numbers express pretty exactly the quantity of phosphates which a soil yields annually on the growth of hay and corn;" therefore 40 lbs. of bone dust on an acre of land is sufficient to supply three crops of wheat, clover, potatoes, turnips, &c. with phosphates. The dust should be very finely powdered, and intimately mixed with the soil. The easiest and most effectual process is to "pour over the bones in a state of fine powder, half their weight of sulphuric acid, diluted with 3 or 4 parts of water, and after they have been thus digested for some time, to add 100 parts of water, and sprinkle this mixture over the field before the plough. Experiments, made to ascertain the effects of this manure, have shewn that corn and kitchen-garden plants have thriven with greater vigour from it.

It must be admitted as a principle of agriculture, that those substances which have been removed from a soil must be completely restored to it, either by excrements, ashes, or bones. "A time will come," says Leibig, "when fields will be manured with a solution of glass (silicate of potash), with the ashes of burnt straw, and with the salts of phosphoric acid prepared in chemical manufactories."

Some plants require *humus*, and do not restore it to the soil by their excrements; others can do without it altogether, and even add humus to a soil deficient in the quantity of it. A rational system of agriculture would therefore employ all the humus at command for the former, and not expend any of it for the latter; it would in fact employ the one as occasion might require to supply the other with humus.

"We may furnish a plant with carbonic acid and all the materials which it may require, and we may supply it with humus in the most abundant quantity, but it will *not attain complete developement until nitrogen is also afforded to it*; an herb will be