

acteristic soils. Thus over quartz rocks and some sandstones we find a very sandy and barren soil, though it is said that in nearly all soils enough silicates of lime and magnesia are present to answer all the purposes of vegetation. But the alkalis and phosphates may be absent. When the rock is limestone, the soil is sometimes quite barren for the want of other ingredients, and in consequence of the difficulty of decomposition. Clay, also, may form a soil too tenacious and cold. The sandstones that contain marly beds, and some of the tertiary rocks of analogous character, form excellent soils. So does clay slate, and especially calciferous mica schist. The amount of potash and soda in gneiss and granite often makes a rich soil from those rocks, and the trap rocks form a fertile though scanty soil.

But, in the third place, in most countries aqueous and glacial agencies have so mixed the soils together that their original peculiarities are lost, and new and compound characters are given them. This is particularly the case in northern countries, where the drift agency has swept over the surface and torn off and mixed together the disintegrated portions of the several formations. Subsequently rains and streams have carried the finer portions of the drift into the lowest places, and there formed alluvial meadows; and although these are usually the best of soils, they are often derived from many different rocks. The drift left upon the higher grounds is generally quite barren, chiefly because of its coarseness.

A fourth service which the geologist renders to agriculture is by the discovery of fertilizers. Sometimes he can point out deposits of the phosphates either in a crystalline state, or as coprolites or guano. He can also show what rocks contain carbonate of lime, or discover sulphate of lime, or marl beds, or green sand, or decomposing fossil shells, or deposits of carbonaceous matter. He can also find what rocks contain enough of potash or soda to be of service when pulverized.

The subject of drainage, as well as the discovery of springs of water and the best means of bringing it to the surface, belong to Agricultural Geology; but our limits do not allow us to enter upon the details.