

azote, which they may require, supply this deficiency. In proportion as soils possess a due degree of tenacity, and power of retaining or absorbing heat and moisture, the necessity for a supply of manure is diminished; and, in some instances, the earths are so fortunately combined, as to render all supply of artificial manure unnecessary. He who possesses on his estate the three earths,—clay, sand, and lime,—of a good quality, with facilities for drainage or irrigation, has all the materials for permanent improvement; the grand desiderata in agriculture being to render wet lands dry, to supply dry lands with sufficient moisture, to make adhesive soils loose, and loose soils sufficiently adhesive.

The intermixture of soils, where one kind of earth is either redundant or deficient, is practised in some countries with great advantage. Part of Lancashire is situated on the red sandstone described in the sixth chapter. This rock, being composed principally of siliceous earth and the oxide of iron, forms of itself very unproductive land: but, fortunately, in many situations, it contains, near the surface, detached beds of calcareous marl. By an intermixture of this marl with the soil, it is converted into fertile land, and the necessity for manure is superseded. The effect of a good marl applied liberally to this land, lasts for more than twenty years. In some lands, a mixture of light marl which contains scarcely a trace of calcareous earth, is found of great service. The good effect of this appears to depend on its giving to the sandy soil a sufficient degree of tenacity. The sterile and gravelly soils in Wiltshire have been recently rendered productive, by mixing them with chalk; the most liberal application of manure having been found ineffective, or injurious. In stiff clay soils, where lime is at a great distance, the land might, frequently, be improved by an intermixture with siliceous sand. A proper knowledge of the quality of the sub-soil, and the position of the sub-strata, is necessary to ascertain the capability of improvement which land may possess. It may frequently happen, that a valuable stratum of marl or stone, which lies at a great depth in one situation, may rise near the surface in an adjoining part of the estate, and might be procured with little expense.

Lime is the only earth which has been generally used to intermix with soils, and has been considered as a manure; but its operation, as such, is very imperfectly understood. Burnt lime, when caustic, destroys undecomposed vegetable matter, and reduces it to mould,—so far its use is intelligible. It combines, also, with vegetable or mineral acids in the soil, which might be injurious to vegetation,—here its operation is likewise intelligible: but if we assert, that when burnt lime has absorbed carbonic acid and become mild, it gives out its carbon again to the roots of plants, we assume a fact, which we have neither experiments nor analogies to support. The utility of lime in decomposing vegetable matter and neutralizing acids is obvious: but its other uses are not so evident; except we admit that it acts