

earth differ widely amongst themselves in character. An acquaintance with the nature of soils is especially necessary, as it serves to throw light upon the cultivation of vegetables, which are principally nourished by them, and upon the suitable adaptation of which most of their properties depend.

Arable soils, which are the only ones of which I shall here speak, are generally composed of silica, lime, alumina, magnesia, oxide of iron, and some saline substances. The various characters of soils arise from the different proportions in which their component parts are combined; and the name given to each is according to that of the predominating portion of earth found in it, as siliceous, calcareous, argillaceous, &c. It is necessary that they should be classed according to their nature, that the degree of fertility of each, and the kind of cultivation to which it is best suited, may be known.

Not one of these earths is by itself well adapted to cultivation, but by their mixture they correct the qualities, or supply the deficiencies of each other; the best soil is that which unites the greatest number of the properties most suited to vegetation.

There are few soils that do not contain, in addition to the above-mentioned earthy and saline principles, some portion of substances, resulting from the decomposition of animal and vegetable matter, by which, other circumstances being the same, their fertility is very considerably influenced.

#### OF THE FORMATION OF ARABLE LANDS.

Arable lands are almost entirely produced by the decomposition, from various causes, of the rocks which form the basis of our globe. The water, which flows in torrents from the tops of the mountains, abrades their sides, and detaches from them large portions of rock, which being afterwards swept by the force of the current, and constantly dashed and rubbed together, have at length their corners and edges broken off, their forms rounded, their surfaces smoothed, and their size diminished, till they form, successively, pebbles, gravel, sand, and mineral slime.

The number and magnitude of the stones found in the beds thus deposited, depend upon their distance from the mountains whence they have been brought, upon the harder or softer character of the rock whence they have been broken, and upon the force of the currents by which they have been acted upon.

Nearly all the lands of our rich valleys owe their origin to the decomposition of rocks, and we can judge of the nature of the principles which compose them, by knowing those of the mountains whence they have been brought. The deposits from granitic mountains, consisting of quartz, feldspar, and mica, form soils mixed with silica, alumina, lime, magnesia, and oxide of iron. Those from mountains of the quartzeous formation are composed, almost entirely, of siliceous earth, and give rise to soils of an analogous character; and so on of the rest.

It would, however, be erroneous to suppose that the lands formed by the waste of mountains are throughout of the same nature, or contain the same principles, in the same proportions, as the rocks from which they have been produced. Upon this supposition it would be necessary that all the substances, originally contained in any one kind of rock, should be of equal specific gravity, and possess an equal affinity for water; and this is not the case. Those, the particles of which are held in the closest union, are deposited first, whilst the others are carried on by the current; silica, and the oxides of iron, predominate in those which are first deposited; then lime, alumina, and magnesia.

It is very interesting to trace the changes which take place in alluvial soils, according to their distance from the rivers which brought them; whether we consider, in these changes, the division and mixture of the constituent principles, or the varieties which they present at different distances from the sources of their origin.

Independently of the various degrees of specific gravity and hardness which exist amongst the earthy principles, there are other causes which contribute powerfully to affect the nature of alluvial lands. Rivers receive, in their courses, many tributary streams, which, mingling the fragments that they carry with the spoils of the others, modify to an illimitable extent the soils which they produce. It frequently happens, that this mixture of the mud of two rivers, produces a soil more fertile, than would have been formed by either of them singly; the qualities of one serving to correct the deficiencies of the other. Thus the washings from mountains of the quartzeous formation, combined with the argillaceous and calcareous portions of the wrecks of other mountains, constitute a more productive soil than would be furnished by either separately.

The greatest part of those lands now appropriated to the richest culture, are but the ruins of those imposing mountains, the sides of which, rent away and carried off by torrents, are in their passage reduced to dust, and deposited in the valleys to form the basis for agriculture.

It is not possible to refer to any other causes than those I have just pointed out, the formation of the arable lands of the valleys; those which are found upon the vast table lands, which crown the tops of mountains or extend along their sides, must have had some other origin. The constant action of air and water, alone, might have produced the plains, but so gradually, that their effects would only be perceptible after a lapse of many ages, if other agents did not conspire with them to hasten the decomposition of the rocks, and to convert them into arable land.

The decomposition of such rocks, as are by their want of density permeable by water, must be much more rapid than that of those, in which the particles are more closely united; and rocks, of which the constituent principles possess some affinity for air and water, will yield much more readily to their action, than those in which no such affinity exists.

In order to account for the action of air and water, upon rocks, it is necessary to consider, that many among them contain lime, very imperfectly saturated, and usually some oxide of iron, at its lowest state of oxidation; the lime is constantly disposed to imbibe from the atmosphere its carbonic acid, whilst the oxide of iron combines with its oxygen; these combinations will be very rapid, if neither the lime nor the oxide of iron is united to any other substances, which, not possessing the same affinities for the constituents of the atmosphere, oppose its action upon them.

Rocks are frequently moistened by water for a considerable length of time, without being much affected by it; but when it has at length insinuated itself into their pores, and become there converted into ice by the cold, it destroys by its expansion the cohesion of their particles, producing rents and fissures, and thus giving access to the air, which combines with the lime and oxide of iron, and produces an immediate change in all the surfaces exposed to its action; from this moment the process of decomposition goes on more rapidly than before. The lichens and mosses, which fasten themselves upon the surfaces of rocks, continue and increase the change; their delicate roots are constantly enlarging the crevices caused by the water, by the effort they make to insinuate themselves into them;