

These considerations must necessarily lead us to the conclusion that the nourishing properties of the soil also depend on its mechanical texture; for it is the particular kind of mechanical texture which causes a more or less perfect communication between the constituents of the atmosphere and the roots of plants, and which consequently furnishes a more or less perfect supply of Water, Carbonic Acid and Ammonia; and that therefore the fertility of soils is due to two factors: to *mechanical texture*, and to *directly nourishing properties*.

It has already been mentioned, that the bulk of soils consists of *quartz-sand* (including the fragments of undecomposed rocks,) and *Clay*; the latter being accompanied by smaller or larger quantities of *Lime*, *Magnesia* and *Humus*. On the different character, as well as on the respective quantitative proportions of these fundamental ingredients of soils, depends therefore the fitness of their mechanical texture for supporting vegetable life, viz: this is due to its water-retaining power; to its consistency in the wet and dry state; to its capacity to dry up more or less quickly; to its consequent contraction of volume, which gives rise to clefts and fissures tearing the roots; to the capacity to attract moisture from the atmosphere; the capacity of absorbing the atmospheric ingredients; to its power to warm itself and to retain the heat, &c.

Among the constituents of the soil, *Sand* has the greatest specific gravity, and forms therefore the heaviest part in soils; it has almost no water-retaining power; it gives consistency to soils only when in its finest state, and wet; it loses its moisture very quickly; it does not contract in volume by drying, nor does it attract moisture, or gases from the atmosphere, to any extent; and it has lastly, the greatest capacity of keeping heat.

The same is true of the *fragments of undecomposed rocks* which accompany the sand.

*Clay*, in its pure state, shows itself more or less in all these properties, as the opposite of *Quartz-sand*.

*Humus* aids in the water-retaining power of soils like *Clay*, without increasing however their consistency. The more a soil contains of *Humus*, the more clay it can contain, without becoming stiff and difficult to be ploughed. *Humus* farther prevents the rapid drying of soils, assists in attracting moisture and oxygen, also in keeping a constant temperature.

*Lime* and *Magnesia* take their place between *Sand* and *Clay*, aiding or tempering the properties of the one or the other.

In nature, we find these substances as constituents of soils, associated in such a manner, that we have on one side *Quartz-sand*, and the fragments of undecomposed rocks; and on the other, *Clay*, *Lime*, *Magnesia* and *Humus*, forming a kind of *Cement*, which envelops and connects the *Quartz-sand* particles, and is itself again loosened by them.