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DISSOLUTION OF STONES—USES OF DRAINING.

Many old men must have observed that the soil of a garden which was originally sandy or gravelly, becomes, where manure has been plentifully used, too stiff and clayey; unfit to work early in the spring, and liable to bake and become hard in dry weather. Such a soil will be much improved by limestone gravel, broken oyster shells, or bones broken into small pieces, stable manure, decayed vegetables, and peat, all possess the power of decomposing the hardest rocks, generally most rapidly when constantly wet. We have along our Southern coast abundance of slate rock which appears to be older than any of the rocks of the sandstone and gypsum districts. This slate contains a large quantity of pyrites, composed mostly of sulphur and iron, and this mineral when exposed to the air soon becomes iron vitriol, or what is commonly called green copperas, which dissolved by water is constantly rising to the surface through the small fissures of the rock; when it is decomposed very quickly, if it comes in contact with decayed vegetable matter; and somewhat more slowly by simple exposure to the air, letting the iron fall in a state resembling yellow ochre, which soon hardens, incrusting the slate with a brown rust, and uniting with rich mould formed from rotted manure, and changing it to a barren coarse gravel not unlike crumbled bog ore. Wherever a bed of wet peat lies upon the slate it will be found separated from the rock beneath by a layer of blue clay eight or ten inches in thickness, which is manifestly a portion of the slate disintegrated by the action of peat and water; it is often laminated like the slate on which it rests, it contains vitriol, and will with proper preparation yield a considerable quantity of alum. Bricks formed from it dry very hard but crumble to dust when exposed to a strong heat. The broken fragments of slate that underlay wet peat are entirely free from the oxyde of iron, or rust that is found on the surface of all those exposed to the air, and they have a worm eaten appearance caused by the solution of the portions of pyrites that were in the stone. Where wet peat rests on the hard blue whinstone, the surface of stones will be found soft and white like a soft white sandstone, and generally a considerable quantity of soft white sand, which is easily rubbed into an impalpable powder, and manifestly formed from the partial decomposition of the stones will be found among them. Occasionally in a cleft of this kind of stone may be found a decayed root of a brake which has left its figure upon the smooth face of the rock by depriving the part in contact with it of its iron and manganese, leaving it white, and much softer than the adjoining part. Even upon the granite, the most imperishable of our rocks, the effects of decaying vegetables are perceptible. It is not therefore strange that gravelly and coarse soils should become fine, and even clayey by cultivation, for many hard rocks contain the materials which form the best soils, but as there are in some rocks which are very widely diffused, immense quantities of the vitriolic mineral, (for this mineral is by no means confined to the slate,) and as this mineral changes earths, and even fertile mould to stone, we see the absolute necessity of draining, to prevent the vitriolic water from beneath from rising, and rendering our rich land barren, and for the same purpose subsoil ploughing is useful; for water will not rise above its level in a loose soil, but it will rise in solid clay, or minute fissures in rocks by capillary attraction, or that power which makes it rise in a lump of broken whinstone or loaf sugar when the bottom is placed in water. Thus we see in dry weather where the slate rock is bare, there is usually a line of copperas along the surface upon minute fissures, but none upon the larger cracks.

Upon all shallow soils therefore that rest upon vitriolic rocks, lime, as a manure must be nearly useless till they are thoroughly drained, for the quantity of lime commonly used would be almost immediately neutralized by the vitriol, before it could have time to decompose the vegetable matter; but limestone gravel would always do some good, for it would be changed to gypsum by the vitriol and separate its carbonic acid in an aereal state, the state in which it furnishes food to vegetables. In Scotland where there is a great proportion of vitriolic soil, it has been found that draining was absolutely necessary to make the land fertile, and that after draining lime was found very useful on most soils that abounded in vegetable matter. Lime has, *by chance*, been found very useful applied to an undrained vitriolic soil in a very dry season, while on the adjoining land, of the same description of soil, it had no perceptible effect, applied in a season when there was a sufficiency of rain. The vitriol will by degrees be in a considerable measure washed away from a drained soil, as we see that where the slate swells into lofty hills, the rock at the lower part of the hill is full of Pyrites, and has its surface covered with rust, while the upper part of the same hill frequently has a pretty good soil resting on a rock with very little pyrites or rust, but occasionally containing small serpentine veins of limestone, which make the slate useless for building stone, because the limestone decaying when exposed, causes the slate to divide into small angular pieces. It is probable that this slate was originally of one kind, and that water running down has in the course of ages removed a considerable part of the vitriolic mineral from the upper parts.

Vitriolic minerals are very generally diffused over no small portion of the earth, and a certain portion of this salt is probably necessary to fertility, because it serves to disengage the carbon from limestone in a state fit for the food of vegetables, but a very considerable part of the barren lands are rendered barren by an excess of vitriol, and the principal use of draining and sub-soil ploughing, is, on many soils, to get rid of the superabundant quantity of this mineral salt.

GRAVELLY SOILS.

Near the sea-shore gravelly soils resting on a coarse open gravel are often cultivated. This is accounted a hungry soil, which re-