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The Field.

Soils.

In the operations of the field, it is with the soil, mainly, that the husbandman has to do. Air, heat, moisture, and other instrumentalities necessary to the earth's productiveness, are in wiser and better hands than ours. It is for us to study the nature of soils, to modify and improve them, to subject them to tillage, and keep them in the best possible condition for growing crops.

What we are accustomed to call "soil," is in reality crumbled or powdered rock. Rock of some kind or other underlies the soil at a greater or less depth below the surface, and often, as we know, protrudes itself into view, and then the slow but sure process of disintegration by which soil is formed, may be seen going on. As there is a great variety of rocks, so soils differ very much in their composition.

If this were a scientific essay, it would be proper to particularize and explain the numerous elements that enter into the composition of soils. To do this, is the province of the agricultural chemist, and it were well that every farmer should come under his teachings, in order fully to understand the philosophy of the business in which he is engaged. But our department is practical, rather than theoretical, and will serve its intended ends if it give enough of scientific information to explain the reason and necessity of things to be done, and awaken a craving for fuller acquaintance with the principles of agriculture.

Every person who has had any experience whatever in farming, is familiar with a number of phrases by which the various kinds of soils are distinguished; such as, a clay soil, a sandy soil, loam, clay-loam, sandy-loam, limy-clay, &c. All these have essentially the same components, only in different proportions. Clay, lime, and sand, are found in various degrees in them all. But these, however well proportioned, will not of themselves form a good, productive soil. There must also be a certain amount of what is philosophically called *humus* or *gaine*, and is commonly known as *vegetable mould*. This produced by the rotting of plants, leaves, and vegetation generally. The leaf mould which we find in the woods, contains a large percentage of this material. It is produced by the decay of leaves year after year, and the admixture of the decayed matter with the top soil.

The best natural soils are those which contain sand, clay, lime, and humus well mixed together. Such soils are found often in river bottoms, and in valleys, through which streams once flowed. Clay, sand, and lime have been washed down from the rocks, and mixed with decaying grasses, plants, and wood; layer after layer of this admixture has been deposited, until a rich, deep, fertile soil has been

formed. The preparation of some of these soils has been the work of ages and generations, and such stores of fertility have been treasured up in them that the first cultivators of such soils have supposed them inexhaustible, and in many instances treated them as so; cropping them year after year without change of crops or supply of manure, until to use a homely American phrase, they have "gin out."

Nature is incomparably the best farmer, but natural processes in the production and improvement of soils, are slow, and can often be hastened by the use of artificial means. A soil in which sand predominates, can be made better by adding a proportion of clay to it, and it often happens that clay is to be found close at hand; sometimes it lies at no great distance beneath the surface. In like manner, a clay soil can be improved by adding sand to it. A too limy soil may be amended by an application of clay or sand, or both according to its character and wants. Humus can be supplied in the shape of manure, peat or swamp-muck, or decaying matter of any kind. Such improvements require time and toil, but they will amply repay them. "There are no gains without pains." It should be the first and last aim of every farmer to have a soil or soils, for they may vary greatly on the same farm, in the best possible condition for growing all sorts of crops. This is as necessary as it is for the mechanic to have suitable material out of which to make the articles he manufactures.

Canadian farms consist almost wholly of lands originally covered with forests. When the trees were cut down, and the undergrowth removed, the soil was found fit to raise all manner of products. "What crops we used to raise when the land was new" has been the exclamation of many an old settler. This fertility, remembered so well, was owing to the enrichment of the surface by the decay of leaves, plants, and fallen timber during the lapse of centuries. After a time, there is a change. The land no longer yields the large crops it did at first. What is wrong? Why, successive croppings have used up the store of plant food at first so abundant. Nature every year spread over the soil a coating of manure to make up for what the trees and saplings drew out of the earth. But man has not followed nature's example. He has "rawn out without paying back. Constant lavish spending will soon consume a store of wealth. So will constant cropping without manuring infallibly impoverish the soil. The hard work for small returns, the meagre yields per acre, which discourage so many farmers, are traceable mainly to this cause. In a too selfish eagerness to get as much as possible *immediate profit*, the soil is robbed, and its ability to yield a liberal increase taken away.

If we could but once thoroughly impress this lesson on the mind and memory of every farmer, so that he should fix it as a principle of action, to be not only just, but generous in his treatment of the soil,—aye, and in his treatment of every thing and every body, the world would indeed be on the eve of a wondrous transformation.

Liming Land.

The use of lime is justly esteemed as one of the best means we possess for improving certain kinds of soils. On many soils the addition of lime is followed by increased fertility, and in numerous cases the improvement effected in this manner is so striking, that we cannot wonder at liming being ranked amongst the standard operations of agriculture.

Lime is required for the growth of all kinds of cultivated plants, and, consequently, is an indispensable constituent of all cultivated soils. But while lime is invariably present in soils that admit of cultivation, the quantity of lime naturally contained in them is often very small, and especially too small for the vigorous growth of certain crops. Hence the addition of lime to soils of this description must obviously increase their fertility. It is on soils of this kind that the most striking effects of lime are displayed, especially when, as is not unfrequently the case, a soil contains in abundance all the materials required for the growth of plants, with the exception of lime. In these cases, the addition of lime is all that is necessary to transform a comparatively barren soil into one of superior quality. To a less extent, the use of lime on ordinary soils is generally attended by good effects; and even on lime soils, that contain a large proportion of calcareous material, the use of lime of some other sort, or from some other district, is frequently beneficial. Hence we find that lime acts in the soil in several capacities.

Action of Lime on Soil.

It not only acts as a direct manure, by increasing the supply of a material necessary for the growth of nearly all plants, but it supplies us with one of the best means of altering the condition of substances already present in the soil, either by destroying or modifying substances that are objectionable and noxious, or by the conversion of indifferent bodies into useful fertilizing materials. For instance, a soil whose fertility is impaired by an excessive quantity of vegetable matter, as a peaty or boggy soil, may be relieved of this encumbrance by a copious dose of quick-lime. Lime, like all alkaline or caustic substances, possesses the property of rotting and destroying organic matter of every sort. Hence, on its addition to soils of this description, it quickly diminishes the quantity of insoluble vegetable remains. Vegetable remains, under peculiar circumstances, refuse to decay, and accumulate to an injurious extent. This kind of vegetable matter, popularly known as "sour humus," is generally found in undrained, or but imperfectly drained land. To remove this sour humus, lime is generally employed, which, by acting upon the insoluble vegetable matter, hastens its decay, and is said to "sweeten" the land; as by decay these materials furnish carbonic acid and other useful feeding materials for plants. The lime thus converts a noxious ingredient into a source of fertility. Again, in the case of soils that are infested with insects, a dose of lime is the least troublesome and most effective remedy.

In considering the agricultural value of lime, we must not forget its mechanical effect on the soil. When applied in large quantities to clay lands, it opens and loosens the dense masses of clay, and imparts a certain amount of porosity and mellowness; and by so doing opens the way to further improvements, by exposing a larger extent of surface to the action of the atmosphere.

Mode of Application.

The effects of lime in the soil, as above briefly enumerated, are most actively exhibited by lime in a