

SOILS OF CEYLON*

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EVEN the most casual observer cannot fail to be struck by the luxuriance of the vegetation of Ceylon, particularly of the wet zones. Most people would attribute this phenomenon to the natural fertility of the soil. In reality, however, our soils, taken as a whole, are by no means rich in mineral and organic plant food material. There are of course important exceptions. The reason for this prolific plant growth is to be sought in the favourable light, temperature and rainfall conditions generally experienced over the Island. Consequently carbon assimilation by the plant is at an optimum; so also is micro-organic and chemical activity in the soil, making quickly available the plant food present in or added to it as organic matter. As Ramann the noted German soil scientist remarks, "Most tropical soils are deficient in plant nutrients and are in great need of manures. The foliage, which falls continually throughout the year, decays rapidly and the liberated plant nutrients circulating very rapidly suffice for the great luxuriance of the tropical forest. On the whole, the tropical forest works with a small capital of nutrients and a rapid turn over." When, however, the equilibrium between soil and natural vegetation is disturbed by the destruction of the forest, the forces of soil deterioration quickly obtain ascendancy and in a few years the fertility of the soil is reduced to a level which makes the cultivation of crops unprofitable unless an intensive, rational system of agriculture is adopted. When this is not feasible, the only alternative is the abandonment of the land for such time as would permit of the regeneration of the soil by secondary vegetation. Hence the prevalence of *chena* or shifting cultivation in all tropical countries. Tennent as early as 1860

*A talk broadcast from Colombo on June 29th, 1937

writes in regard to local soils, not without reason, that "the soil notwithstanding its wonderful display of spontaneous vegetation, is not responsive to systematic cultivation and is but imperfectly adapted for maturing a constant succession of seed and cereal crops." Experience has shown that most local crops require manuring if good yields are to be maintained, for, in Ceylon, as in other parts of the tropics, "the inexhaustible richness of tropical soils is but seldom found in Nature."

The environmental factors affecting soil character are climate, the nature of the parent rock, topography and to a lesser degree, vegetation. Climate is undoubtedly the predominant soil-characterizing factor in Ceylon. The high temperatures, and heavy precipitations alternating with periods of dry weather are eminently favourable for chemical weathering and the development of laterite (*cabook*) or lateritic soils from the crystalline rocks which constitute the main geological formation of the Island. In the process of laterisation the soluble bases are leached out, and a residual material rich in the hydrated oxides of aluminium and iron is left. Pure laterite soils must necessarily be infertile, but only rarely are they encountered in Ceylon. Most of the red to yellow soils so prevalent in both the wet and dry zones belong to the lateritic type. They are generally deep, well-drained loams with varying proportions of quartz and ferruginous gravel, of fair but variable organic matter and nitrogen contents, poor in available lime and other bases, and acid in reaction. They show, however, a marked variation in chemical composition which is governed in large degree by that of the parent rock. The granites and other acid crystalline rocks give rise to soils poor in lime but likely to be rich in potash, while those derived from the dark-coloured basic rocks tend to be poor in potash but of relatively high lime content. Of fair agricultural value, lateritic soils respond to good cultivation and are adapted for the growth of a variety of crops, mainly of the perennial type. They are well suited for tea and rubber, but with due attention to cultivation, coconuts, fruits, food crops, etc. can also be grown on them with fair success.

The geological nature of the parent rock bears a close relationship to the character of two important groups of local

soils. This is best exemplified in the soils derived from Miocene limestone in the Jaffna Peninsula and the north-western part of the Island. They are deep, well-drained soils of brick-red colour and texture varying from light to heavy loams, rich in available mineral plant foods, mainly calcium and phosphoric acid, but poor in organic matter and nitrogen. Of the soils of the Island, these show the greatest response to cultivation with annual crops and fruits, provided they are adequately supplied with water and organic matter. In North Matale and other districts where crystalline limestone (mainly of the dolomitic type) outcrops, soils of a similar nature to the Jaffna calcareous red loams occur. Of no little importance from the soil standpoint are certain wind-borne "plateau deposits" of Pleistocene age which overlie the gneisses and crystalline rocks over the low-country. These often occur in two strata, the upper being a characteristic "red earth" of variable depth and the lower a gravel in a matrix of red clay. The former has given rise to the reddish sandy soils on which coconut thrives so well and to the white cinnamon soils, while the latter is the origin of the gravelly soils. The sandy soils, though of good physical condition for plant development, are deficient in nutrients and require supplementing with manures for optimum crop production.

The soils of the highlands and the paddy areas furnish the best examples of the effect of topography on the character of local soils. In the former, severe erosion caused by the heavy and intense rainfall has depleted the soils, for the most part, of the valuable surface soil with its accumulation of humus and mineral matter. This wash from the hills is deposited in the depressions and valleys where they form, under the influence of water movements, soils typically suited for paddy cultivation. Paddy is cultivated in Ceylon with varying degrees of success, on soils of wide textural range from clay loams to light sandy soils. They vary as widely in chemical composition and reaction. The heavy loams of no small extent in the dry zone forests, are by far the best types of paddy soils in the Island. Topography by its influence on soil water movement, is also the determining factor in the formation of the low-lying, acid, peat soils to be found in certain paddy and gemming areas.

The influence of vegetation on soil type in Ceylon is clearly seen in the *patanas* (grasslands) of the Central and Uva Provinces and the *kekilla* (fernlands) of Sabaragamuwa. Unlike most tropical soils which are generally poor in organic matter (the climatic conditions being more favourable for its decomposition than its accumulation) these soils have a surface layer of dark humic material of variable depth. Into their origin it is not my purpose to enter, but there is good evidence that some of these areas, at any rate, have resulted through man's interference with the natural forest vegetation. The *patana* and *kekilla* soils are, as would be expected, rich in organic matter and nitrogen, acidic in reaction, and poor in bases. They overlie red or yellow laterite and lateritic soils. Like the latter they are mainly suited for acid-preferring, perennial crops, *e.g.*, tea and rubber, but on the *patanas* certain vegetables can be grown successfully.

Ceylon soils may therefore be classed into five groups each with characteristic properties of its own. They are: (1) the laterite and lateritic red and yellow earths of the wet and dry zones, (2) the limestone-derived soils of the Jaffna and North Matale series, (3) the sandy and gravelly soils derived from Pleistocene plateau deposits, (4) the alluvial paddy soils, and (5) the *patana* and *kekilla* vegetation soil types. These soil classes exemplify the influence in varying degrees of one or more of the major environmental factors responsible for soil development and character generally. Taken as a whole Ceylon soils are poor in organic matter, available lime and phosphoric acid, but fair in nitrogen and potash. Our crops are therefore generally deficient in calcium and phosphorus except in areas like Jaffna where limestone occurs. Provided climatic conditions are not the limiting factor, there is a fairly close correspondence between the nature of local soil groups and the system of agriculture practised. Whatever their nature, our soils constitute the primary source of prosperity of the country, and it is a duty we owe to posterity no less than to ourselves to preserve this natural wealth by every means in our power.