

## Study of Profile Morphology of Madurai Agricultural College Farm Soil

by

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**Introduction :** It is essential that to understand the genesis and properties of any soil, the profile must be the unit of study followed by other laboratory analysis. As the profile study and morphological examination will reveal the hidden secrets of the soil body, the profile investigations have been taken up in the first instance to bring out the salient features of the soils of Madurai Agricultural College Farm. Detailed informations regarding the profile characteristics, morphological and other surface features of the soils of Madurai Agricultural College Farm have been collected to understand the genesis and nature of these soils.

**Physiography :** The locality is situated at an altitude of about 500 feet above Mean Sea Level. The area under investigation is situated between the Yanamalai rock and Madurai-Melur road with a slope of about 2-3% from the rock towards the road. This slope is found to be an important factor in deciding the various morphological and physical properties of the soil.

**Climate :** The area is much benefited by the North-east monsoon and only about one fourth of the total rainfall is received in the South-west monsoon. The average rainfall ranges from 800-850 mm. Except in the rainy season the climate is dry and the evaporation is more. The temperature ranges from 25 to 35°C. Hence the area is an example of one that receives moderate rainfall with the prevalence of high temperature.

**Geology :** The soils of the locality might have been derived from gneissic granite. The Yanamalai rock also appears to be of a granite type. There are also frequent occurrences of out-crops of granite rocks and laterite like vesiculated rocks in many places.

**Vegetation :** Though the area receives moderately good rainfall, the vegetation in the uncultivated area is mainly of grasses and scrub jungle as a major portion of the rainfall which is confined to about 3 months in the year is lost as run off without much benefit to the growth of any vegetation. The present cultivated area was under dry cultivation before the inception of the Periyar Irrigation System and now paddy is the crop grown year after year either as single or double crop.

**Profile studies :** A number of profiles were studied both in the cultivated area (paddy lands, orchard and botanical gardens) and uncultivated area. The profile features of some of the typical profiles are given below :

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*Profile I:* Near Chittankulam Kanmoy on the north eastern side. 0-6": Brown, clayloam compact and hard, sparse distribution of roots, presence of few grits, absence of calcium carbonate, clear cut line of demarcation; 6"-9": Moist layer with the above features but more friable and loamy to sandy loam texture. 9"-20": Brown, sandy to sandyloam, very loose and single grain structure, clear cut line of demarcation.

*Profile II:* Near the Guest House about 50 yards south. 0-4": Brown, loam, blocky and compact, very hard, sparse distribution of roots and grits - diffused layer. 4"-6": Brown, sandy, single grain and very loose, presence of more gravels and grits, soil portion is less than 20 to 30%. 6"-12": Brown, sandy, single grain but compact, presence of more grits of 2mm size - angular and subangular - diffused layer absence of calcium carbonate. 12"-24": Light brown, sandy loam, compact, presence of haematite and black mottlings - presence of 2-5 mm size grits - very hard layer.

*Profile III:* Botanical Garden area - about 20 yards from Yanamalai rock. 0-9": Brown, sandy loam, compact and hard, presence of grits and roots, absence of calcium carbonate. 9"-18": Brown, sandy loam, compact and more hard, presence of more grits and ferruginous gravel. Below 18": Weathering parent material under different stages of weathering.

*Profile IV:* Well cutting near the College Main Building. 0-20": Brown, loamy, compact and very hard, blocky, sparse distribution of roots and gravels, absence of calcium carbonate. 20-50": Weathered parent material - 90% of the material mixed with a soil matrix, presence of different size quartz and ferruginous gravels - absence of calcium carbonate - clearcut line of demarcation. 50"-70": Light brown soil matrix mixed with white gravels, limonite and kaolinite like material occurring in pockets - very hard layer. Below 70": parent rock presence of exposed rocks closeby indicates the colluvial action and transported nature of the profile.

*Profile V:* Near the Botany Laboratory of the Main Building on the Eastern side. 0-20": Brown, loamy, compact and blocky, no root distribution, angular quartz and ferruginous gravel present, absence of calcium carbonate. 21-33": Soil portion same as above, but presence of more gravels of 2-5 mm size; gravels are both angular and subangular. Below 33": Weathered parent material followed by parent rock. Exposed rocks closeby.

*Profile VI:* Foundation trench near the Physics Laboratory of the College Main building on the western side. 0-15": Light brown, loamy, weakly developed prismatic structure, no root distribution, presence of quartz 1-2 mm size - ferruginous gravel present. 15-27": Compact and very hard layer - soil and ferruginous gravel well mixed up - appears to be a laterite horizon with vesicular



structure. 27-40" : Light brown mixed with quartz and ferruginous gravel, white specks - weakly developed prismatic structure. Below 40" : Parent rock.

*Profile VII:* Profile on the northern side of the road opposite to Guest House. 0-3" : Light yellowish brown, sandy loam, grits present 1 mm size, sparse distribution of roots. 3"-10" : Yellowish brown, clayey loam, presence of large size grits - 2-4 mm. 10"-22" : Gravel layer, presence of ferruginous gravels and quartz, soil portion is less than 25% and clayey. 22-25" : Gravel layer with less soil. Below 25" : Parent rock.

*Profile VIII:* Near Hostel Buildings opposite to Veterinary Hospital. 0-13" : Brown, clayey, compact to weakly developed prismatic structure, no root distribution, grits present, no quartz, presence of iron concretions, clear line of demarcation. 13-24" : Light brown, clayey, compact to weakly developed prismatic structure, lesser percentage of grits. Below 24" : Gravel layer with about 10% soil mixed up with the gravel, quartz and iron concretions present, calcium carbonate particles of 5 mm to 2 mm size - compact and hard. Laterite like vesiculated rock as out-crop occurs close by over a large area.

*Profile IX:* Orchard area - Vineyard. 0-12" : Brown to reddish brown, sandy loam, compact grits present, no roots, no concretions, clear cut line of demarcation. 12"-18" : Yellowish brown, sandy, loose and single grain, grits of 1-3 mm size present. 18"-21" : Brown, loam, compact, smaller size grits present. 21-27" : Gravel layer with iron concretions, soil portion is clayey and weakly developed prismatic structure. 27"-33" : Brown, highly clayey, prismatic structure, clear cut line of demarcation. Below 33" : Weathered parent material.

**Discussion:** The topography of the area might have had a dominant role in deciding the depth of the soil. As seen, the soil depth in all the profiles examined is very shallow. Heavy rainfall in a shorter period aided by the sloping topography will be very conducive for normal erosion and hence it can be concluded that a major portion of the soil would have been eroded away leaving only very shallow soil profiles. That is the reason why all the profiles examined revealed a very shallow soil layer which is mixed up with gravels and grits of different sizes. In many profiles the soil depth is in the order of few inches and immediately followed by the weathered parent material layer or parent rock itself. This conclusively proves that a major portion of the soil would have been eroded away leaving only the subsequent horizons which we are able to observe now.

The various morphological properties studied indicate the immature nature of the soil under investigation. The soil colour in all the profiles do not vary very much. The texture is almost the same among the various profiles and within the different units of each profile. There is no development of any well defined



structural units in any of the profiles except in one or two. Except one, all the other profiles do not contain calcium carbonate. All the profiles are found to have good amount of grits, quartz and ferruginous gravels of different sizes. All these evidently show that the soil is not fully developed but at the same time indicating that a major portion of the soil would have been eroded away.

Further there are occurrences of out-crops of granite rocks and laterite like vesiculated rocks. The vesiculated rocks are found to be hard under dry condition, possessing the properties of the typical laterite rocks of West Coast and East Coast. In addition there is the occurrence of calcium carbonate in one or two locations. Moreover, the soil is found to be very soft when wet but on drying it becomes very hard resulting in a peculiar condition of poor drainage when wet and very good compactness under dry condition. All these varying features give a complicated picture in understanding the genesis and the properties of the soil under investigation. A clear understanding of the genesis of these soils can be had when the data of analysis of profile samples become available.

**Summary:** The profile characteristics and morphological features of the soils of Madurai Agricultural College Farm have been studied with a view to understand the genesis, physico-chemical properties and fertility status. Detailed profile investigations have been made. The study showed that the soil depth is very shallow and many profiles do not deviate much in their characteristics. It is evident that the topography of the area and the rainfall would have been responsible for the shallowness of the soil. The occurrence of rock out-crops, and laterite like vesiculated rocks side by side, occurrence of calcium carbonate in some places, poor drainage, soil becoming soft when wet and hard on drying and other profile features studied give a complicated picture on the genesis of the soil. The soil can be called as immature or in virile state of development which is due to the continuous natural erosion and what is left over to-day is only the lower horizons of the soil profile.