CHARACTERIZATION AND POTENTIALITY EVALUATION OF SOILS FOR ADOPTING NATURAL FARMING – A CASE STUDY OF BABURAYANPETTAI, TAMIL NADU, INDIA

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ABSTRACT

Soil resource inventory was done by using cadastral map and with the help of satellite imagery to understand the origin and potentiality of soil to practice natural farming in future days. Therefore entire area of Baburayanpattai -SRM Agricultural college area is divided into three different transacts based on variation in elevations and surface features of soil. Three soil pedons are excavated in a single transact which falls under nearly level sloping land, soils are studied for understanding the potentiality for crop growth and characterized into different classes. Soils in the study area are very deep and it was found that surface soils have dark greyish brown colour with clayey texture and having the angular blocky structure. The soil pH ranged from 7.65 to 8.38 from surface to subsurface horizon. Available nitrogen is observed lower in the surface and sub-surface horizons. Phosphorous shows lower status from surface to subsurface horizon because it is fixed with CaCO_3 as orthocalcium phosphate. Potassium is observed medium to high in status due to the presence of smectitic clay minerals abundantly in the soil. Iron, Manganese and copper are showing more than their critical status, this is due to not chelated with other chelating agent in the soil. It was observed that soils are having some of the limitations like drainage and heavy clay content. Therefore to eradicate these limitations natural farming with tree farming is advised to practice instead of inorganic farming.

KEYWORDS: Natural farming, Characterization, Potentiality

Received: Oct 16, 2020; **Accepted:** Nov 06, 2020; **Published:** Nov 21, 2020; **Paper Id.:** IJASROCT20203

INTRODUCTION

Agriculture is the main source of income generating entrepreneurship to the farmers in the world, due to the mismanagement in the crop production by using indiscriminate quantity of inorganic fertilizers and pesticides killed the natural biota in the soil. This is the main reason for deterioration of healthy soils towards poor soil fertility status. Evaluation of the soils for their quality to fix the suitable cropping system is the only solution left before us, therefore use of daily available raw materials in the farm should be reused as a source of nutrient to the plants brings changes in the yield and population of soil biota, which can also bring out the less cost of production

by boosting the soil biota. This can maintain the soil sustainability for future generation.

As per several research outcomes says natural farming is the only way to bring out the rejuvenation in status of soil health and fertility, so by creating the awareness in the young generation we have to restart this modern agriculture with the healthy eco-friendly agriculture to safeguard the future generation from the problems raised by the inorganic farming. In this context, before adopting natural farming we need to understand the soils in ground level, therefore this study needs soil survey to characterize the soils by analysing for nutrient content in soil which brings the lots of scope to fix the suitable cropping system to selected piece of land or region and identification of limitations of the soils in ground level. Therefore, this pilot study aims to provide site management by using soil resource inventory of soils of SRM College of Agricultural Sciences campus, Baburayanpettai village, Chengalpattu district, Tamil Nadu. The main objective is to focus on soil resource inventory, and evaluation of soil potentiality to adopt natural farming.

MATERIAL AND METHODS

Study Area

Baburayanpettai campus is located in Madhuranthagam taluk of Chengalpattu district. Initially the campus is having a total area of 181 acre land. The campus boundary is surrounded by Baburayanpettai and Siruperandi on the north, Kalathur villages on the south, Chithamoo on the east and Athivakkam village on the west. Based on the geological aspects the major rocks observed are Granites and Gneiss, limestone in the study area. Dykes, popularly known as black granite, occur in the study area as intrusive rock. The granite and gneiss show significant variations in their texture, colour, mineral assemblage and degree of weathering. Entire area consists of moderately sloping to nearly level in elevation. Based on the general slope, the area can be classified as almost flat.

METHODOLOGY

Base Maps Used

The detailed survey of the land resources occurring in the study area was carried out by using cadastral map as a base. The cadastral map shows field boundaries with their survey numbers, location of tanks, streams and other permanent features of the area. Apart from the cadastral map, remote sensing data products from IRS and Google earth at the scale of 1:8000 were used in conjunction with the cadastral map to identify the landforms and other surface features. The Imageries helped in the identification and delineation of boundaries between hills, uplands and lowlands, water bodies, forest and vegetated areas, roads, habitations and other cultural features of the area.

Field Investigations

Preliminary traverse of the entire campus was carried out with the help of cadastral map, Google earth imagery. During the traverse profiles site were located at closely spaced intervals to take care of any change in the land features like break in slope, erosion, gravel, stones etc. In the selected sites, profiles (vertical cut showing the soil layers from the surface to the rock) were opened up to 200 cm or to the depth limited by rock or hard substratum and studied in detail for all their morphological and physical characteristics. The soil and site characteristics were recorded for all profile sites on a standard proforma as per the guidelines given in USDA Soil Survey Manual (Soil Survey Staff 1993). Apart from the profiles study surface soil samples are collected and analysed for major and micronutrients.

Site Characteristics

Study area was categorized into different classes based on depth explained in Table No.1 represents the very deep depth soils category, it falls under the midslope physiographic unit and having the granite gneiss as parent material for origin of soils. Study area is facing the normal winter and hot summer. Study area is nearer to seashore experience the medium humidity therefore atmosphere is having high temperature mixed with moist air leads to rapid process of weathering of mineral matter. Since more heat radiation falls on the surface of soil leads to faster rate of mineralization of carbon to CO₂, which is the main reason for less organic carbon in the soil. Therefore it's advised to use the live mulches to avoid faster rate of carbon mineralization.

Table 1: Site Characteristics of Pedon-1

Location	Baburayanpettai campus
Latitude	11° 54' 35.4" N
Longitude	76° 46' 23" E
Altitude (m)	777
Landform and slope	<1-3 per cent slope with 50-150 m length,
Physiographic unit	midland
Geology	Granite gneise
Plot no	209
Parent material	Granite gneise
Physiographic division	Southern Deccan plateau
Erosion	slight
Run off	slow
Drainage	well
Ground water depth (m)	>50
Flooding	No
Vegetation	Neem, teak.
Crops grown	---
Micro features	grassland
Climate	very hot in Summer.

Morphometric Characteristics of Deep Depth Soils of Study Area

Soils are characterized by using USDA soil classification procedure, Table No-2 depicts the variation observed in the different layers from surface plough layer to parental rock, it was found that surface soils have dark greyish brown colour with clayey texture and having the angular blocky structure. Since it has having angular blocky structure leads to slickensides of soil aggregates therefore, it's not a good soil structure for very smooth rooting crops. As increase in the depth from surface to sub surface it was observed that the presence of CaCO₃ concretions, since it occupies majorly in subsurface leading to soil calcareous. Increase in content of clay with increased depth and the development of soil structure, which indicated the development of cambic horizon (Gangopadhyay *et al.*, 2001).

This is the major limitations observed in study area. Because of this limitation choice of crop is affected therefore remedial measures should be taken care to solve the problem, its recommended use effective incorporation Application of green manure and bulky organic manure to maintain the pH of the soil. Decomposition of green manure releases the organic acids, leads to pH level being brought down from higher to neutral status.

Table 2: Morphometric Features of Pedon -1

Horizon	Depth (cm)	Profile Description
Ap	0-30	Dark greyish brown, 10YR4/2, clay, strong grade, very fine size, angular blocky structure, very hard, very firm, very sticky, very plastic, fine many roots, fine many pores, abrupt smooth boundary
Bw₁	30-60	Dark greyish brown, 10YR4/2, clay, strong grade, very fine size, angular blocky structure, very hard, very firm, very sticky, very plastic, fine many roots, fine many pores, abrupt smooth boundary
Bw₂	60-100	Dark greyish brown, 10YR4/2, clay, strong grade, very fine size, angular blocky structure, very hard, very firm, very sticky, very plastic, fine many roots, fine many pores, abrupt smooth boundary
BC	100-200	Dark reddish brown, 2.5YR3/4, fine gravel, sandy clay, moderate, medium to coarse, subangular blocky, slightly hard, very friable, very sticky, slightly plastic, clean wavy boundary, Presence of CaCO ₃
C	Partially weathered parent material	

Physico-Chemical Properties of Soil

The physico-chemical properties of study area are described in the Table 3. The soil pH ranged from 7.65 to 8.38 from surface to subsurface horizon. As the soil depth increases there is an increase of soil reaction were noticed, this may be due to the presence of CaCO₃ concretions in the lower horizon. There is an evidence of illuviation of clay and formation of argillic horizon in the sub-surface layer and similar result was observed by Sitanggang *et al.* (2006). Soil salinity ranges from 0.20 to 0.8 dSm⁻¹ which results in non-salinity in nature for growing plants. Available nitrogen is observed lower in the surface and sub-surface horizons; this is because of higher rate of mineralization of carbon due to high temperature and less organic matter in the soil. Phosphorous shows lower status from surface to subsurface horizon because of fixed with CaCO₃ as orthocalcium phosphate. Potassium is observed medium to high in status due to the presence of smectitic minerals abundantly present in the soil. Iron, Manganese and copper are showing more than their critical status this is due to not chelated with other chelating agent in the soil and due to the granite mineral matter naturally brings the more solubility of these metal ions.

Table 3: Physico- Chemical Properties of Study Area

Depth (cm)	Horizon	pH) (1:2.5)	Ec (dSm ⁻¹)	N	P	K	Fe	Mn	Zn	Cu
Pedon-1		Master Profile at Nearly Level Slope Land Transact								
0-30	Ap	7.65	0.20	56	15	100	8.01	5.81	0.27	2.77
31-60	Bw ₁	7.45	0.14	94.5	15	112.5	9.13	7.3	0.48	2.86
60-100	Bw ₂	8.38	0.55	98	15	125	5.88	4.05	0.36	2.05
100-200	BC	8.34	0.98	35	14.5	187.5	4.91	2.19	0.93	1.95
>200	C	Partially weathered parent material								

CONCLUSIONS

From the present study it can be concluded that soils of the study area was having different landforms with fundamental soil forming process. Due to this it was observed that soils are having some of the limitations like drainage, gravelliness, calcareousness and heavy clay content. Therefore to eradicate these limitations with eco-friendly it is advised to follow the natural farming with tree farming to boost the soil health for saving future days from this limitations.

ACKNOWLEDGEMENT

I sincerely thank Dr.Thyagarajan, Dean (Agri.), FAS, SRM University for permitting me to use the facilities available at Baburayanapettai and his encouragement during the study.

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