ORIGINAL RESEARCH PAPER

Geography

SPATIAL DISTRIBUTION OF SOIL PHYSICAL PROPERTIES IN WEST TRIPURA DISTRICT, TRIPURA

KEY WORDS: soil quality, agricultural land, areal distribution, farmers, utilization

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ABSTRACT

Soil quality is an assimilation of soil processes and evaluates the changes in soil condition. At present, soil quality is defined as "capacity of soil to function". Among the soil properties, Soil physical properties are more important than other properties. Soil physical properties are essential for farmers to know about their agricultural lands for better utilization and profit maximization. After studying the areal distribution of individual soil physical properties, it is seen that soil properties are not evenly distributed in the study area. But through scientific implementation of land management system and proper utilization of land may improve soil physical properties (soil quality) and standard of living of farmers for better future.

1. INTRODUCTION:

The concept of 'Soil Quality' induces with various retorts, relying on our scientific and social backgrounds. Soil quality is an assimilation of soil processes and evaluates the changes in soil condition (Doran *et al.*, 1996). At present, soil quality is defined as "capacity of soil to function". Among the soil properties, Soil physical properties are more important than other properties though all properties are vital for smooth functioning of soil capacity. By considering all these literatures, the present study finds suitable the following parameters:

2. DATABASE AND METHODOLOGY:

2.1 DATABASE: Soil Samples were collected from the sampling Sites of West Tripura District, Tripura by following standard operating procedure. Total 86 samples were collected and processes in the lab (see Table no. 1).

2.2 METHODOLOGY FOR SOIL PHYSICAL PROPERTIES:

2.2.1 SOIL TEXTURE: Soil texture assessed through electric rotating sieve method (mechanical analysis) of soil separates with different sizes namely sand, silt, and clay in percentage as given USDA (National soil survey handbook, 2008).

2.2.2 SOIL BULK DENSITY: Soil Bulk Density was determined with the help of direct which is preferred by agricultural soil scientists, researchers, and engineers (Ma *et al.*, 2013). The formula for Soil Bulk density estimation is mass of the oven-dried soil/ volume of the oven-dried soil and usually, the unit is gm/ m^3 (Campbell, 1994).

2.2.3 SOIL DEPTH: Soil Depth indicates the depth to which the roots of cultivated crops can reach and use the available water and nutrients in the soil (Fu *et al.*, 2011). The soil depth map of the study area generated from the National Bureau of Soil Science and Landuse Planning publication of 65a, 65b, and C.

2.2.4 SOIL MOISTURE CONTENT: Soil Moisture Content of the study area was determined gravimetrically by overnight oven drying method and shows in percentage (Zhang *et l.*, 2011). The formula for soil moisture content determination is Ww-Dw / Dw-Cw*100%.

Where, Ww= Wet Weight of a soil sample, Dw= Dry Weight of Soil Sample, Cw= Cane Weight of soil Sample. All the weights are in gm.

2.2.5 SOIL WATER HOLDING CAPACITY: 'The Soil Water Holding Capacity (SWHC) was determined by drying a known weight of the soil sample in an electric oven at 105°C for about 15 minutes. The moisture bottle and the stopper is removed and placed in a desiccator. Then its weight was recorded. After that, the sample was soaked in water and kept it in the electric oven at 105°C for 24 hours. Then it was cooled in the desiccator and weighed. The SWHC was calculated by the loss in weight of the soil and expressed on an oven-dry basis (Viji and Rajesh, 2012).

2.2.6 SOIL POROSITY: The 'Soil Porosity' and Percentage of Water Filled Pore Spaces (WFPS) of soil samples collected from the study area were determined with help of following formula:

Soil Porosity (in %) = (1 – Bulk Density/ Particle Density)*100 (Viji and Rajesh, 2012).

2.2.7 SOIL TEMPERATURE: Soil Temperature was calculated directly from the Satellite Imageries of LandSat – 8 OLI of February, 2018.

All the soil properties data were processed in the GIS Environment and get valuable maps.

3. ANALYSIS AND DISCUSSION:

3.1 SOIL TEXTURE: 'Soil texture is a means of describing the particle sizes present in a soil'. Each soil separates contributes in the nature of the soil as a whole. Here in the present study, maximum portion of soil falls under sandy to fine textured loamy soil as it is covered with floodplains and Tilla-Lunga topography (see Fig. No. 1). Fertility of this kind of soil is high. These soils are easy to till and apt for crop production.

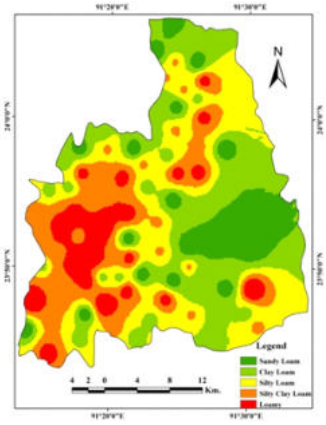

Fig. 1 Soil Texture of map the study area

3.2 BULK DENSITY: 'Soil is a matter but a loose body. If the volume of pore space is considered together with the volume

of solid particles in the measurement of density that measure of soil density is called bulk density' (Das, 2011). Bulk density of soil has grown naturally possesses pore spaces. Here, bulk density ranges from 1.319 gm/cm3 to 1.375 gm/cm3. The bulk density of maximum area is from low to medium category as they belonged to light textured soil (see Fig. 2). Moreover, porosity and organic matter is also responsible for low to medium category bulk density of the soil in the study area.

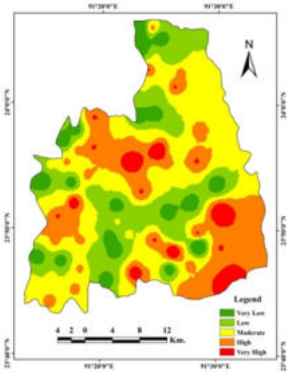

Fig. 4.2 Bulk Density of the study area

3.3 SOIL DEPTH: The physical and chemical property of soil varies from surface to sub-surface soil due to changes in soil (Adugna and Abegaz, 2015). More deep the soil, the roots can penetrate deep. Here, depths of soils are categorized from moderately deep to very deep. Maximum area covers up by deep to very deep category of soil depth. However, this is due to the soil texture and other parallel soil properties which are working together continuously (see Fig. No. 3)

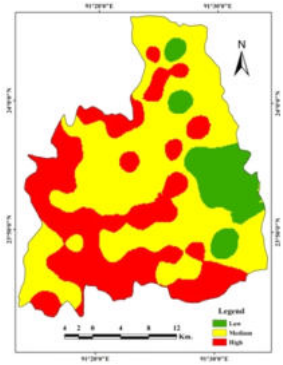

Fig. 4.3 Soil Depth of the study area

3.4 SOIL MOISTURE CONTENT: Soil moisture means the moisture (wetness) presence in the soil in its physical appearance. Soil moisture in the study area covers maximum portion ranges from very low to medium and rest high to very high covers limited area (see Fig. No. 4).

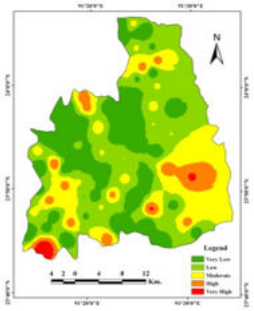

Fig. 4.4.1 Soil Moisture Content of the study area

3.5 SOIL WATER HOLDING CAPACITY: The water holding capacity and soil properties are significant to water management planning for irrigation and dry land crops (Viji and Rajesh, 2012). For the growth of soil and plant, water is essential aspect. There is a distribution of water holding capacity from very low to medium which covers maximum area and very limited area covers by very high to high category (See Fig. 5). The soil texture of this area is of lighter category and porosity of low to medium category prevails in the study area, cannot hold much water.

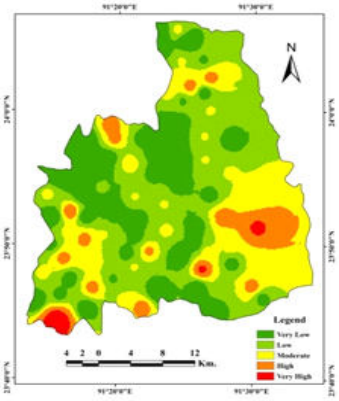

Fig. 5 Soil Water Holding Capacity of the study area

3.6 SOIL POROSITY: 'Soil is a granular body with varying sizes and distances' and because of that there remains space between them which are not filled up solid particles, called pore spaces (Das, 2011). The range of porosity in the study area is from low to high category which covers maximum area and very limited area covers very low and very high category (See Fig. 6).

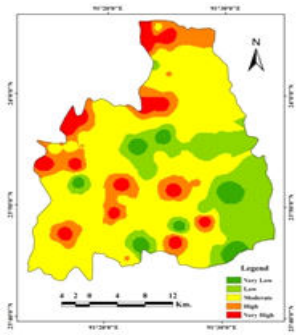

Fig. 6 Soil Porosity of the study area

3.7 SOIL TEMPERATURE: Soil represents a major storage of heat, act as a reservoir during day and source of surface heat at night (Geiger *et al.*, 2003). Soil temperature influences soil properties processes involved in seed germination, seedling, plant root growth and the availability of soil nutrients (Probert, 2000). It governs the soil physical, chemical and biological processes (Buchan, 2001). Temperature in the study area ranges from 19.05^{0}C to 24.69^{0}C. The surface temperature range of the study area is Soil temperature of the study area influences to grow micro-Organisms, soil moisture retention and water holding capacity, decaying of organic matter and evapo-transpiration (see fig no. 7).

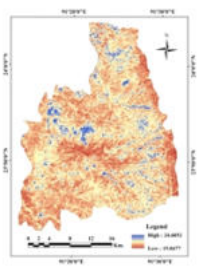

Fig. 7 Soil surface Temperature of the study area

CONCLUSION:

After studying the areal distribution of individual soil physical properties, it is seen that soil properties are not evenly distributed in the study area. But through scientific implementation of land management system and proper utilization of land may improve the soil physical properties which will help the farmers to get maximum profit generation within limited land.

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