International Journal of Contemporary Research In Multidisciplinary

Research Paper

Study of Soil Health of The Selected Areas of Malda District

Suchandra Das[1], Himadri Sekhar Mandal[2], Pramod Jha[3], Hariswami Das[4*]

[1,2,3,4]Science Department, Sovanagar High School, Malda, West Bengal, India

Corresponding Author: * Hariswami Das

Abstract

This study examines the physicochemical properties of soil in the Malda district, West Bengal, India, focusing on soil health and its impact on agricultural productivity. The research encompasses soil samples from three distinct regions: the Tal, Diara, and Barind regions. Following methodologies aligned with RAS Guidelines (2022–23), the study assesses soil texture, pH levels, water-holding capacity, bulk density, water infiltration rate, and organic content. The results indicate that the soils in these regions demonstrate favorable conditions for crop growth, with moderate pH levels, sufficient water-holding capacity, and high organic matter content. Additionally, the study investigates the development of chickpea plants in these soils, revealing varying growth rates across different soil types. The research underscores the significance of soil management in enhancing agricultural productivity and stresses the need for regular maintenance of soil fertility. The study aims to raise awareness among local farmers about the best soil and crop management practices in the Malda district for enhancing agricultural productivity. It emphasizes the need for ongoing, periodic maintenance of soil fertility. The study's conclusions aim to raise awareness among local farmers about the best practices for soil and crop management in the Malda district.

Manuscript Information

- **ISSN No:** 2583-7397
- **Received:** 25-05-2024
- **Accepted:** 24-06-2024
- **Published:** 23-08-2024
- **IJCRM:**3(4); 2024: 178-184

- **Plagiarism Checked:** Yes
- **Peer Review Process:** Yes

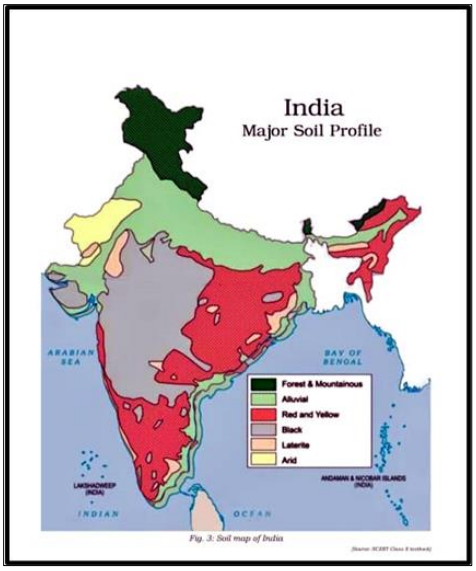
How to Cite this Manuscript

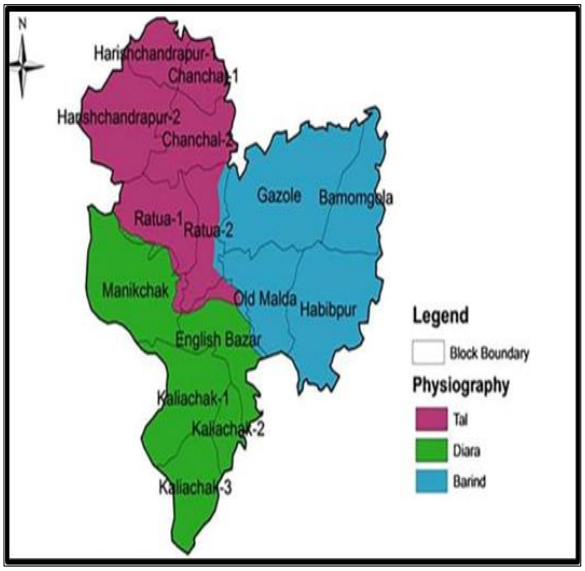
Suchandra Das, Himadri Sekhar Mandal, Pramod Jha, Hariswami Das. Study of Soil Health of The Selected Areas of Malda District. International Journal of Contemporary Research in Multidisciplinary.2024; 3(4): 178-184.

Keywords: Tal, Diara, and Barind regions, soil management, soil fertility

1. INTRODUCTION

Soil is the loose surface material that covers the area of the land. It is composed of many organic and inorganic materials. It forms the ground and gives shelter to life. It provides structural support, nutrients, and water for plants. To improve agriculture and forestry, a practical awareness of soils and their management is required. The basic components of soils are sand, silt, clay, loam, and humus. But different land areas consist of different types of soil. In India, we see some major groups of soil, *viz.*, alluvial soils, black soils, red soils, forest and mountain soils, arid soils, saline and alkaline soils, and marshy and peaty soils. Alluvial soil varies in nature from sandy loam to clay and consists of silt, sand, clay, and gravel. On the other hand, black soils are rich in humus, phosphorus, and ammonia as their physicochemical properties. This project mainly covers the study of soil health, its physicochemical properties, and its agricultural values. Mainly, the study is done on the soil of Malda district, West Bengal, India. This district is situated in the Lower Gangetic Plain Region (III) Agro-Climatic Zone, according to the Planning Commission, with old alluvial soils. Malda district mainly covers three soil types: deep clay to clay loam land (Tal region), medium sandy loam to loam medium land (Diara region), and deep clay to loam high land (Barind region). (Ref.7) The total area of Malda district is 3733 square kilometers, and the cultivating area with major crops and fruits is about 2959 square kilometers. (ref 7). The area of this study involves the soils of the Tal Region (Chanchal II Block), Diara Region (Bamangola Block), and Barind Region (English Bazar Block). Malda's soil is rich in its physical and chemical properties and fertile for the agriculture of major crops and fruits.





2. METHODOLOGY

The methodology of different tests of soil to determine soil health is accomplished according to RAS Guidelines (2022-23) in the school laboratory with a collaboration of students of classes 9 and 11, Sovanagar High School, English Bazar, Malda.

3. OBJECTIVES

Soil samples were analyzed using the methodology provided by the RAS Guidelines. The purpose of the study is to show the texture of the soil, pH level of soil samples, water holding capacity of soil samples, bulk density of the soil, water infiltration rate of the soil, and organic content of the soil.

PLATE 1:

Collection of Soil Samples by students of Sovanagar High School

Collection of Soil Samples from Different Areas of Malda District

Experimental

Soil samples were collected randomly from different areas of Malda district, and the following steps were taken to achieve the study of soil health:

Step 1

To determine qualitative and quantitative measures, collected soil samples (100 g) were filtered with wire mesh sizes of 2 mm, 0.05 mm, and 0.002 mm. From these filtered samples, the percentage was measured.

Step 2

To determine the water infiltration rate, a 4-inch diameter pipe is placed up to a 3-inch depth of soil and poured with water. The time of absorption of water was taken, and the rate was calculated.

Step 3

To determine the pH of soil samples, the standard pH scale was compared.

Step 4

To determine the soil texture, soil balls of sizes 10 mm to 15 mm were made. The balls were dipped into 250 ml of distilled water, and time for disintegration was taken.

Step 5

To determine the water-holding capacity of the soil, the soil samples (50 g) were placed into perforated plastic bottles and water was added. After oozing out the water completely, the weight of the soil was taken. The difference in weight shows the water-holding capacity.

Step 6

To determine the bulk density, the sample soil was collected in a 4-inch-diameter, 6-inch-high pipe. The density was measured.

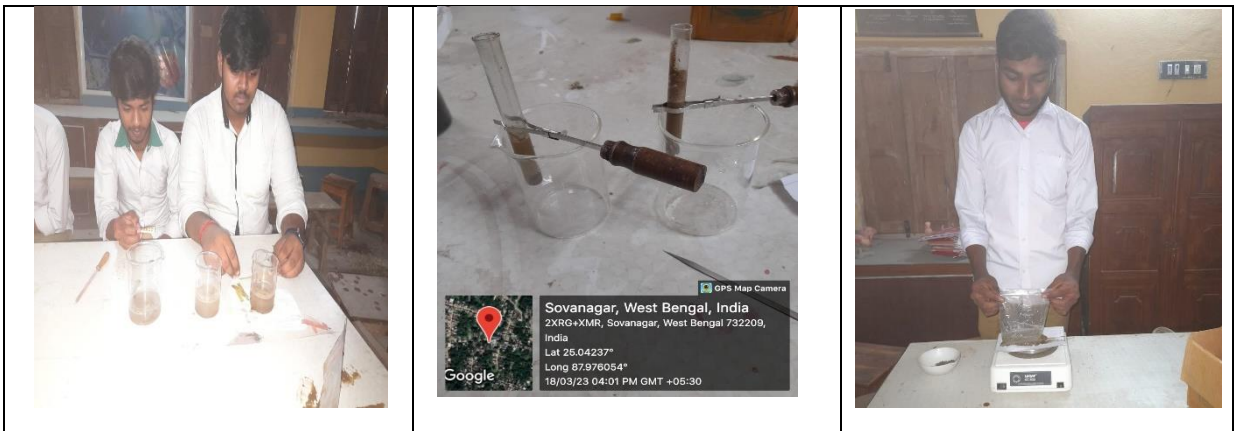
Step 7

To determine the organic matter, the sample soil (1 g) is dissolved in 10 ml of 6% hydrogen peroxide, and the bubbling time is counted. The bubbling time is compared to the given chart.

PLATE 2:

Test of Soil Texture and Water Infiltration Rate

PLATE 3:



Test of Soil pH, Turbidity of Soil and Water Holding Capacity

PLATE 4:

Students involved in experiments

Different Soil Samples and Chickpea plants

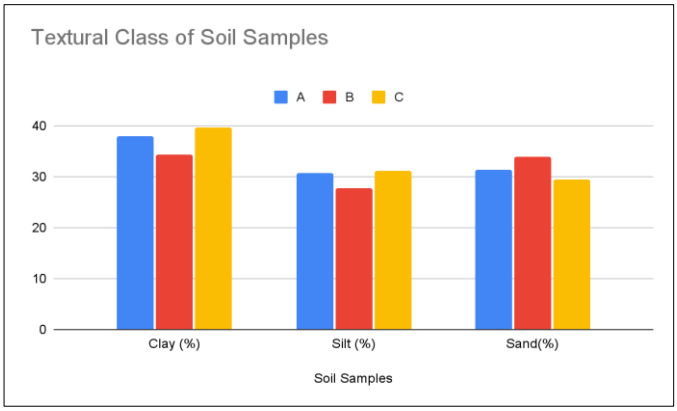
Showing Growth of Chickpea plants in different soil samples

Besides those experiments, all of the sample soils were taken to know about the growth of plants in them. For this reason, some chickpea seeds were used. After the growth of seedlings, those were planted on sample soils. That also shows some variations in results.

RESULTS AND DISCUSSION

The color of randomly taken soil samples from different zones of the Malda district varies from light gray to brown, yellow in dry conditions, and dark brown to dark brownish gray in the finding of soil texture. Over turbidity of the soil shows poor plant growth. (Ref.9) But our results show a moderate to low turbidity, which is good for plant growth. Here, Fig. 1 shows the graphic representation of textural classes of soil.

Fig 1: Textural Class of Soil Samples



Soil samples were collected randomly from English Bazar (A), Chanchal II (B), and Bamongola (C).

The pH level varies from 7.3 to 8.0 to determine whether the soil is either acidic or alkaline. The high level of acidity, *i.e.*, very low pH (less than 6.3), decreases the growth of roots in plants. So, it has a vast effect on the cultivation of crops and vegetables. On the other hand, a high pH level (higher than 8) shows alkalinity, inhibiting plant growth. Sometimes it shows high levels of calcium deposition and less phosphorus solubility in the soil. But this result shows a moderate soil pH value, which is very useful for crop productivity. The water-holding capacity of the soil and the water infiltration rate are also important keys to crop productivity. The study shows the percentages of Water holding capacity of soil samples, which is very good for major crop growth like paddy, wheat, maize, and different types of vegetables. Loamy soil generally shows a good water-holding capacity for the growth of plants. It also helps with the solubility of micro- and macronutrients in the soil. Soil particles are an important factor in soil infiltration capacity. Clayey soil has a lesser infiltration capacity than sandy soil. Proper infiltration and water-holding capacity of the soil increase crop productivity.

Soil bulk density is another important feature. Higher bulk density may have harmful effects on plant growth. Sometimes it may inhibit the germination of seedlings. Lower bulk density allows proper drainage and fungal growth, too. It is considered that the bulk density of soil, if 1.6 g/cc, is not very fruitful for plants. (Ref.4) Higher organic matter in soil shows higher bulk density. So, it is also a necessity for plant growth to have a suitable bulk density in the soil. The study shows here a moderate rate of density, 0.95 to 1.10, that shows high crop productivity. Here is the Table 1, which shows different soil characteristics:

Table 1: Showing different Physicochemical properties of soils

Area of Collection of soil	Soil Sample	pH of soil	Nature of soil	Water Holding Capacity (%)	Bulk Density of soil (gm/cc)	Water infiltration Rate(ml/min)	Organic Matter Content
English Bazar block	A	8	Alkaline in nature	40	0.95	7.3	High
Chanchal Il Block	B	7.5	Neutral to Alkaline in nature	34	0.90	8	High
Bamangola Block	C	7.3	Neutral to Alkaline in nature	51	1.10	6.3	High

From the result shown in the table, there is an interrelationship between the data. The very high organic matter shows a low pH. But use of high-density fertilizer sometimes may cause variations in acidity and alkalinity. The large bulk density of soil shows a high water-holding capacity of soil and a low infiltration rate.

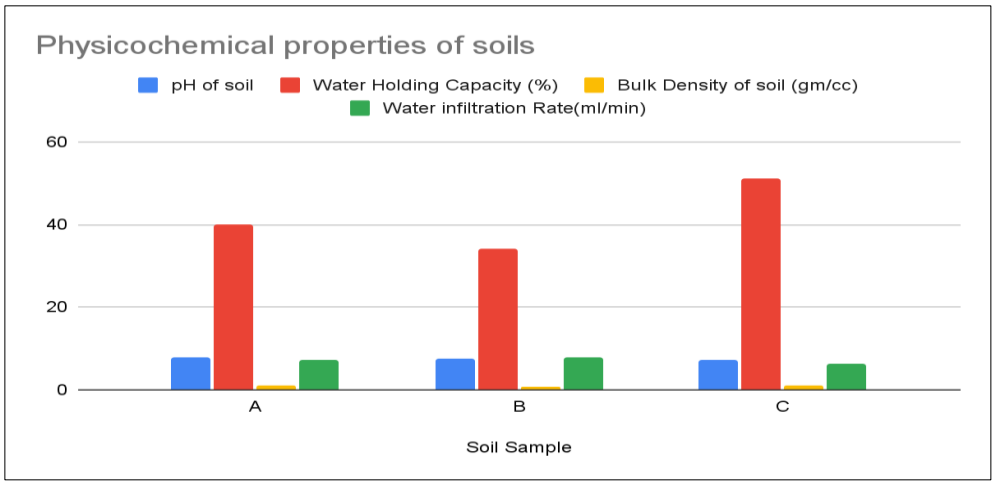


Fig 2: Physicochemical properties of soils

Soil samples were collected randomly from English Bazar (A), Chanchal II (B), and Bamongola (C). As per the mentioned procedure in the RAS guidelines, when the soil is reacted to hydrogen peroxide and it forms bubbles, the bubbling time is compared to the organic matter in the soil. So, the study shows all the soil samples are high in organic content. Also, the study has shown chickpea plant growth in sample soils. All three types of soil samples show a higher growth rate for these pea plants. The growth of such chickpea plants varies from 8.1 cm to 18.9 cm within 15 days, which is quite good. Mostly, chickpea plants grow better in well-drained, fertile soil with neutral pH levels.

Table 2: Growth of plant on Day 3

Soil samples	Mean	SD	SE
A (Barind Region)	4.3	0.854	0.493
B (Tal Region)	5.2	1.1	0.635
C(Diara Region)	5.733	1.15	0.664

Table 3: Growth of plants on Day 7

Soil samples	Mean	SD	SE
A (Barind Region)	12.933	1.32	0.762
B (Tal Region)	14.7	0.565	0.326
C(Diara Region)	16.8	1.682	0.971

Table 4: Growth of plants on Day 10

Soil samples	Mean	SD	SE
A (Barind Region)	16.233	1.05	0.606
B (Tal Region)	16.8	1.682	0.971
C(Diara Region)	19.833	1.205	0.696

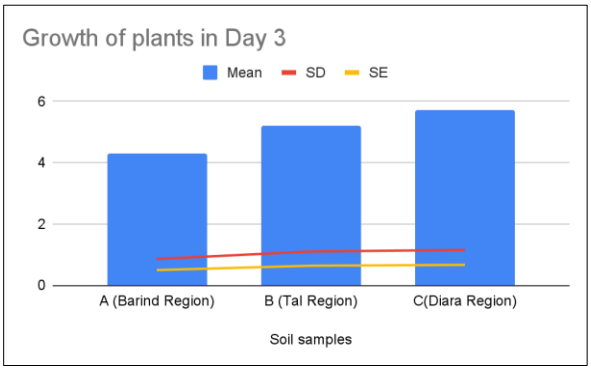


Fig 3: Growth of plants on day 3

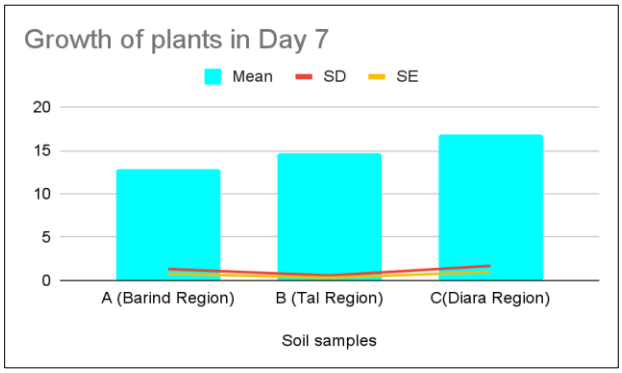


Fig 4: Growth of plants on day 7

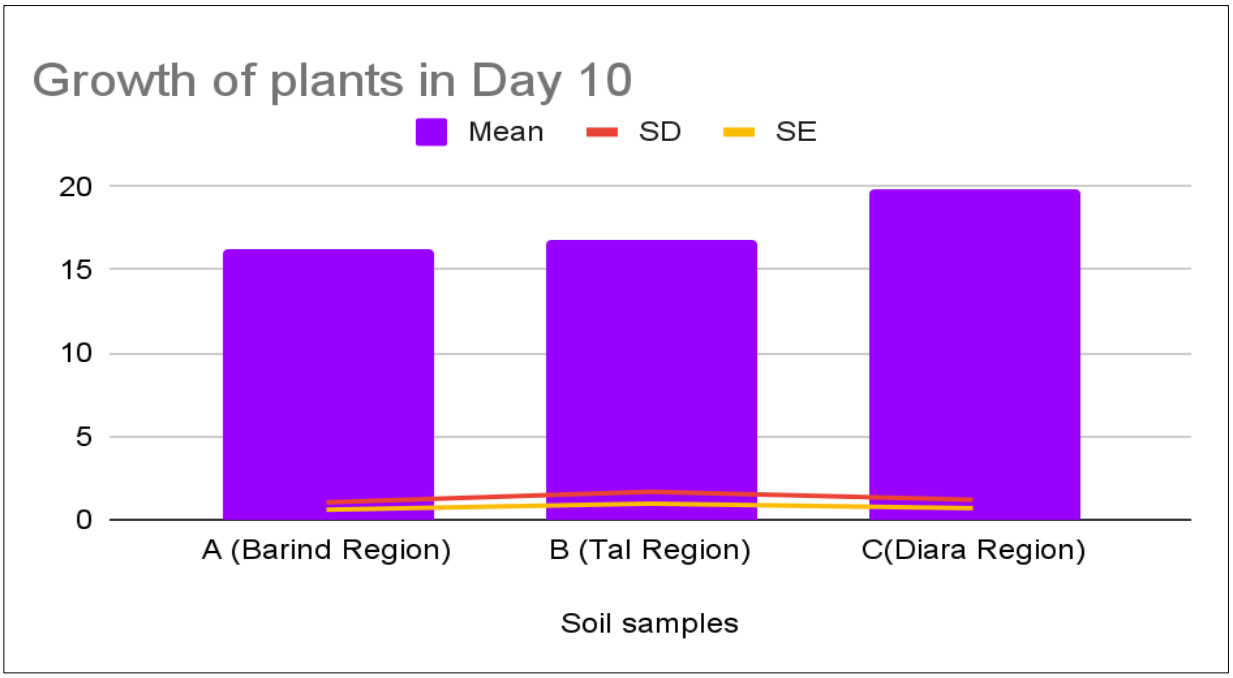


Fig 3: Growth of plants on day 10

CONCLUSION

This study of soil health helps to raise awareness among the common people and farmers in those localities. Sometimes they need to know which soil is better for crop production or which is for vegetables or fruits. The soil alkalinity and acidity effect on plant growth is another concern for crop production. The porosity of the soil influences plant growth as well. Here, the study demonstrates healthy soil physical condition with adequate organic matter. The pH level is delayed somewhere, but potassium, aluminum, and nitrogen fertilizers in the recommended amounts improve the soil's suitability for planting and harvesting. Furthermore, crop productivity and soil health depend on the periodic maintenance of soil fertility.

Above all, the study was completed in a very short period with a limited number of soil samples that were collected from various locations in Malda district for the study of plant growth. So, the study has some limitations. The result may vary over a wide time range and across a large number of soil samples, but it is concluded.

Plate 5:

Awareness Programs on Soil Health and Crop Productivity

REFERENCES

1. Soil quality and soil health: A review. International Journal of Ecology and Environmental Sciences 38(1). January 2012.
2. Robert D. Doyle & R. Michael Smart. Impacts of Water Column Turbidity on the Survival and Growth of Vallisneria americana Winterbuds and Seedlings. Lake and Reservoir Management. Volume 17, 2001 - Issue 1.
3. Major soil types of India-Alluvial soil and Black soils, PMF IAS, Geography, Indian Geography.
4. Soil pH- an important factor in crop production. Bighaat.DEC 24, 2019.
5. Soil acidity. Agriculture Victoria is part of the new Department of Energy, Environment and Climate Action (DEECA). 1 January 2023,
6. Md Najmus Saadat, Krishnendu Gupta. Impact of Soil on the Productivity of Mango Crop in Malda District, West Bengal. American International Journal of Research in Humanities, Arts and Social Sciences. AIJRHASS 16-162; © 2016.
7. Md Ramiz Raja, Tarence Thomas, Narendra Swaroop and Raghunandan, Singh Khatana. Evaluation of Physico-chemical properties of old Alluvium soil of Malda District, West Bengal. The Pharma Innovation Journal 2021; 10(9): 99-103.