



Soil Series and Soil Health Parameters: A Study on Jehanabad District of Bihar

Shreya

M.Sc., Central University of Kerala, Kerala, India
Email - s3666774368@gmail.com

Abstract:

Aim: The main objective of the study is to identify the various factors affecting the soil health and to examine the soil series and soil health parameters of Jehanabad District of Bihar.

Approach: The secondary data has been used in the study which has been collected from the Soil and Land use survey of India, Department of Agriculture and farmers welfare, State Report, Bihar, 2019.

Results: It has been found that the major factors which mainly affects the soil health at overall level is Climate, Soil texture, Soil Structure, Water storage and Electrical Conductivity and further under Bumhorkhas, chiksi, Gajaradhi of soil series the range in pH found slightly acidic under sub surface and the Kinjer and Kulhadia was found normal in every aspect of soil health parameters.

Implications: The study will be helpful for the policy makers to develop a policy or methodology or formula to improve the soil health.

Value Addition: The study is unique in the context that it covers every aspect of all those dynamics which need to be study at the time of examining the soil health.

Key Words: Soil Series, Soil Health Parameter, Soil Texture, Soil Structure etc.

1. INTRODUCTION :

Soil is a vital natural resource that plays a crucial role in supporting agricultural productivity, ecosystem functioning, and overall sustainable development. Understanding the characteristics and health of soils is essential for effective land management and agricultural practices. This study focuses on exploring the soil series and soil health parameters in the Jehanabad district of Bihar, India. A study conducted on soil series distribution in Bihar and identified major series including the Gangetic Alluvium, Calcareous Alluvium, and red and yellow soils (Tiwary, P., et al. 2015). Bihar, located in the eastern part of India, is an agriculturally rich state with diverse soil types. Jehanabad district, situated in the southern region of Bihar, has significant agricultural activity, making it an ideal area for studying soil series and their associated health parameters. Soil series refers to a group of soils that share similar characteristics such as parent material, climate, topography, and age. Each soil series has unique properties that influence its suitability for different types of crops and land use practices. Understanding the soil series present in an area provides valuable information for land planning, crop selection, and soil conservation strategies.

Soil health parameters assess the overall condition and fertility of soils. These parameters include physical, chemical, and biological indicators that indicate the soil's ability to sustain plant growth and maintain ecosystem functionality. Additionally, there is a growing tendency in the deteriorating of soil health and degradation of land (Basak et al., 2021). Some common soil health parameters include soil organic matter content, pH, nutrient availability, water holding capacity, microbial activity, and soil compaction. The study analyzed soil health indicators in Bihar, including soil organic carbon, available nitrogen, and phosphorus levels, emphasizing the importance of nutrient management practices (Sharma, S., et al. 2017). The Study evaluated the effects of long-term organic and inorganic fertilizer application on soil health parameters in Bihar, emphasizing the role of organic fertilizers in improving soil fertility and microbial activity (Kumar, A., et al. 2020). assessed the impact of different agricultural practices on soil health in Bihar, comparing conventional tillage and conservation agriculture practices. The study highlighted the positive effects of conservation agriculture on soil organic carbon, pH, and aggregate stability (Sharma, S., et al. 2019).



By conducting this study, policymakers, farmers, and land managers can gain insights into the specific soil characteristics and health status of different areas within Jehanabad district. This information can guide decision-making processes related to land use planning, crop selection, and sustainable agricultural practices. studied the effects of different land uses, including agriculture, forests, and grasslands, on soil health parameters in Bihar, highlighting the importance of land use planning and soil conservation measures (Singh, B., et al. 2018).

In conclusion, understanding soil series and soil health parameters is vital for sustainable land management and agricultural productivity. The study conducted in the Jehanabad district of Bihar aims to know the soil series and soil health parameters in the region.

2. Materials and Methods:

The study is primarily based on identifying the factors which are responsible for affecting the soil health and in the second part of the study an attempt has been made to identify and examine the factors which are responsible for affecting and the soil health under different soil health parameters. The secondary data has been used in the study which has been collected from the Soil and Land use survey of India, Department of Agriculture and farmers welfare, State Report. The study area was Jehanabad district of Bihar, and the study year was 2019. The distractive approach has been adopted and applied to conduct the study.

3. Objectives: The following objectives are set for the study:

- To study the various factors affecting the soil health.
- To examine the soil series and soil heath parameters of Jehanabad District of Bihar.

4. Results and Discussion:

Table:1 Distribution of area under different Soil Series.

Sl No.	Soil Series	Mapping units	Area (ha)	Area (%)
1.	Bumhorkhas	4	3781	10-93
2.	Chiksi	5	15764	45-56
3.	Gajaradhi	2	815	2-35
4.	Kinjer	3	3211	9-28
5.	Kulhadia	3	910	2-63
6.	Lacknor	5	5273	15-24
7.	Nima	2	1361	3-93
8.	River	-	1542	4-45
9.	Canal	-	13	0-04
10.	Habitation	-	1620	4-68
11.	Road	-	300	0-87
12.	Tank	-	13	0-04
Total (ha)			34603	100-00

Source: Soil and Land use survey of India, Deptt. of Agriculture and farmers welfare, State Report(Bihar), Jehanabad 2019

Table 1 represents the soil series distribution area under the Jehanabad district of Bihar for the year 2019 in which Bumhorkhas has been allotted highest area i.e. 15764 and Tank has the lowest value in the soil series of the district.

Table 2: Distribution of area under different Depth Class

S. No.	Soil Depth Class	Depth (cm)	Area (ha)	Area (%)
1	Very deep -d5	>100	31115	89.92
2	Misc.	&	3488	10.08
Total (ha)			34603	100-00

Source: Soil and Land use survey of India, Deptt. of Agriculture and farmers welfare, State Report(Bihar) Jehanabad 2019



Table: 3 Distribution of area under different Slope Class

S.No.	Slope Class	Area (ha)	Area (%)
1	Very gently (1-3%) sloping, terraced to nearly level (0-1%)	31115	89.92
2	Misc.	3488	10.08
Total (ha)		34603	100.00

Source: Soil and Land use survey of India, Deptt. of Agriculture and farmers welfare, State Report(Bihar) Jehanabad 2019

Table: 4 Distribution of area under different Slope Class

S.No.	Slope Class	Area (ha)	Area (%)
1	Very gently (1-3%) sloping, terraced to nearly level (0-1%)	31115	89.92
2	Misc.	3488	10.08
Total (ha)		34603	100.00

Source: Soil and Land use survey of India, Deptt. of Agriculture and farmers welfare, State Report(Bihar) Jehanabad 2019

Table: 5 Distribution of area under different Land Capability Class (LCC)

S. No.	Land Capability Class	Area (ha)	Area (%)
1	Class II	31115	89.92
2	Misc.	3488	10.08
Total (ha)		34603	100.00

Source: Soil and Land use survey of India, Deptt. of Agriculture and farmers welfare, State Report(Bihar) Jehanabad 2019

Table: 6 Landscape wise distribution of area under different Physiographic class

S. No.	Landscape	Physiographic Class	Area (ha)	Area (%)
1	Alluvium	Alluvial plains	28844	83.36
		River Bank	2271	6.56
2	Misc.		3488	10.08
Total (ha)			34603	100.00

Source: Soil and Land use survey of India, Deptt. of Agriculture and farmers welfare, State Report(Bihar) Jehanabad 2019

Table: 7 Distribution of area under different Land Use/land cover class

S. No.	Land Use Classes	Area (ha)	Area (%)
1	Multiple crop cultivation(C2)	30700	88.72
2	Plantation (P1)	415	1.20
3	Misc.	3488	10.08
Total (ha)		34603	100.00

Source: Soil and Land use survey of India, Deptt. of Agriculture and farmers welfare, State Report(Bihar) Jehanabad 2019

Table 2,3,4,5,6 & 7 represents the details information about the soil series and quality of soil and land in which the study was conducted.



Table:8 Distribution of Series Wise Soil Health Parameter

S. No.	Soil Series	Depth (cm) Surface/ Subsurface	Range in pH		Range of Electrical Conductivity (EC)		Range of ESP		Range of Organic carbon (OC)		Area (ha)
			Value	Rating	Value	Rating	Value	Rating	Value	Class	
1	Bumhorkhas	Surface 0-15	7.01	Normal	0.06	Non saline	3.77	None to slight hazard	0.60	Medium	3781
		Sub-surface 15-147	6.40-7.13	Slightly acidic to Normal	0.06-0.07	Non saline	2.66-7.02	None to slighthazard	0.25-0.48	Low	
2	Chiksi	Surface 0-13	7.05	Normal	0.07	Non saline	3.35	None to slighthazard	0.39	Low	15764
		Sub-surface 13-135	7.08-7.93	Normal to slightlyalkaline	0.07-0.07	Non saline	1.79-2.25	None to slighthazard	0.15-0.34	Low	
3	Gajaradhi	Surface 0-12	6.52	Normal	0.09	Non saline	7.88	None to slighthazard	0.42	Low	815
		Sub-surface 12-137	6.0-7.32	Slightly acidic to Normal	0.07-0.08	Non saline	2.42-5.75	None to slighthazard	0.20-0.34	Low	
4	Kinjer	Surface 0-15	6.98	Normal	0.07	Non saline	0.93	None to slighthazard	0.42	Low	3211
		Sub-surface 15-141	6.89-7.32	Normal	0.06-0.06	Non saline	0.74-2.19	None to slighthazard	0.24-0.39	Low	
5	Kulhadia	Surface 0-15	7.29	Normal	0.07	Non saline	0.94	None to slighthazard	0.37	Low	910
		Sub-surface 15-135	7.21-7.31	Normal	0.07-0.07	Non saline	0.79-1.62	None to slighthazard	0.15-0.37	Low	
6	Lacknor	Surface 0-15	7.60	Slightly alkaline	0.08	Non saline	1.89	None to slighthazard	0.30	Low	5273
		Sub-surface 15-145	7.37-7.74	Normal to slightlyalkaline	0.08-0.08	Non saline	0.72-1.43	None to slighthazard	0.08-0.27	Low	
7	Nima	Surface 0-11	7.37	Normal	0.08	Non saline	1.20	None to slighthazard	0.53	Medium	1361
		Sub-surface 11-150	7.42-8.16	Normal to slightlyalkaline	0.07-0.07	Non saline	1.20-2.65	None to slighthazard	0.30-0.35	Low	
8	Misc.		-	-	-	-	-	-	-	-	3488
Total (ha)											34603
Note: EC-Electrical Conductivity (dSm ⁻¹), ESP-Exchangeable Sodium Percentage (%), OC-Organic Carbon (%) Source: Soil and Land use survey of India, Deptt. of Agriculture and farmers welfare, State Report(Bihar) Jehanabad 2019											

Table: 8 represents the series wise distribution of soil health parameters. Under Bumhorkhas, chiksi, Gajaradhi of soil series the range in pH found slightly acidic under sub surface and for the rest it was found normal i.e. Non saline for Range of Electrical Conductivity, None to slight Hazard for Range of ESP and Low for Range of Organic carbon. The Kinjer and Kulhadia was found normal in every aspect of soil health parameters. Lacknor found Slightly alkaline for surface area and Nima was found normal for surface area.

5. Factors Affecting the Soil Health:

Climate: Climate is long-term weather. Temperature and rainfall affect soil fertility. Rainfall and temperature affect crop output. Greenhouse gases affect climate, which affects temperature and rainfall. Low rainfall and high temperatures damage soil and cause droughts. Rain increases surface runoff and flooding. These variables reduce soil fertility and agricultural productivity.

Soil texture: Soil texture is based on particle size dispersion. Sand, silt, and clay are sized particles. Soil texture affects porosity, rate of organic matter breakdown, solidity, cation exchange capacity, percolation, nutrient, and water retention, making it more important for soil fertility.

Soil Structure: Stable particle aggregates support soil structure. Soil aggregates are naturally bound soil particles. These aggregates can form peds. Microbe-produced humus and polysaccharides cement. Fungi bind best, followed by streptomyces, gum-producing bacteria, and yeast. Rhizopus, Mucor, Fusarium, Cladosporium, Aspergillus, Rhizoctonia,



and other fast-growing fungi release gums. Azotobacter, Rhizobium, Xanthomonas, Bacillus produce gum. Soil structure affects fertility.

Water storage: Water holding is the soil's ability to resist gravity. After gravity water percolates into deeper strata, soil capillaries hold water. Cohesion binds water molecules. Sand-dominated soils hold less water. Soil water is gravitational, capillary, and hygroscopic.

Electrical Conductivity: Electrical conductivity measures soil salt content. Electrical conductivity is measured in Decisiemens/m (ds/m). Sodic soils conduct less electricity than saline soils. Saline soils contain mostly Ca, Mg, K, and Na. Soluble salts, limited water passage, irrigation, flood, marine sedimentation, and evapotranspiration cause saline soils. Electrical conductivity indicates soil fertility. Salt and exchangeable sodium negatively impact vegetation. Low-fertility soils hinder plant growth.

6. Conclusion:

The above study was carried out on identifying what are the factors which affects the soil health and it has been found that the major factors which mainly affects the soil health at overall level is Climate, Soil texture, Soil Structure, Water storage and Electrical Conductivity. The second objective was to examine the soil series and soil health parameters and it has been found that under Bumhorkhas, chiksi, Gajaradhi of soil series the range in pH found slightly acidic under sub surface and the Kinjer and Kulhadia was found normal in every aspect of soil health parameters. The Lacknor found Slightly alkaline for surface area and Nima was found normal for surface area. The overall health of soil health of jehanabad district of bihar was to an extent found normal in the above study.

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Author's Biography:



Shreya

M.Sc. Environmental Science

Email: s3666774368@gmail.com

Shreya is M.Sc. in Environmental Science, Central University of Kerala. She completed her B.Sc. in Zoology Honours from LNMU, Bihar