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Assessment of soil fertility of *Tal* and *Diara* Land: A case study of Bhagalpur district, Bihar, India

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Abstract

In this study the soils of the study area as per the criteria of taxonomic classification predominantly come under three orders namely, Entisols, Inceptisols and Vertisols as per 7th approximation of soils classification of Tal and Diara land of some selected district of Bhagalpur district. All the physical and chemical parameters were estimated that, the soils of 'Tal' which are highly clayey throughout their depth, grey in colour and low to medium availability of NPK. whereas, the 'Diara' land consists light texture soil and low to medium range of available NPK. Some of major soil physical constraints relating crop production and income are appropriate soil conservation measures.

Keywords: Soil fertility, *Tal* and *Diara* land, NPK status

Introduction

In continuation of available natural resources the soils of 'Tal' which are highly clayey through their depths, grey to dark grey in colour, neutral to slightly alkaline in reaction found in adjoining of river Ganges with spatial geomorphic characteristics. These soils are moderately rich in nitrogen, available P and K and very hard under normal conditions. In same river basin, the other geomorphic features which is locally known as 'Diara' land found in between the natural levees of the river and formed due to periodical erosion and deposition of sediments under the entire region is characterized by palaeo levees, swamps or flood basins locally called "Chauras" relict palaeo channels aggraded to different extents, meander belts, oxbow lakes and cut off loops (Ahmad, 1971) [1]. The Diara land soils with their undulating landscapes are generally very light to medium heavy textured but all underlain by sandy layers within 80 to 100 cm of their surface and very well drained to moderately well drained, neutral to slightly alkaline in reaction. (Sharma *et al.*, 1997) [11]. India is estimated to have about 58.2 million hectares of wetlands, many of which are distributed around the Indo-Gangetic plains. Generally regarded as "a water-surplus area" (Ghosh *et al.*, 2004). management, remote sensing has proved to be the most efficient, economical and reliable technique to prepare a comprehensive inventory of soil resources and land use pattern of an area (patel *et al.*, 2001) [7]. Above these facts, the present study was carried out for assessment of Tal and Diara lands under Bhagalpur district with following objectives.

To characterize and classify Tal and Diara land of Bhagalpur district.

To study the soils fertility status of Tal and Diara land of Bhagalpur district.

Materials and Methods

General description of geological setting of the study area *viz.* relief, geology, drainage, climate, collection of soil samples and their analytical methods adopted in this investigation are briefly presented. Bhagalpur district, the study area having geographical area of 2612.55 km² is an important district under agro-climatic zone of IIIA of Bihar. It lies between 25°012'N AND 25°32'N and 46°42'E and 47°32' E. The river Ganga comprises the major portion of the district with generally plain surface, comprising nine blocks know as sultanganj, Shahkund, Nathnagar, Jagdishpur, Gauradih, Sabour, Sanhaura, Kahalgaon and Pirpainty. The Ganga across from west to east in middle portion of the district and provides a large drainage pattern association with Chanan and Barua rivers.

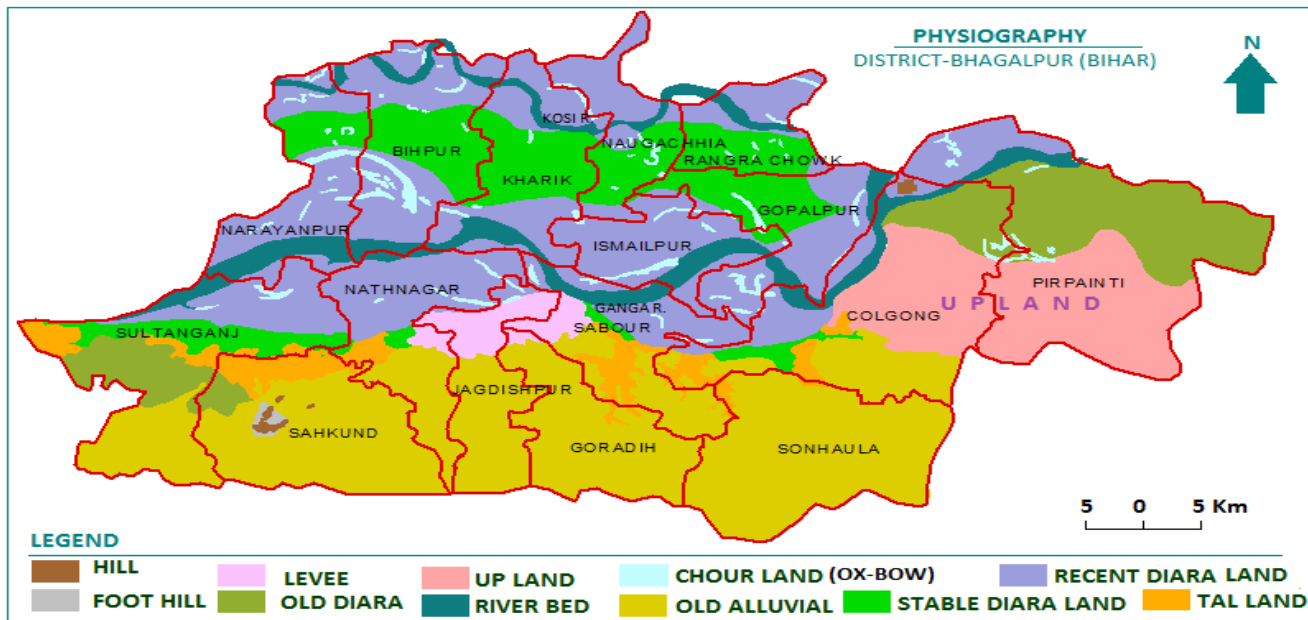


Fig 1: Map of physiography of the study area

Analytical Methods for soil and water analysis

SN	Properties	Method	Reference
A. Soil			
I. Physical			
1.	Mechanical analysis	International pipette	Piper (1950) [9]
2.	Colour	Munsel colour chart	Piper (1950) [9]
II. Chemical			
1.	pH (1:2.5)	Potentiometric	Jackson (1967) [3]
2.	EC (1: 2.5)	Potentiometric	
3.	Organic carbon	Walkey and Black titration	Subbiah and Asija (1956)
4.	Available N	Alkaline permanganate	
5.	Available P	Extraction with 0.5M NaHCO ₃ (pH 8.5) and estimated by spectrometric	Olsen <i>et al.</i> (1954)
6.	Available K	Extraction with 1 N NH ₄ OAc	Jackson (1967) [3]
7.	Micronutrients	DTPA extractable	Lindsay and Norvell (1978)
8.	Exchangeable Ca and Mg	Complexometric titration	Jackson (1967) [3]
9.	Exchangeable Na and K	Extraction with 1 N NH ₄ OAc (pH 7) and estimated by Flame photometric	

Taxonomically classification of the soils of Tal and Diara land in Bhagalpur District

Sr. No	Pedon	Location	Soil series
Tal land			
1.	Pedon 1:	Sultanganj	Clayey, mixed, Hyperthermic Typic Haplusterts
2.	Pedon 2:	Bihpur	Clayey, mixed, Hyperthermic Dystric Eutruderts
3.	Pedon 3:	Kahalgong	Clayey, mixed, Hyperthermic Typic Hapluderts
4.	Pedon 4:	Sabour	Clayey, mixed, Hyperthermic Typic Ustifluverts
Diara Land			
5.	Pedon 5:	Sultanganj	Fine-loamy, mixed, hyperthermic Typic Hapludents
6.	Pedon 6:	Bihpur	Fine-loamy, mixed, hyperthermic Dystric Eutrudepts
7.	Pedon 7:	Kahalgong	Fine-loamy, mixed, Hyperthermic Typic Hapludents
8.	Pedon 8:	Sabour	Fine-loamy, mixed, hyperthermic Typic Ustifluvents

Chemical properties of different soil profile in selected location

Pedon 1: Sultanganj: Clayey, mixed, Hyperthermic Typic Haplusterts								
Soil depth (cm)	Tal land							
	pH	EC (dSm ⁻¹)	OC (%)	N	P ₂ O ₅	K ₂ O	CEC (meq/100g)	ESP (%)
				kg/ha				
0-15	7.6	0.11	0.37	115.41	11.57	74.76	45.79	5.68
15-35	7.8	0.42	0.29	149.18	14.96	96.63	47.11	5.84
35-59	7.8	0.44	0.19	179.26	17.97	116.11	49.39	6.13
59-90	7.5	0.5	0.18	197.06	19.76	127.65	48.23	5.98
90-149	7.9	0.53	0.17	195.22	19.57	126.45	49.53	6.15
Max	7.90	0.53	0.37	197.06	19.76	127.65	49.53	6.15
Min	7.50	0.11	0.17	115.41	11.57	74.76	45.79	5.68
Mean	7.72	0.40	0.24	167.23	16.77	108.32	48.01	5.96

Pedon 2: Bihpur: Clayey, mixed, Hyperthermic Dystric Eutruderts								
0-15	7.8	0.51	0.17	222.53	22.31	144.15	41.02	5.09
15-35	8.5	0.35	0.53	226.53	22.71	146.73	46.37	5.75
35-60	8.75	0.48	0.48	223.46	22.41	144.75	41.51	5.15
60>	8.6	0.52	0.31	224.07	22.47	145.14	43.99	5.46
Max	8.75	0.52	0.53	226.53	22.71	146.73	46.37	5.75
Min	7.80	0.35	0.17	222.53	22.31	144.15	41.02	5.09
Mean	8.41	0.47	0.37	224.15	22.48	145.19	43.22	5.36
Pedon 3: Kahalgaon: Clayey, mixed, Hyperthermic Typic Hapluderts								
0-20	7.5	0.45	0.25	215.48	21.61	139.58	40.73	5.05
20-41	7.8	0.17	0.73	218.85	21.94	141.76	47.04	5.84
41-68	7.8	0.18	0.52	221.92	22.25	143.75	44.29	5.50
68—97	7.6	0.19	0.31	219.16	21.98	141.96	47.83	5.93
97-140	7.8	0.18	0.3	233.28	23.39	151.11	49.29	6.12
Max	7.80	0.45	0.73	233.28	23.39	151.11	49.29	6.12
Min	7.50	0.17	0.25	215.48	21.61	139.58	40.73	5.05
Mean	7.70	0.23	0.42	221.74	22.23	143.63	45.84	5.69
Pedon 4: Sabour: Clayey, mixed, Hyperthermic Typic Ustifluverts								
0-20	7.4	0.2	0.2	222.84	22.34	144.35	45.08	5.75
20-62	7.6	0.18	0.32	218.85	21.94	141.76	46.69	5.96
62-96	7.6	0.19	0.31	225.91	22.65	146.34	41.36	5.28
96-137	7.7	0.18	0.23	225.3	22.59	145.94	42.52	5.42
137-151	7.8	0.21	0.25	227.45	22.81	147.33	44.46	5.67
Max	7.80	0.21	0.32	227.45	22.81	147.33	46.69	5.96
Min	7.40	0.18	0.20	218.85	21.94	141.76	41.36	5.28
Mean	7.62	0.19	0.26	224.07	22.47	145.14	44.02	5.62

Results and Discussion

To fulfill the objectives towards resources characterization and fertility status of soil in the study area. The pH, EC, OC, available N, P₂O₅ and K₂O status N was found low and P₂O₅ and K₂O were low to medium whereas, pH was neutral to slightly alkaline in nature, ESP was non-sodic, organic carbon status was medium in nature and EC was non-saline in nature. Physical constraints relating crop production suggested technological interventions for higher crop production and soil conservation measures. By pati and Mukhopadhyay (2011)^[10] and Behera and Shukla (2013)^[2].

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