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SOIL FERTILITY STATUS OF SOME VILLAGES IN DHENKANAL SADAR BLOCK OF DHENKANAL, ODISHA,INDIA.

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ABSTRACT
Using the Global Positioning System (GPS), the soil fertility condition of the Dhenkanal Sadar block in the Dhenkanal district of Odisha was prepared. In 14 villages in the Dhenkanal Sadar block of the Dhenkanal district, which is situated in the mid-central tableland Agroclimatic zone of Odisha, India, a study on the status of soil fertility was conducted.
It is evident that the Dhenkanal Sadar block's several villages have varying textural classes, from clay loam to sandy loam. In this block, the percentage of sand in the surface soil ranged from 60.4% to 85.4%.Silt percentages ranged from 3.2% to 15.6%.Clay percentages ranged from 11.4% to 25.6%.
In Dhenkanal Sadar block, soils with a dark red colour were discovered. The soil's pH ranged from 4.59 to 6.81, with a mean of 5.25. The carbon that is organic in the soil ranged from 0.233 – 1.634g/kg with a mean value of 0.64 g/kg. The available N content varied from 105.00 – 365.00 kg/ha and the mean was 70.47 kg/ha. The available P content varied from 0.49-28.17 kg/ha and the mean was 5.35 kg/ha. The available K content varied from 26.80 – 831.04 kg/ha and the mean was 216.94 kg/ha. The available S content varied from 2.80 – 32.20 mg/kg and the mean was 12.96 mg/kg. The hot water soluble B content varied from 0.18-0.64 mg/kg with a mean value 0.37 mg/kg.
Keywords : GPS, Dhenkanalsadar, soil fertility status

2. INTRODUCTION

Study Area

The research area is the Dhenkanalsadar block in the Dhenkanal district, which is situated between latitudes 20'29"N and 21°11"N and longitudes 85° 58' E to 86°20"E. The research area is located in Odisha's Mid Central Tableland Agroclimatic Zone.

Climate

The research region has hot, dry, subhumid weather with an average of 1421 mm of precipitation per year. In general, December and January are frigid, whereas April and May are hot and sticky. The monsoon usually starts in June. The average summer temperature is 38.7°C, while the average winter temperature is 14°C. The district, which spans 4,452 km2, is composed of 1215 localities and 8 administrative blocks (Mishra et al., 2014). The main agricultural products grown in the district include sugarcane, fruits, vegetables, groundnuts, green and horse gram, and sesamum.

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Soils

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3. MATERIALS AND METHODS :

A detailed soil survey of the area was conducted by using the soil survey manual of USDA (Soil Survey Staff, 1995). The textural class analysis was carried out by the Bouyoucus Hydrometer method (Piper, 1950). The pH of 1:2 (w/v) soil and water suspension was determined using a glass electrode digital pH meter.EC at 1:2 (w/v) soil and water suspension was determined by an EC meter. Soil organic carbon was determined by Walkley and Black's rapid titration method (Jackson, 1973). Available phosphorous was determined by Olsen's method (Olsen *et al.,* 1954). Available nitrogen was determined using the alkaline potassium permanganate method (Subbiah and Asija, 1956). Available potassium was determined by the neutral normal ammonium acetate extraction method using a digital flame photometer (Page *et al.*, 1982). Available boron was done by hot water extraction method (John *et al.,* 1975) and available Sulphur was done by 0.15% $CaCl_2$ method (Chesnin and Yien, 1950).

RESULTS AND DISCUSSION:

Soil Reaction

The mean soil pH (1:2) of the surface soil samples from each of the 14 villages was determined to be 5.25, with variations ranging from 4.59 to 6.81 (Table 1). The nature of the soils was acidic. Thus, it seems that a significant crop production limitation in the research area is the acidity of the soil. Dash et al. (2018) have previously reported findings that are similar.

Electrical conductivity

Less than 1 dS m-1 was determined to be the electrical conductivity (1:2) of surface soil samples throughout the entire study area (Table 1). Because of this, every soil in the research area was suitable for growing every kind of crop because of its soluble salt level.

ORGANIC CARBON

The soil's organic carbon content had a mean value of 0.64 g/kg and ranged from 0.233 to 1.634g/kg .Table 1 showed the percentage of organic carbon in each of the research area's settlements. According to the findings, the soil had a modest amount of organic matter in it.

Available Nitrogen

The available nitrogen status of the individual villages was as follows: Sarikiha’s soils were found to be between 150.00 and 365.00 kg/ha with a mean value of 222.8 kg/ha; Jankhira's soils were found to be between 152.50 and 207.50 kg/ha with a mean value of 171.45 kg/ha; Ranja's soils were found to be between 150.00 and 318.75 kg/ha with a mean value of 211.66 kg/ha; Banasinga's

soils were found to be between 146.25 and 275.00 kg/ha with a mean value of 178.12 kg/ha; Suakhaikateni's soils were found to be between 153.75 and 280.00 kg/ha with a mean value of 188.95 kg/ha; Mahulapunji's soils were found to be between 142.50 and 183.75 kg/ha with a mean value of 162.08 kg/ha; soils of Bhapur found to be between 127.50 -206 .25 kg/ha with a mean value of 163.75 kg/ha; soils of Gangadharprasad found to be between 118.75 -198.75 kg/ha with a mean value of 153.95 kg/ha; soils of Jenasahupatna found to be between 137.50 -178 .75 kg/ha with a mean value of 163.95 kg/ha; soils of Kanteikolia found to be between 148.75 -211 .25 kg/ha with a mean value of 173.33 kg/ha; soils of Chhadasing found to be between 132.50 - 156.25 kg/ha with a mean value of 145.83 kg/ha; soils of Fatkei found to be between 127.50 - 165 .00 kg/ha with a mean value of 148.12 kg/ha; soils of Gahamkhunti found to be between 117.50 -170 .00 kg/ha with a mean value of 156.04 kg/ha; soils of Paikadahikhor found to be between 105.00 -178 .00 kg/ha with a mean value of 147.29 kg/ha;

Available Phosphorus

The available phosphorus status of the corresponding villages is as follows: the available phosphorus content of 14 villages was found to range from 1.96 to 10.29 kg/ha, with a mean of 5.39 kg/ha; The study determined that the soils in Sarakhia ranged from 1.96 to 10.29 kg/ha with an average value of 5.39 kg/ha; those in Jankhira ranged from 6.62 to 28.17 kg/ha with an average value of 16.98 kg/ha; those in Ranja ranged from 4.90 to 9.07 kg/ha with an average value of 6.74 kg/ha; those in Banasinga ranged from 2.45 to 6.62 kg/ha with an average value of 4.61 kg/ha; the soils in Suakhaikateni ranged from 6.37 to 17.15 kg/ha with an average value of 9.47 kg/ha; and the soils in Mahulapunji ranged from 4.17 -7.35 kg/ha with a mean value of 5.39 kg/ha; soils of Bhapur found to be between 1.47 -8.58 kg/ha with a mean value of 4.70 kg/ha; soils of Gangadharprasad found to be between 0.74 -2.70 kg/ha with a mean value of 1.18 kg/ha; soils of Jenasahupatna found to be between 0.49 -4.90 kg/ha with a mean value of 2.98 kg/ha; soils of Kanteikolia found to be between 0.74 -3.19 kg/ha with a mean value of 1.76 kg/ha; soils of Chhadasing found to be between 2.20 -9.80 kg/ha with a mean value of 4.53 kg/ha; soils of Fatkei found to be between 2.94 -5.39 kg/ha with a mean value of 4.20 kg/ha; soils of Gahamkhunti found to be between 2.70 -4.90 kg/ha with a mean value of 3.39 kg/ha; soils of Paikadahikhor found to be between 1.47 -7 .65 kg/ha with a mean value of 3.56kg/ha;

Available Potassium

The available potassium content was found to range from 26.80 to 831.04 kg/ha, with a mean of 216.94 kg/ha. The available potassium status for each village is as follows: Sarakhia's soils were found to range from 72.80 to 493.92 kg/ha, with a mean value of 203.84 kg/ha; Jankhira's soils were found to range from 44.80 to 210.56 kg/ha, with a mean value of 109.76 kg/ha; Ranja's soils were found to range from 201.60 to 577.92 kg/ha, with a mean value of 351.12 kg/ha; Banasinga's soils were found to range from 59.36 to 376.32 kg/ha, with a mean value of 255.92 kg/ha; Suakhaikateni's soils were found to range from 16.80 to 831.04 kg/ha, with a mean value of 351.12 kg/ha; Mahulapunji's soils were found to be 184.80 -318.08 kg/ha with a mean value of 262.64 kg/ha; soils of Bhapur found to be between 84.00 -645.12 kg/ha with a mean value of 333.57 kg/ha; soils of Gangadharprasad found to be between 86.24 -351.68 kg/ha with a mean value of 201.97 kg/ha; soils of Jenasahupatna found to be between 95.20 -180.32 kg/ha with a mean value of 128.98 kg/ha; soils of Kanteikolia found to be between 128.80 -266.56 kg/ha with a mean value of 203.09 kg/ha; soils of Chhadasing found to be between 57.12 -107.52 kg/ha with a mean value of 75.04 kg/ha; soils of Fatkei found to be between 127.68 - 225.12 kg/ha with a mean

value of 186.85 kg/ha; soils of Gahamkhunti found to be between 232.96 -323.68 kg/ha with a mean value of 283.92kg/ha; soils of Paikadahikhor found to be between 48.16 -132 .16 kg/ha with a mean value 83.81 kg/ha;

Available Sulphur

The available sulfur content was found to range from x2.80 to 32.20 mg/kg, with a mean of 12.96 mg/kg. The available sulphur status of the individual villages is as follows: Sarakhia's soils were found to range from 7.70 to 28.00 mg/kg with a mean value of 16.8 mg/kg; Jankhira's soils were found to range from 4.20 to 24.15 mg/kg with a mean value of 11.08 mg/kg; Ranja's soils were found to range from 2.80 to 9.80 mg/kg with a mean value of 5.95 mg/kg; Banasinga's soils were found to range from 8.05 to 32.20 mg/kg with a mean value of 17.61 mg/kg; Suakhaikateni's soils were found to range from 3.15 to 19.25 mg/kg with a mean value of 13.35 mg/kg; Mahulapunji's soils were found to be 12.25 mg/kg -23.90 mg/kg with a mean value of 16.87 mg/kg ; soils of Bhapur found to be between 11.55 mg/kg -38.15 mg/kg with a mean value of 23.04 mg/kg; soils of Gangadharprasad found to be between 12.60 mg/kg -26.60 mg/kg with a mean value of 20.59 mg/kg ; soils of Jenasahupatna found to be between 1.75 mg/kg -14.35 mg/kg with a mean value of 6.94 mg/kg; soils of Kanteikolia found to be between 2.10 mg/kg -5.95 mg/kg with a mean value of 3.96 mg/kg; soils of Chhadasing found to be between 3.15 mg/kg -16.45 mg/kg with a mean value of 10.55 mg/kg; soils of Fatkei found to be between 12.25 mg/kg – 15.75 mg/kg with a mean value of 13.53 mg/kg; soils of Gahamkhunti found to be between 13.30 mg/kg -20.30 mg/kg with a mean value of 15.34 mg/kg; soils of Paikadahikhor found to be between 19.25 mg/kg -25 .90 mg/kg with a mean value 23.04 mg/kg.

Available Boron

The available boron status of the individual villages is as follows: Sarakhia's soils were found to be between 0.18 and 0.50 mg/kg with a mean value of 0.31 mg/kg; Jankhira's soils were found to be between 0.27 and 0.55 mg/kg with a mean value of 0.40 mg/kg; Ranja's soils were found to be between 0.36 and 0.64 mg/kg with a mean value of 0.5 mg/kg; Banasinga's soils were found to be between 0.18 and 0.41 mg/kg with a mean value of 0.30 mg/kg; Suakhaikateni's soils were found to be between 0.23 and 0.46 mg/kg with a mean value of 0.40 mg/kg; and Mahulapunji's soils were found to be between 0.27 and 0.55 mg/kg with a mean value of 16.87 mg/kg ; soils of Bhapur found to be between 0.41mg/kg -0.87 mg/kg with a mean value of 0.64 mg/kg; soils of Gangadharprasad found to be between 0.59 mg/kg -1.19 mg/kg with a mean value of 0.93 mg/kg ; soils of Jenasahupatna found to be between 0.82 mg/kg -1.1 mg/kg with a mean value of 0.93 mg/kg; soils of Kanteikolia found to be between 0.64 mg/kg -1.51 mg/kg with a mean value of 0.92 mg/kg; soils of Chhadasing found to be between 0.23 mg/kg -0.73 mg/kg with a mean value of 0.51 mg/kg; soils of Fatkei found to be between 0.32 mg/kg – 0.64 mg/kg with a mean value of 0.46 mg/kg; soils of Gahamkhunti found to be between 0.41 mg/kg -0.82 mg/kg with a mean value of 0.63 mg/kg; soils of Paikadahikhor found to be between 0.27 mg/kg -0.50 mg/kg with a mean value 0.35 mg/kg.

CONCLUSION

It was found that the surface soils were less acidic. Therefore, the right liming materials need to be used. Organic matter must be applied liberally in order to preserve the quality of the soil. It can be inferred that 25% more phosphatic and nitrogenous fertilizer should be used to produce crops.

It should be applied to the soil's additional sources of boron fertilizers, as it was noted that the soils were lacking in accessible boron.

COMPETING INTERESTS

There are no competing interests, according to the authors.

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TABLE 1 CHEMICAL PROPERTIES OF THE SOIL UNDER STUDY

Name of the Village	**pH (1:2)**		**EC (1:2) (dS m-1)**		**OC (g/kg)**	
	Range	**Mean**	**Range**	**Mean**	**Range**	**Mean**
Sarakhia	5.18 - 5.39	5.17	**0.048**-0.089	0.06	0.409-0.852	0.613
Jankhira	4.66 - 4.92	4.8	0.029-0.205	0.085	0.312 - 0.858	0.497
Ranjha	4.69 - 5.15	4.89	0.198 - 0.237	0.22	0.526 - 0.975	0.731
BanaSinga	5.2 - 6.81	5.93	0.273 - 0.402	0.337	0.148 - 0.799	0.606
Suakhaikateni	5.13 - 5.96	5.46	0.254-0.337	0.289	0.233 - 0.763	0.455
Mahulapunji	5.36 - 5.81	5.58	0.053 - 0.124	0.074	0.649 - 1.004	0.754
Bhapur	5.03 - 6.63	5.72	0.037 - 0.188	0.081	0.433 - 0.827	0.543

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GangadharPrasad	4.99 - 6.26	5.58	0.038 - 0.148	0.075	0.295 - 0.846	0.508
Jenasahupatna	4.6 - 5.07	4.75	0.04 - 0.109	0.057	0.393 - 0.669	0.524
Kanteikolia	4.59 - 5.89	5.31	0.042 - 0.125	0.08	1.004 - 1.634	1.197
Chhadasing	4.98 - 5.38	5.21	0.048 - 0.88	0.062	0.557 - 0.845	0.649
Fatkei	4.68 - 5.3	4.83	0.042 - 0.40	0.11	0.362 - 0.804	0.616
Gahamkhunti	4.9 - 5.38	5.08	0.016 - 0.075	0.051	0.402 - 0.787	0.624
Paikadahikhor	4.75 - 5.77	5.13	0.036 - 0.058	0.045	0.537 - 0.922	0.665

TABLE 2 AVAILABLE NUTRIENT STATUS OF THE SOIL UNDER STUDY

	Available nutrient Status									
Name of the Village	**N**		**P**		**K**		**S**		**B**	
	Kg/ha						**mg/kg**			
	Range	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Range**	**Me**
Sarakhia	150.00 - 365.00	228.08	1.96 - 10.29	5.39	72.80 - 493.92	203.84	7.70 - 28.00	16.8	0.18 - 0.50	0.
Jankhira	152.50 - 207.50	171.45	6.62 - 28.17	16.98	44.80 - 210.56	109.76	4.20 - 24.15	11.08	0.27 - 0.55	
Ranjha	150.00 - 318.75	211.66	4.90 - 9.07	6.74	201.60 - 577.92	351.12	2.80 - 9.80	5.95	0.36 - 0.64	
BanaSinga	146.25 - 275.00	178.12	2.45 - 6.62	4.61	59.36 - 376.32	255.92	8.05 - 32.20	17.61	0.18 - 0.41	
Suakhaikateni	153.75 - 280.00	188.95	6.37 - 17.15	9.47	16.80 - 831.04	356.72	3.15 - 19.25	13.35	0.23 - 0.46	0.
Mahulapunji	142.50 - 183.75	162.08	4.17 - 7.35	5.39	184.80 - 318.08	262.64	12.25 - 23.90	16.87	0.27 - 0.55	
Bhapur	127.50 - 206.25	163.75	1.47 - 8.58	4.73	84.00 - 645.12	333.57	11.55 - 38.15	23.04	0.41 - 0.87	0.
GangadharPrasad	118.75 - 198.75	153.95	0.74 - 2.70	1.18	86.24 - 351.68	201.97	12.60 - 26.60	20.59	0.59 - 1.19	0.
Jenasahupatna	137.50 - 178.75	163.95	0.49 - 4.90	2.98	95.20 - 180.32	128.98	1.75 - 14.35	6.94	0.82 - 1.10	0.

Kanteikolia	148.75 - 211.25	173.33	0.74 - 3.19	1.76	128.80 - 266.56	203.09	2.10 - 5.95	3.96	0.64- 1.51	0.
Chhadasing	132.50 - 156.25	145.83	2.20 - 9.80	4.53	57.12 - 107.52	75.04	3.15 - 16.45	10.55	0.23 - 0.73	0.
Fatkei	127.50 - 165.00	148.12	2.94 - 5.39	4.2	127.68 - 225.12	186.85	12.25 - 15.75	13.53	0.32 - 0.64	0.
Gahamkhunti	117.50 - 170.00	156.04	2.70 - 4.90	3.39	232.96 - 323.68	283.92	13.30 - 20.30	15.34	0.41 - 0.82	0.
Paikadahikhor	105.00 - 178.00	147.29	1.47 - 7.65	3.56	48.16 - 132.16	83.81	19.25 - 25.90	32.04	0.27 - 0.50	0.