International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048
Volume 7, Issue 8, pp 101-105, August-2023
https://doi.org/10.47001/IRJIET/2023.708013

Soil Quality Assessment Using Physico-Chemical Parameters of Industry Area Soil

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***Abstract* - The study was aimed to assess the soil quality index of industry area soil. Seasonal variations in physic-chemical such as pH, EC, TDS, TH, TA, Ca, Mg. Na and K were analyzed. The results indicated that most of the physic-chemical components found within the acceptable limit whereas the value of some components found beyond the permissible limit.**

Keywords: Soil, Physico-Chemical parameters and Seasonal variations.

1. Introduction

The cultivated soils are a limited and predominantly non-renewable resource (Blum 2006). The function of productivity is related to the most usual definition of soil quality as "the capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation". According to this definition, good soil quality is reflected to the soil type and geographic region. Soil quality Indexes (SQIs) comprise of indicators sensitive to regional scale. When management goals focus on sustainability rather than simply crop yield, a soil quality index (SQI) can be also viewed as one component within a nested agro ecosystem sustainability hierarchy. Soil quality depends on a variety of factors, including soil type, management practices and environmental influences such as climate and inherent soil characteristics. Consequently, a holistic dataset of soil health indicators should include physical, chemical and biological properties focused on chemical properties because they were considered as the most important factors that have been reported to be affected by land management while they have a great impact on crop productivity.

2. Materials and Methods

In the present study, soil samples were collected from three sites flowing around the industry located near Attur port at salem, Tamilnadu state. Using standard procedures each location is separated by distance 100m approximately. All the samples were collected in2020. In each and every site, three samples were collected, one at the surface level, second at 15cm depth, third at 30cm depth. Nine samples were selected for the present study. Those all samples were dried at room temperature in open air for two days and stored in plastic vials. The soil samples are ground well into a powder by using an agate mortor. The soil samples were well powdered and remove the moisture content.

Figure 1: Tamilnadu Map

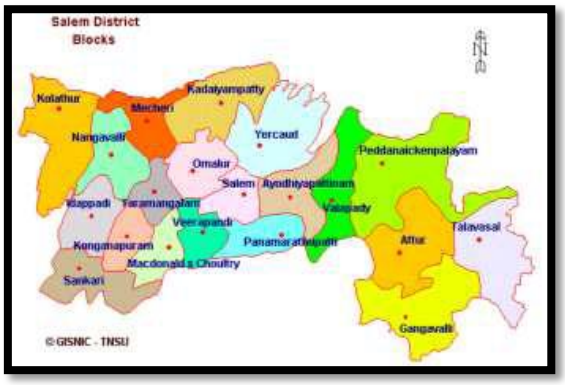

Figure 2: Sample collection area

3. Result and Discussion

3.1 Physico-Chemical analysis of soil samples

The physic-Chemicl analysis of four season soil samples given table 1-4 (Winter, Spring, Summer and Autumn). The summary of the analytical results and the statistical measure such s minimum, maximum, mean and standard deviation is given in table 5.

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Table 1: Physico-chemical analysis of soil samples at winter season (WS_1-WS_{15})

Samples		Parameters															
		pH	EC	TDS	TA	TH	TUR	Ca	Mg	Na	K	Cl	F	SO_4	PO_4	NO_3	CO_3-HCO_3
Site-1	WS_1	8.4	1.26	844	240	126	1.5	20.01	11	40.02	3.03	240	1.5	105	6.4	1.8	150
	WS_2	8.7	1.25	837	224	128	1.0	20.03	11	41.06	3.08	236	1.0	100	6.3	2.1	164
	WS_3	8.5	1.19	797	220	120	1.1	20.00	11	50.04	2.00	230	0.5	60	6.2	1.9	152
Site-2	WS_4	8.6	1.26	844	242	126	1.6	22.04	12	51.07	2.05	262	1.5	120	6.0	2.0	182
	WS_5	8.0	1.27	850	232	134	1.7	22.07	12	52.06	3.03	250	1.0	125	5.8	2.2	204
	WS_6	8.2	1.21	810	250	124	1.8	20.06	11	44.06	4.06	252	0.5	100	4.8	1.8	196
Site-3	WS_7	8.8	1.26	844	232	136	1.2	22.05	12	52.02	3.07	232	1.0	65	5.6	2.0	170
	WS_8	8.1	1.20	804	254	130	1.4	21.06	11	42.05	5.04	250	1.0	55	5.9	1.5	144
	WS_9	8.4	1.27	850	234	120	1.1	21.04	11	44.06	6.01	236	1.5	65	5.5	2.4	192
Site-4	WS_{10}	8.5	1.26	844	236	132	1.0	21.00	11	55.06	5.02	214	1.5	90	6.0	2.5	150
	WS_{11}	8.2	1.20	804	234	134	1.6	21.05	11	40.07	5.06	210	0.5	95	5.7	3.0	148
	WS_{12}	8.7	1.22	817	222	120	1.4	22.03	12	51.05	4.09	236	1.0	50	5.6	1.4	156
Site-5	WS_{13}	8.6	1.20	804	214	130	1.3	22.06	12	41.05	4.02	248	1.5	100	5.4	2.5	162
	WS_{14}	8.1	1.16	777	236	136	1.1	21.08	11	44.06	5.03	232	1.5	200	6.2	2.5	170
	WS_{15}	7.9	1.26	844	232	126	1.8	21.00	11	40.06	5.06	252	1.0	120	6.2	1.7	152
BIS (2012) (IS - 10500)		6.5-8.5	Agreeable	500-2000	200-600	200-600	1-5	75-200	30-100	200-250	12	250-1000	1-1.5	200-400	1-5	Agreeable	200-600

Table 2: Physico-chemical analysis of soil samples at spring season (SPS_1-SPS_{15})

Samples		Parameters															
		pH	EC	TDS	TA	TH	TUR	Ca	Mg	Na	K	Cl	F	SO_4	PO_4	NO_3	CO_3-HCO_3
Site-1	SPS_1	8.6	1.19	797	224	122	1.2	22.08	12	50.04	5.00	258	1.5	140	4.6	2.0	166
	SPS_2	8.7	1.26	844	220	128	1.4	22.06	12	41.08	5.06	230	0.5	145	5.8	2.4	168
	SPS_3	8.4	1.24	830	226	132	1.5	22.01	12	44.07	5.09	234	1.5	180	4.8	2.8	158
Site-2	SPS_4	8.3	1.25	837	224	126	1.4	21.06	12	41.02	4.02	254	1.5	185	5.0	2.9	140
	SPS_5	8.5	1.20	804	222	136	1.6	22.05	12	50.01	4.01	232	1.0	150	4.9	2.5	130
	SPS_6	8.7	1.21	810	214	120	1.0	19.06	10	40.01	3.06	236	0.5	70	5.8	2.0	160
Site-3	SPS_7	8.8	1.18	790	230	128	1.1	20.04	12	40.05	2.05	268	1.0	65	5.9	3.0	152
	SPS_8	8.6	1.23	824	232	134	1.5	22.07	12	39.07	2.01	214	1.0	70	6.2	2.0	162
	SPS_9	8.0	1.05	703	238	122	1.3	20.03	13	50.05	3.03	242	1.5	60	5.0	3.1	142
Site-4	SPS_{10}	8.5	1.26	844	234	132	1.9	20.01	12	51.00	3.09	230	0.5	55	4.8	2.0	176
	SPS_{11}	8.4	1.22	817	232	138	1.7	21.03	11	50.06	3.07	220	1.0	70	4.6	1.5	160
	SPS_{12}	8.6	1.21	810	234	134	1.3	21.06	11	40.07	2.07	246	1.5	75	5.2	1.6	172
Site-5	SPS_{13}	8.7	1.22	817	236	126	1.2	21.08	11	40.04	2.06	272	1.5	160	5.8	2.4	168
	SPS_{14}	8.6	1.21	810	232	128	1.1	20.06	12	51.05	2.00	260	0.5	165	5.9	3.1	144
	SPS_{15}	8.0	1.20	804	230	122	1.0	20.01	12	51.08	2.01	256	1.0	160	4.7	2.4	148
BIS (2012) (IS - 10500)		6.5-8.5	Agreeable	500-2000	200-600	200-600	1-5	75-200	30-100	200-250	12	250-1000	1-1.5	200-400	1-5	Agreeable	200-600

Table 3: Physico-chemical analysis of soil samples at summer season (SUS_1-SUS_{15})

Samples		Parameters															
		pH	EC	TDS	TA	TH	TUR	Ca	Mg	Na	K	Cl	F	SO_4	PO_4	NO_3	CO_3-HCO_3
Site-1	SUS_1	8.5	1.27	850	242	260	1.0	20.00	11	40.01	3.04	242	1.0	80	7.1	1.9	304
	SUS_2	8.6	1.26	844	220	272	1.5	20.03	11	41.02	3.09	238	1.5	75	6.9	1.8	320
	SUS_3	8.4	1.20	804	222	244	1.1	20.02	11	50.05	2.01	232	1.5	95	6.4	1.4	288
Site-2	SUS_4	8.7	1.25	837	248	256	1.7	22.01	12	51.06	2.08	264	1.0	105	5.9	1.7	368
	SUS_5	8.1	1.29	864	236	276	1.6	22.06	12	52.09	3.04	252	1.0	115	4.7	1.8	404
	SUS_6	8.3	1.23	824	252	252	1.8	20.07	12	44.07	4.08	258	1.5	110	6.0	1.5	396
Site-3	SUS_7	8.9	1.27	850	236	272	1.4	22.09	13	52.03	3.08	234	0.5	125	6.2	1.3	344
	SUS_8	8.2	1.20	804	252	264	1.2	21.08	12	43.06	5.06	256	0.5	130	5.8	1.1	284
	SUS_9	8.6	1.24	830	238	248	1.4	21.06	12	44.09	6.07	238	1.5	110	5.5	1.6	376
Site-4	SUS_{10}	8.5	1.28	857	232	268	1.1	21.00	11	55.07	5.03	214	1.5	120	5.7	1.5	296
	SUS_{11}	8.3	1.21	810	232	276	1.5	21.06	12	41.07	5.01	252	1.0	55	6.4	2.0	304
	SUS_{12}	8.6	1.20	804	220	244	1.0	22.03	12	50.06	4.09	238	1.5	80	6.2	1.4	316
Site-5	SUS_{13}	8.9	1.19	797	218	272	1.1	22.07	12	41.08	4.03	250	0.5	90	5.6	1.6	320
	SUS_{14}	8.1	1.27	850	234	276	1.7	21.09	11	44.09	5.04	234	1.5	45	5.3	1.5	344
	SUS_{15}	8.0	1.28	857	236	256	1.9	21.08	12	41.03	5.07	252	0.5	95	5.0	1.7	300
BIS (2012) (IS - 10500)		6.5-8.5	Agreeable	500-2000	200-600	200-600	1-5	75-200	30-100	200-250	12	250-1000	1-1.5	200-400	1-5	Agreeable	200-600

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ISSN (online): 2581-3048

Volume 7, Issue 8, pp 101-105, August-2023

https://doi.org/10.47001/IRJIET/2023.708013

Table 4: Physico-chemical analysis of soil samples at autumn season (AS_1-AS_{15})

Samples		Parameters															
		pH	EC	TDS	TA	TH	TUR	Ca	Mg	Na	K	Cl	F	SO_4	PO_4	NO_3	CO_3-HCO_3
Site-1	AS_1	8.7	1.17	783	230	248	1.0	22.06	12	51.04	5.01	230	1.5	110	5.7	1.9	336
	AS_2	8.8	1.24	830	222	240	1.2	22.08	12	52.06	5.09	258	0.5	120	5.9	1.6	332
	AS_3	8.5	1.25	837	228	268	1.5	22.00	12	53.06	4.08	232	0.5	105	6.0	1.8	312
Site-2	AS_4	8.4	1.26	844	226	244	1.3	21.00	12	52.07	4.02	234	1.0	125	6.2	1.4	284
	AS_5	8.3	1.19	797	224	276	1.7	22.06	12	51.08	4.01	254	1.0	105	6.1	1.1	276
	AS_6	8.5	1.20	804	216	272	1.0	19.07	10	40.02	3.07	232	1.5	70	6.1	1.9	324
Site-3	AS_7	8.9	1.19	797	234	240	1.5	20.01	12	40.06	2.07	264	1.0	85	6.3	2.0	316
	AS_8	8.8	1.24	830	230	256	1.1	22.07	12	39.08	2.06	212	0.5	65	4.8	1.8	288
	AS_9	8.1	1.07	716	222	244	1.2	20.04	12	50.09	2.01	244	0.5	80	5.9	2.2	304
Site-4	AS_{10}	8.6	1.09	730	232	260	1.8	20.00	12	51.00	3.04	232	1.0	105	4.7	2.1	348
	AS_{11}	8.3	1.26	844	238	276	1.7	21.06	12	50.01	3.07	228	1.5	115	4.5	1.7	320
	AS_{12}	8.5	1.23	824	236	272	1.9	21.05	12	40.08	3.09	254	1.5	140	3.0	1.8	356
Site-5	AS_{13}	8.6	1.20	804	220	256	1.4	21.08	12	40.05	2.08	276	0.5	145	4.6	1.4	340
	AS_{14}	8.7	1.23	824	224	252	1.3	20.06	12	51.06	2.05	262	1.5	120	4.2	1.0	300
	AS_{15}	8.2	1.21	810	228	248	1.2	20.07	12	51.07	2.01	260	1.0	125	2.8	1.5	296
BIS (2012) (IS - 10500)		6.5-8.5	Agreeable	500-2000	200-600	200-600	1-5	75-200	30-100	200-250	12	250-1000	1-1.5	200-400	1-5	Agreeable	200-600

Table 5: The mean and standard deviation of soil samples at four seasons

Parameters	Parameters concentration in water samples								F value	P value
	Winter season		Spring season		Summer season		Autumn season			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
pH	8.380	2.808	8.493	0.240	8.447	0.280	8.527	0.234	0.898	0.448^{NS}
Electrical Conductivity	1.231	0.036	1.209	0.050	1.243	0.035	1.202	0.056	2.655	0.057^{NS}
Total dissolved Solids	824.670	23.751	809.400	33.615	832.130	23.213	804.930	38.007	2.658	0.057^{NS}
Total Alkalinity	233.470	10.730	228.530	6.653	234.530	11.122	227.330	6.172	2.372	0.080^{NS}
Total Hardness	128.130	5.630	128.530	5.630	262.400	11.789	256.800	13.111	921.673	0.001^{S}
Turbidity	1.373	0.284	1.347	0.261	1.400	0.302	1.387	0.287	0.096	0.962^{NS}
Calcium	21.105	0.809	20.910	0.997	21.117	0.807	20.914	0.994	0.236	0.871^{NS}
Magnesium	11.330	0.488	11.730	0.704	11.730	0.594	11.870	0.516	2.366	0.081^{NS}
Sodium	45.853	5.373	45.246	5.181	45.992	5.125	47.455	5.614	0.464	0.709^{NS}
Potassium	3.977	1.221	3.175	1.190	3.988	1.221	3.117	1.099	2.499	0.069^{NS}
Chloride	238.670	14.296	243.470	17.394	243.600	12.877	244.800	17.725	0.447	0.720^{NS}
Fluoride	1.100	0.387	1.067	0.417	1.100	0.431	1.100	0.423	0.194	0.900^{NS}
Sulphate	96.670	116.670	37.781	50.131	95.330	24.890	107.670	23.820	1.181	0.325^{NS}
Phosphate	5.840	0.4222	5.267	0.564	5.913	0.657	5.120	1.148	4.277	0.009^{S}
Nitrate	2.087	0.434	2.380	0.524	1.587	0.239	1.680	0.347	12.727	0.001^{S}
Carbon trioxide	166.130	19.160	156.400	13.271	330.930	39.147	315.470	24.136	198.544	0.001^{S}

S - Significant NS – Not Significant

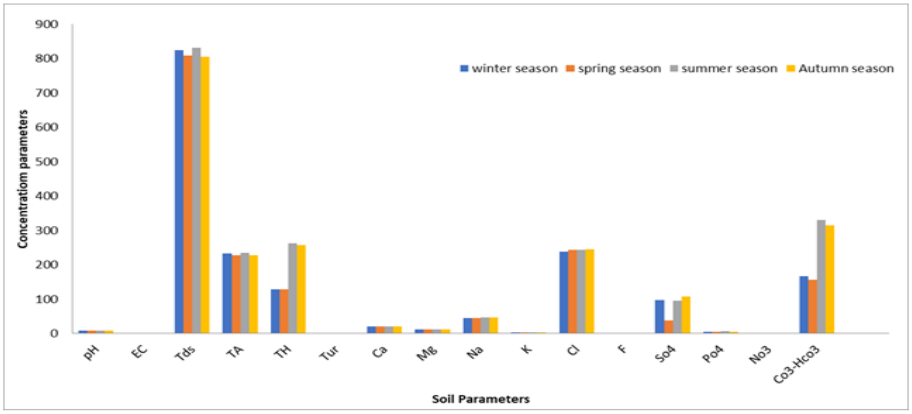


Figure 3: The Relative distribution of parameters in soil samples at four seasons

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

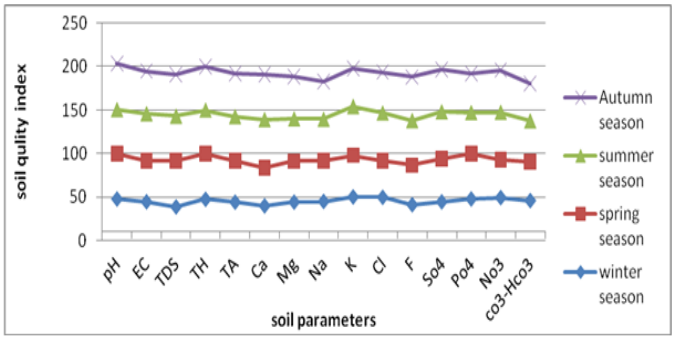
Volume 7, Issue 8, pp 101-105, August-2023

https://doi.org/10.47001/IRJIET/2023.708013

The pH is high in the soils of the autumn and spring seasons and low in that of winter season. The electrical conductivity (EC) is high in summer seasons and moderate in the autumn season. TDS is maximum for soils in the summer season and low in the autumn season. TA values of soils are high in that summer season and low in that spring season. TH values of soils are at maximum in that summer season and at minimum in winter season. The turbidity value of soils is high in that summer season and low in that spring season. Ca values of soils are at the maximum in that winter season and minimum in that spring season. The Mg values of soils are high in that summer season and low in that spring season. The Cl values of the soils are at maximum in that autumn season and minimum in that winter season. The F values of the soils are at high in that winter season and low in that autumn season. The SO_4 values of the soils are high in that winter season and low in that autumn season. The PO_4 values of soils are at high in that summer season and low in that autumn season. The NO_3 values of soils are high in spring and moderate in autumn season.

3.2 Soil quality analysis

S. No	Winter Season	Spring Season	Summer Season	Autumn Season
1	47.78	52.11	50.73	53.34
2	44.60	46.84	54.40	49.41
3	38.90	52.77	51.25	48.42
4	47.36	52.18	50.52	50.21
5	44.21	47.38	50.89	49.90
6	40.06	43.72	55.28	52.22
7	44.23	47.06	48.53	49.01
8	44.96	47.33	47.07	43.83
9	50.06	47.99	56.22	43.90
10	49.63	42.43	54.52	47.40
11	41.32	45.41	51.23	50.57
12	44.58	49.79	53.55	49.18
13	47.81	51.90	47.36	45.10
14	49.31	43.88	54.32	48.74
15	45.96	44.90	46.61	43.34
Minimum	38.90	42.43	46.61	43.34
Maximum	50.06	52.77	56.22	53.34
Average	45.28	47.70	51.49	48.31



Class		No of Sample			
< 45	Good	8	4	0	3
45-50	Moderate	6	7	11	8
> 50	Poor	1	4	4	4

4. Conclusion

The values of soil quality parameters such as all samples collected from different residential areas. Found to be within the recommended limit. Therefore the quality of soil is good is residential areas.

REFERENCES

[1] Amacher, M. C., K. P. O'Neil and C. H. Perry. 2007. Soil Vital Signs: A New Soil Quality Index Research Paper RMRS-RP-65, US Department of Agriculture, Forest Service, Rocky Mountain Research Station 12, Fort Collins, CO, p. 65.

[2] Andrews, S. S. and C. R. Carroll. 2001. Designing a soil quality assessment tool for sustainable agro ecosystem management. Ecol. Appl. 11(6): 1573-1585.

[3] Brejda, J. J. and T. B. Moorman. 2001. Identification and Interpretation of Regional Soil Quality Factors for the Central High Plains of the Midwestern USA. Sustaining the Global Farm, Selected Papers from the 10th International Soil Conservation Organization Meeting, p. 535-540.

[4] Brejda, J. J., T. B. Moorman, D. L. Karlen and T. H. Dao. 2000. Identification of regional soil quality factors and indicators I. Central and Southern high plains. Soil Sci. Soc. Am. J. 64(6): 2115-2124.

[5] Chapman, H. D. and and Brejda, J. J. and T. B. Moorman. 2001. Identification and Interpretation of Regional Soil Quality Factors for the Central High Plains of the Midwestern USA. Sustaining the Global Farm, Selected Papers from the 10th International Soil Conservation Organization Meeting, p. 535-540.

[6] Grisso, R. D., M. M. Alley, D. L. Holshouser and W. E. Thomason. 2005. Precision Farming Tools. Soil

ISSN (online): 2581-3048
Volume 7, Issue 8, pp 101-105, August-2023
https://doi.org/10.47001/IRJIET/2023.708013

Electrical Conductivity. Report Virginia Cooperative Extension.

[7] Hammac, W. A., D. E. Stott, D. L. Karlen and C. A. Cambardella. 2016. Crop, tillage, and landscape effects on near-surface soil quality indices in Indiana. Soil Sci. Soc. Am. J. 80(6): 1638-1652

[8] Soil Science Division Staff. 2017. Soil survey manual. In: Ditzler, C., K. Scheffe and H. C. Monger (Ed.), USDA Handbook 18, Government Printing Office, Washington, D.C.

[9] Stott, D. E., D. L. Karlen, C. A. Cambardella and R. D. Harmel. 2013. A soil quality and metabolic activity assessment after fifty-seven years of agricultural management. Soil Sci. Soc. Am. J. 77(3): 903-913.

[10] Sila and L. Diby. 2016. Assessment of soil health indicators for sustainable production of maize in smallholder farming systems in the highlands of Cameroon. Geoderma. 276: 64-73.

[11] Wakeel, A., M. Gul and M. Sanaullah. 2013. Potassium dynamics in three alluvial soils differing in clay contents. Emirates J. Food Agric. 25: 39-44.

[12] Williams, B. G. and D. Hoey. 1987. The use of electromagnetic induction to detect the spatial variability of the salt and clay contents of soils. Soil Res. 25(1): 21-27.

[13] Yao, R., J. Yang, P. Gao, J. Zhang and W. Jin. 2013. Determining minimum data set for soil quality assessment of typical salt- affected farmland in the coastal reclamation area. Soil Tillage Res. 128: 137-148.

Citation of this Article:

R.Selvaraju, V.Mahalakshmi, "Soil Quality Assessment Using Physico-Chemical Parameters of Industry Area Soil" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 7, Issue 8, pp 101-105, August 2023. Article DOI https://doi.org/10.47001/IRJIET/2023.708013

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