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ASSESSMENT OF SOME SOIL AND WATER QUALITY PARAMETERS IN THE TEA GARDEN BELT OF LAKHIMPUR DISTRICT, ASSAM, INDIA

Environmental Science

Bistirna Saikia* Department of Geography, Gauhati University, Guwahati, Assam, India. *Corresponding Author

Bhabajit Bhuyan Department of Chemistry, North Lakhimpur University, North Lakhimpur, Assam, India.

ABSTRACT

The district of Lakhimpur in Assam flanks the foothill of the Arunachal Pradesh and has lately been subjected to large-scale human interference and its consequential hazards, mainly, river shifting, deforestation, water quality, soil quality and also social problem. This paper is intended to analyze some of the soil and water quality parameeers of tea garden belt in Lakhimpur District, Assam. All the important soil fertility features are found to be not in accordance with the fertility rating chart given by Indian Council of Agricultural Research (ICAR). Main causes which affect vulnerably the health of the public are disproportionate levels of aesthetic water quality parameters and waste tea garden management. The Diarrhea, Malaria, and others water-bone disease are 'Acute Problem' of the tea garden belts in the monsoon period in every year. Poor drinking facility, low literacy rate, lack of awareness and poverty were some of the major reasons which exposed the public to the pesticide poisoning. Thus, in order to improve the environmental conditions in these areas, it is necessary to increase the level of awareness on issues of water quality, soil quality, health, environment, education, family planning etc.

KEYWORDS

Fertility, soil quality, water quality, iron, tea garden, etc.

INTRODUCTION:

Tea is an economically important, high-value plantation crop in India with an old history; many tea estates in Assam are more than 100 years old. Tea production levels in India were about 1000 kg ha^{-1} during the 1950's and these increased up to about 1800 kg ha^{-1} in the mid 1980's, due to the introduction of green-revolution technologies such as external chemical inputs. Nevertheless, no further yield increases have been obtained in average tea yields, despite increasing application of external inputs such as fertilizers and pesticides, and even spraying of plant growth hormones. Reasons for this stabilization are linked to chemical, physical and biological impoverishment of soil fertility under intensive tea production. Integrated development is one of the important dimensions of economic aspects in our country. The district of Lakhimpur in Assam flanks the foothill of the Arunachal Pradesh and has lately been subjected to large-scale human interference and its consequential hazards, mainly, river shifting, deforestation, water quality, soil quality and also social problem. Water and soil resources are at the heart of sustainable development in this district. But water and soil resources are deplete and degrade due to the use of huge amount of chemicals in the study area for better production which contaminates ground water through percolation and rivers and other water bodies through surface run-off. The lost of quality is causing health hazards and death of human which disturbs the whole ecology system of this region. The soil of this district is alluvial in nature and defined as heavy clay. The long-term exploitation of soil under the tea gardens in Assam has led to impoverishment of soil fertility and stabilization of yields. This work is intended to analyze some of the soil and water quality parameters in the Tea garden belt of Lakhimpur District, Assam.

Study Area:

There are eight major tea gardens in the district of Lakhimpur, Assam (Figure I). These gardens are situated near the banks of river Dikrong, Ranganadi and Subansiri respectively. The major tea producer of the district include Ananda Tea Estate, Johing Tea Estate, Dirju Tea Estate, Harmuuty Tea Estate, Koilamari Tea Estate, Dolohat Tea Estate, Kakoi Tea Estate, and Silanibari Tea Estate.

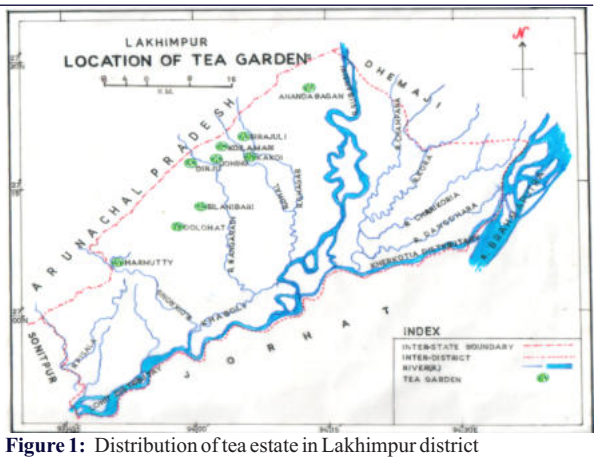

Figure 1: Distribution of tea estate in Lakhimpur district

MATERIALS AND METHODOLOGY:

Thirty two soil samples were collected by adopting Simple Random Sampling Technique by maintaining a distance of about 50 meters between two samples and analyzed for different parameters using standard procedures (Jackson'1973). Separate water samples were selected by random selection and compiled together in plastic bottles to set a representative sample. Temperature, pH and conductivity were determined quickly after sampling. Samples were protected from direct sun light during transportation. Analytical Techniques as described in "AWWA" were adopted for physico-chemical analysis. Twenty water samples were analysed. A multidisciplinary approach has been adopted in collecting informations and Cross-sectional survey is used to gather data on health status of labourers at a single point in time. "The Rapid Appraisal Method" was adopted for the study.

RESULTS AND DISCUSSIONS:

Table: 1 Analytical Data Of Soil With Chemical Rating Chart

Sl. No.	Soil Parameters (Dec' 2004 to May' 2005)	Statistical Values			Rating (ICAR 2005)		
		Average	Max.	Min.	Low	Medium	High
1	Soil pH (Units)	4.3	5.1	3.6	< 6.0 Acidic	6.0-8.5 Normal	>9.0 Alkaline
2	Electrical Conductance (µmhos/cm)	280.7	1042	69		< 1000 Normal	1000-2000 Critical
					*<400 Normal	400-800 Fairly safe	810-1200 Critical
3	Organic Carbon (%)	0.7	1.7	0.2	<0.5	0.5-0.75	>0.75
4	Available phosphorous (Kg/acre)	4.6	16.1	1.3	<25	25-62	>62
					<34* Kg/ha	34-68	>68
5	Available Potassium (Kg/acre)	105.5	304	22	<272	272-690	>690
6	Available Nitrogen (Kg/ha)	362.7	785	92	<280	280-560	>560
7	Iron (mg/L)* (mg/Kg in Soil = mg/L in Solution x 2)	27.0	57.1	12.8	<3.0 (mg/kg)	<5.0	>5.0

8	Manganese* (mg/L)	4.3	12.7	1.4	<2.00 (mg/Kg)	<1.0	>1.0
9	Aluminium (meq/100 gm)	1.8	4.2	0.3	-	-	-
12	Calcium*(meq/100 gm)	1.7	3.0	0.9	<4.5	(Cregan 1980)	
13	Magnesium(meq/100 gm)	0.5	1.5	0.1	-	-	-

* In: Soil Analysis Hand Book of Reference Methods, Soil and Plant Analysis Council, CRC Press, 2004.

Table: 2 Analytical Data Of Water With Rating Chart

Sl. No.	Parameters	Statistical Values			Maximum Permissible Limit		
		Mean	Maximum	Minimum	W.H.O	I. S. I	USEPA
1	pH (Units)	7.37	8.2	6.5	6.5-8.5	6.5-8.5	6.0-8.5
2	Electrical Conductance (mmhos/cm)	0.67	1.03	0.28	-	-	0.3
3	TS (mg/L)	399.5	548	196	-	-	-
4	TSS (mg/L)	14.9	32	8	-	-	5.0
5	TDS (mg/L)	385	550	260	1000	500	500
6	Total Alkalinity (mg/L)	228	400	92	-	-	-
7	Total Hardness (mg/L)	195.5	316	30	250	-	-
8	Ca (mg/L)	48.9	79	7.5	100	75	100
9	Mg (mg/L)	16.3	26.3	2.5	150	30	30
10	Fe (mg/L)	1.37	5.2	0.1	0.3	0.3	0.3
11	Chloride (mg/L)	16.64	28.1	2.4	250	250	250
12	Sulphate (mg/L)	5.23	17.86	0	400	150	250
13	Nitrate (mg/L)	3.11	4.9	1.1	50	10	-

The study area which is situated in the foothill region of Arunachal Pradesh, faces different types of hazards which is natural and also man made like floods, landslides etc. Soils of the tea gardens of Lakhimpur District, Assam generally have properties that make their management somewhat difficult. Within the study area there is a wide variety of soils. Some are highly productive and extremely important for agriculture, while others are thin and infertile with low agricultural potential. The soil pH was towards the very acidic side with a minimum of pH 3.8. Acidity of the soil was the main factor of deficiency of Phosphorous (4.6 Kg/.Acre), Calcium (1.7 meq/100gm), Magnesium (0.5 meq/100gm) and toxicity of metal ions like Aluminium (1.8 meq/100gm) and Manganese (4.3 mgL^{-1}) in the area. The iron (Fe) content was very high (27.0 mgL^{-1}) and this favors corrosion and rusting hazards by increasing the concentration of the insoluble iron oxides (Fe_2O_3) in the soils. The soil texture is clay, most of which have low to modest organic matter contents ranging from (0.2-0.7) % and are, therefore, difficult for plant root penetration. Except for some soil samples that have native leguminous vegetation, nitrogen levels are critically low (92.0 Kg/ha) which may be due to the non uniform distribution of organic carbon in soils and can be attributed to the accumulation of dust and other chemicals like pesticides that are extensively used in these tea gardens. All these important soil fertility features reduce plant root growth and plant health, limiting any potential benefits of chemically-based recovery of soil fertility (e.g., with high fertilizer applications). The removal of fertile top soils as a result of erosion is one cause of land degradation. The other causes are discrepancy of soil nutrients, damage to physical and chemical properties of the soil, and the reduction in soil capacity to retain moisture. The nutrient imbalance and the reduction in moisture retention capacity are associated with the loss of productive potential of soils

The variations in TDS, TS, TSS and in chemical parameters like alkalinity, hardness and iron are observed in the investigated drinking water samples for which environmental awareness among people will help to eradicate them. The iron contents of tube well waters need immediate attention. It was observed that some samples have corrosion and also needed treatment for mild scale coatings.

CONCLUSION:

The life of a worker in tea gardens is characterized by unhealthy and poor living and working conditions, the lack of safe drinking water, the low fertility status of soil, the prevalence of danger from pesticides and other occupational diseases and the lack of safety measures. In order to change this situation, along with awareness building, training and education, income generation activities are extremely important. The socio-economic and environmental condition of the tea plantation workers appears to be unsatisfactory as their level of income is very low and their family size is large. They cannot think about their future due to illiteracy and lack of awareness. Thus, in order to improve the living standards of the workers' families and the environmental hazards prevailing in these areas, it is necessary to increase their level of awareness on issues of water quality, soil quality, health, environment, education, family planning etc.

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