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## Evaluation of soils fertility of Barbhata village under Arang Block of Raipur district (C.G.)

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### Abstract

The present study was conducted during the year 2021 - 2022 with an objectives to find out the major, secondary and micronutrients status of collected soil sample from study area and to prepare soil fertility map of Barbhata village based on the fertility status and to rating of soil test values with available nutrients. One hundred and seventy soil samples were collected from study area using GPS. Available N, P, K, S content in the soil of the study region varied from 151.00 to 253.79, 03.12 to 15.70, 224.00 to 399.39, 5.51-25.91 kg/ha respectively with mean value 201.03, 10.86, 337.68, 14.56 kg/ha respectively. The DTPA extractable iron, manganese, copper, zinc and boron in soils ranged from 30.02 to 59.94, 17.14 to 36.92, 1.06 to 4.38, 0.66 to 1.28, and 0.30 to 1.23 mg/kg respectively with mean value 48.28, 27.47, 2.83, 0.90 and 0.74 mg/kg respectively.

**Keywords:** Ecosystem, physico-chemical, GIS, GPS

### Introduction

Agriculture is the main source of income for the majority population of the Indian subcontinent and acts as a pillar of the Indian economy. It helps to meet our life needs from ancient times to the present day. Most of the income comes from agricultural products. The amount of crops produced mainly depends on the nutrient capacity of the soil, which can be called soil fertility. At present, the population is constantly increasing and, as a result of the intervention, the geo ecosystem will eventually disintegrate over time. Due to increase population, the demand for food is constantly growing, so it is must to understand the physico-chemical properties of the soil and its relationship to plants.

The growth of plants is largely dependent on the fertile soil conditions in which the plants grow. Ensure that the concept of "soil fat" works well in increasing the productivity of agricultural land with a high degree of climate change. Soil research is not as popular in India as it is in other major agricultural countries. Soil research infrastructure needs to be significantly improved. Soil fertility tests provide information on soil nutrient content, which is the basis for crop yield.

Measuring the spatial variability of soil fertility and soil condition has been facilitated with the introduction of the Global Positioning System (GPS) and Geographical Information System (GIS) techniques. Knowledge of remote sensing, GIS, GPS and Arc GIS are the main limitations in creating a map of soil fertility for this particular region.

Experiments are currently underway to assess land reclamation status and map soil fertility in Barbhata Village, Arang Block, and Raipur Chhattisgarh. It is 13 km from the capital of Arang province (Tehsilar office) and 32 km from the capital of the province Raipur. According to the 2009 statistics, Nariyara is the Gram Panchayat of the village of Barbhata. The total geographical area of the village is 289.46 hectares. There are 916 population people. There are about 213 houses in the village of Barbhata. Raipur is the nearest town to all major economic activities from Barbhata which is about 32 km away.

### Material Method

One hundred and seventy representative surface (22.5 cm) soil samples were collected randomly from Barbhata villages along with GPS reading. The samples were air dried in shade then powdered gently with a wooden mallet and sieved through 2 mm sieve then stored in clean polyethylene bags for further analysis. The soil pH was determined by glass

electrod pH meter method described by Piper (1967). 1:2.5 soil water suspensions after stirring 30 minutes, Electrical conductivity was evaluated by Soluble-bridge method as gives by Black (1965) [1] and Organic carbons in samples soils were determined by Walkley and Black Method (1934) [16] rapid titration method as described by Jaction (1967).

Available Nitrogen in soil was extracted by alkaline potassium permagnate method (Subbiah and Asija, 1956) [13], Available phosphorus in the soil is determined by Olsen's method 1954, and Available K was evaluated by the extracting soil ammonium acetate method Turbidimetric Method (Hanway and Heidel, 1952) [18]. Available sulphur in the soil is determined by Calcium chloride ( $\text{CaCl}_2$ ) extractable method (William and Steinberg, 1969) [17]. Available Boron of soil extracted by Hot Water Soluble Boron Method (Berger and Troug, 1939 and the micronutrient were determined by DTPA extracting method (Lindsay and Norvell 1969) [9] in atomic absorption spectrophotometer. Soil fertility maps were prepared by using GPS reading and fertility maps of soils were prepared by employing Arc GIS 10.3 software.

## Results and Discussion

The results of the study area are presented and discussed as follows-

### Soil reaction (pH), EC (Electrical Conductivity) and Organic carbon

The research area's soil response (pH) ranged from 5.56 to 6.90 in a narrow range, with an average of 6.16, and 75.29% of samples were determined to be in the acidic acid and 24.71% of samples were determined to be in the neutral acid pH range. The EC of the soil water suspension ranged from 0.08 to 0.28 dS/m, with 0.15 dS/m being the average. 100

percent of the samples obtained fall within the typical EC (1.0 dS/m) range. The organic carbon content of the soil in the research region ranged from 0.30 to 0.68 percent, with a mean of 0.47 percent. 61.76% of the soil samples obtained fall into the low fertility group, while the remaining 38.24% fall into the medium fertility category.

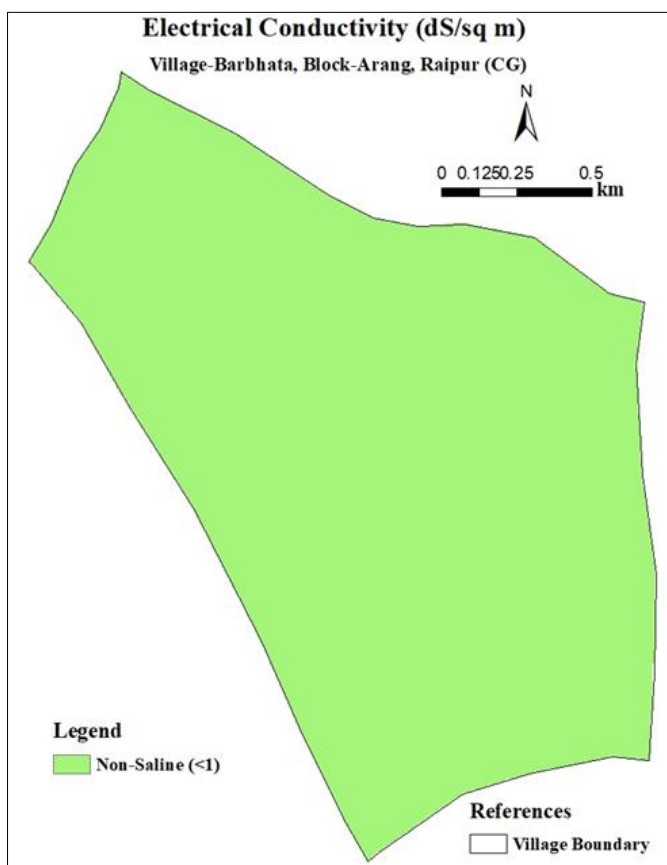
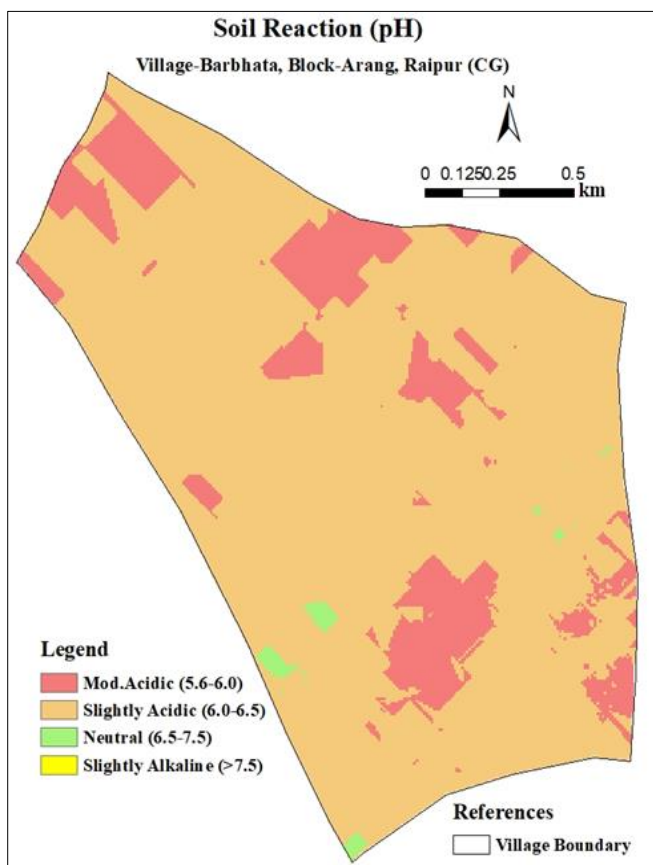
### Available macronutrient

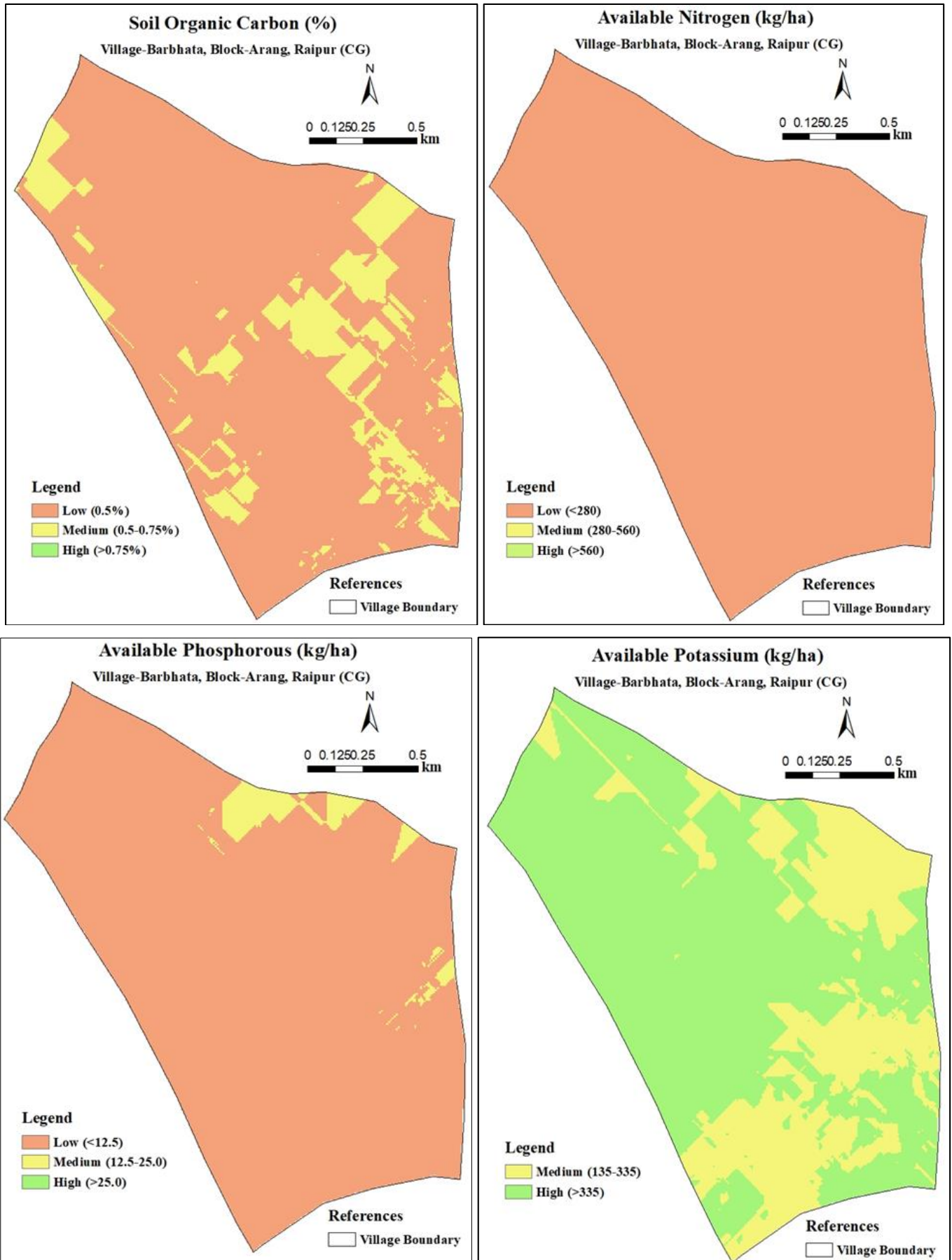
Available N, P, K, S content in the soil of the study region varied from 151.00-253.79, 03.12-15.70, 224.00-399.39, 5.51-25.91 kg/ha respectively with mean value 201.03, 10.86, 337.68, 14.56 kg/ha respectively. All 100.00% samples categorised under low available nitrogen, while 48.23% sample are low phosphorus category and 51.76% sample classified under medium phosphorus status, while 32.94% samples classified under medium potassium category and 67.05% samples classified under high potassium category status while, 97.05% of collected samples under low sulphur rating and 2.94% samples found in medium sulphur rating.

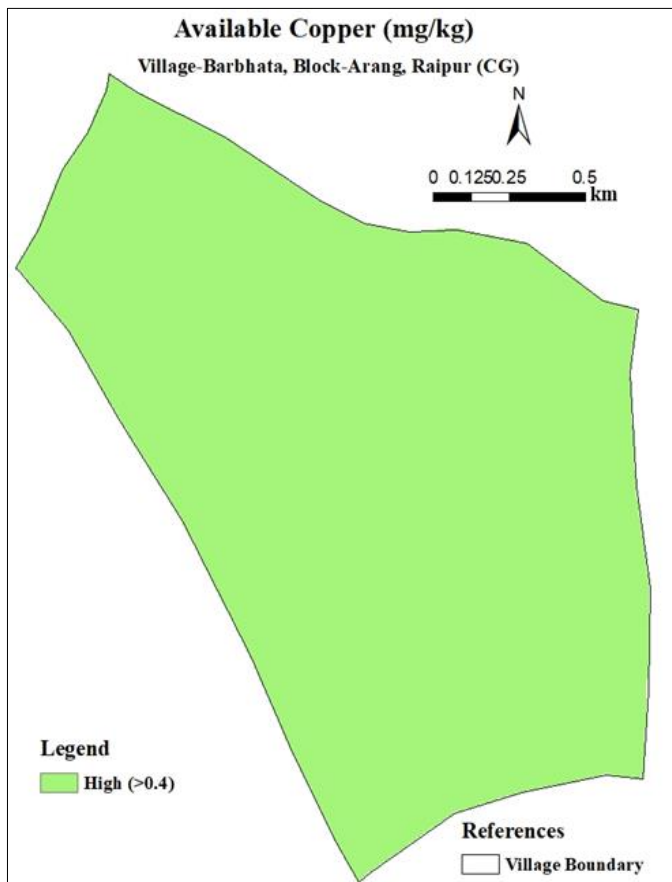
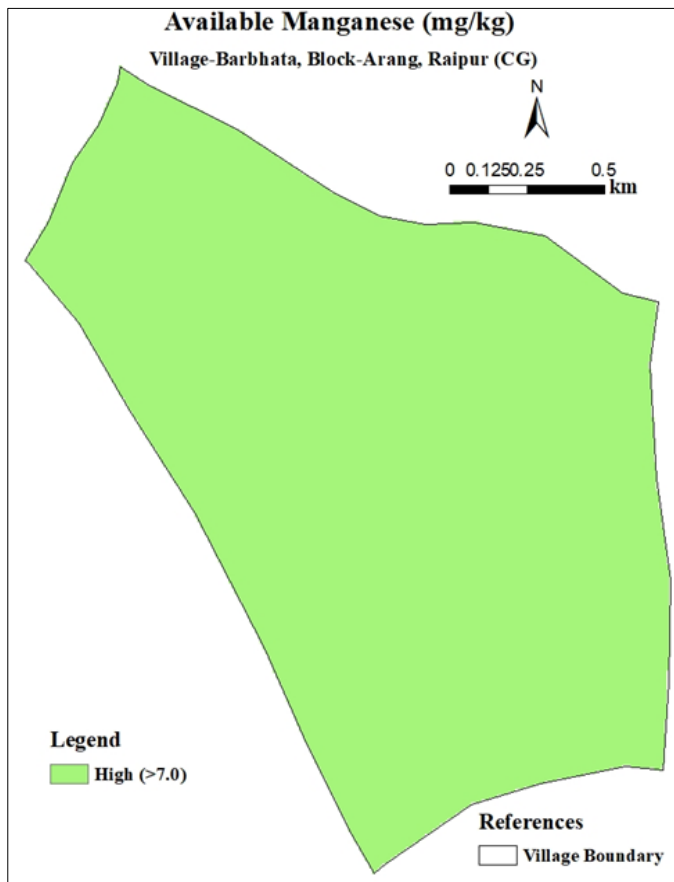
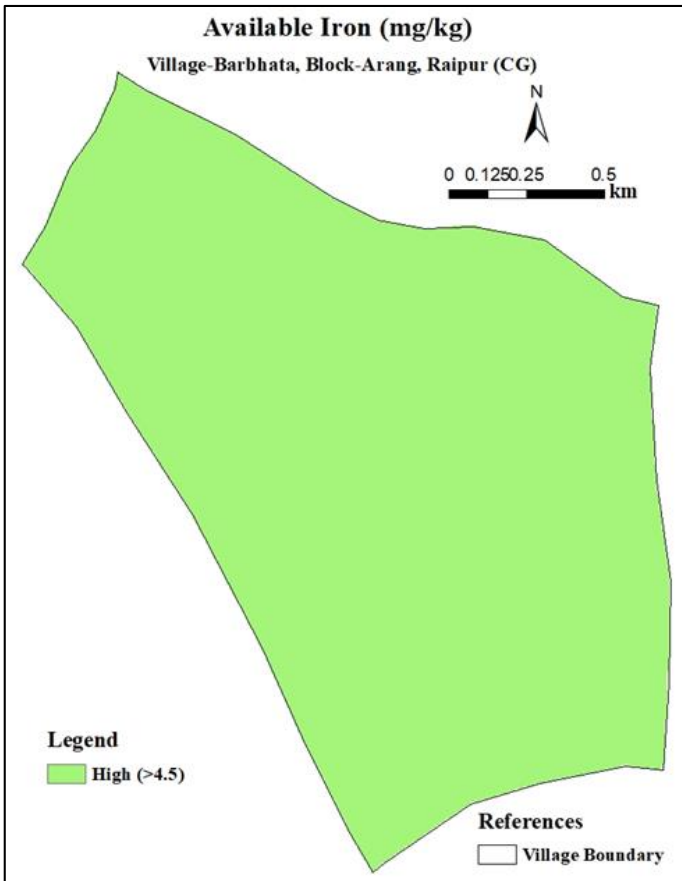
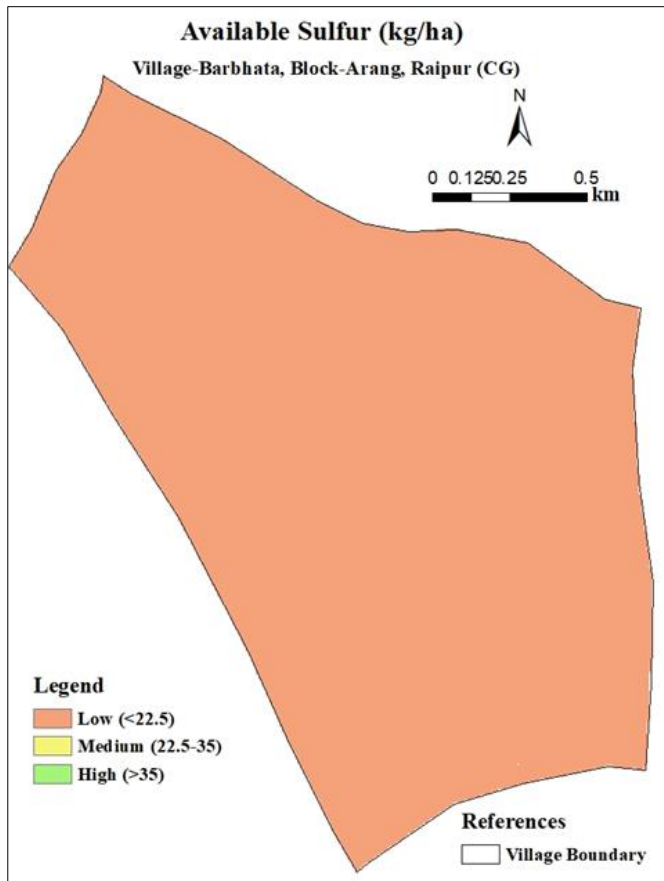
### Available micronutrient

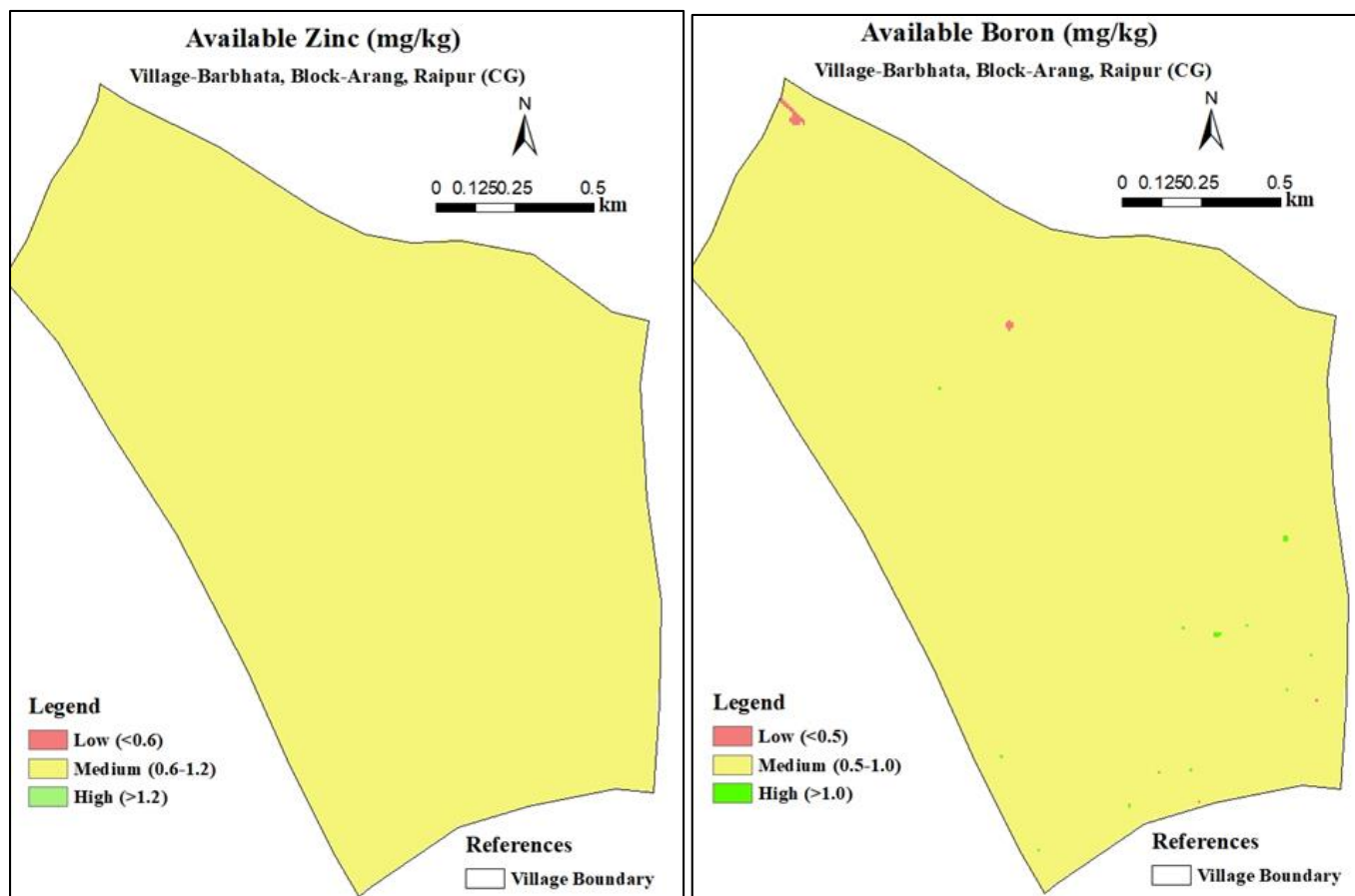
The available micronutrients in the research area were assessed, and it was discovered that Fe, Mn, Cu, Zn and B content in study area ranged from 30.02-59.94, 17.14-36.92, 1.06-4.38, 0.66-1.28, and 0.30-1.23mg/kg respectively with mean value 48.28, 27.47, 2.83, 0.90 and 0.74 mg/kg respectively. All 100% collected samples are high in Fe, Mn, Cu and Zn rating while 170 samples under deficient 4.70% samples under sufficient 95.29% samples under high boron content.

### GPS based soil fertility mapping









**Table 1:** Overall mean, range of soil properties and nutrient status in soil samples of study area

S. No.	Parameters	Range	Average/Mean	Standard deviation
1	pH	5.56-6.90	6.16	0.38
2	EC	0.08-0.28	0.17	0.04
3	Organic carbon	0.30-0.68	0.47	0.11
4	Nitrogen	151.00-253.79	201.03	33.66
5	Phosphorus	03.12-15.70	10.86	3.20
6	Potassium	224.00-399.39	337.68	46.93
7	Sulphur	5.51-25.91	14.56	4.49
8	Iron	30.02-59.94	48.28	7.98
9	Manganese	17.14-36.92	27.47	5.31
10	Copper	1.06-4.38	2.83	0.76
11	Zinc	0.66-1.28	0.90	0.12
12	Boron	0.30-1.23	0.74	0.16

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