ORIGINAL RESEARCH PAPER
Volume-8 | Issue-9 | September - 2019 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

# A SURVEY AND ANALYSIS OF SOIL FOR MICRONUTRIENTS IN PLANT OF VARIOUS AREAS OF NORTH GUJARAT

Science

**Sarika P.Patel** Mehsana Urban Institute of Sciences, Ganpat University, Kherva- 384012 Gujarat, India
**Ami R. Patel*** Vrundavan Science College, Ganeshpura - 382705 Gujarat, India *Corresponding Author
**Henil R. Prajapati** Mehsana Urban Institute of Sciences, Ganpat University, Kherva- 384012 Gujarat, India

## ABSTRACT

To outline a decent inspecting arrangement for soil testing. One needs to consider the fundamental certainties identified with soil development. We are managing complex frameworks, where organic, concoction and physical factors all cooperate. At that point soil and water are interconnected, and cultivating rehearses influence both soil quality. A concise clarification of a portion of these essential components identified with soils will be canvassed in this part.

## KEYWORDS

Soil, Alluvial sandy soils, Nitrogen, Phosphorus

## INTRODUCTION

The beginning common richness of the parent material (Kansas soils, for instance, have a tendency to be normally high in potassium), The subtraction of supplements because of disintegration and harvest use since the land has been worked (by and large for as far back as 100 years or somewhere in the vicinity), and Increments of manure sources, for example, excrements, fertilizers, vegetables, and mineral composts. When outlining a dirt inspecting program, one needs to think about these variables. Knowing the dirt kind (from soil study maps), geography, and field narratives (crops developed and richness sources) will enable you to outline an arrangement to answer particular homestead administration questions. In Mehsana locale agribusiness is reliant on water system – water system is done through channels, save, wells, bore-wells and tube-wells. Because of trenches, stores and bore wells, there has been an expansion in the developed region. Because of the last three rural celebrations, the ranchers have begun embracing logical techniques and legitimate utilization of enhanced seeds and concoction composts is finished. The ranchers have received trickle water system strategy and in this way decreased farming expense and expanded this pay. The horticultural division of the area panchayat embraces program for mindfulness, preparing workshops and instructive sours for ranchers keeping in mind the end goal to give them appropriate direction. Help is given to ranchers amid characteristic catastrophes through yield protection conspire. Mishap protection plot, for ranchers; Also help is given amid surges when the harvests flop because of soil disintegration. The area is arranged between 230.15' N. Scope and 720.46' to 720.26 E longitude Banaskantha area is arranged toward the North-East, Patan locale toward the North-West a piece of Ahmedabad region toward the south and south-east, Surendranagar region toward the South-West and Gandhinagar region toward the East. Add up to topographical zone of the area is 439374 hectares which is isolated into 9 talukas and 599 towns. The primary streams are Khari, Rupen and Pushpawali. The primary control of the general population of this region is horticulture and creature rising. The well known Dudh-Sagar dairy is arranged in this locale. The locale has 375661 hectares and farming area, 43712 hectares of waste land and 30442 hectares of field arrive. Kheralu, Satlasana and Vadnagar talukas have sandy soil and Mehsana, Unjha, Visnagar and Vijapur talukas have great rich land, while Becharaji taluka has less and the dirt is saline and semi-dark. In the Southern piece of Kadi taluka has delicate soil thus paddy is developed there. Subsequently the region has different sorts of soil. Harvests are developed amid all the 3 rarer in the locale for the most part edits likes cotton, wheat, mustard seeds, cumin seeds, fennel seeds, castor, millet and so forth are developed. The Gujarat Agricultural University us dealing with a flavours examine focus at Jaggudan and wheat inquire about focus at Vijapur. In the year 2004-2005 59 hectares were secured by trickle water system framework and 461 hectares in the year 2007-2008. Over the most recent three years, sufficient precipitation has occurred thus the water levels have likewise risen.

### Procedure of soil arrangement

The procedure of soil arrangement has been going ahead since the surface of the earth and factors that figure out what the dirt looks like now incorporate;

A. Parent material (the stone from which it framed),
B. Time (is this a "youthful" soil or an "old" soil),
C. Climate,
D. Topography,
E. Biological forms.

The parent material and shake, will frequently decide the essential science of the dirt. Soils framed from limestone for instance, will have a local, And common pH that is higher than soil shaped from different materials. On the off chance that one takes a gander at a dirt profile, or cross segment. You will discover the parent material and shake in the lower layers. In Kansas, the vast majority of our dirts have been shaped from limestone, shale, or sandstone. A few soils have been framed from a unique soil that was shaped in another area, and afterward moved. Soil saved by water, for instance a stream. It`s called alluvium. Wind stored soils, normal in parts of the immense fields. It`s called loess.

**Table1: Cropping pattern**

| No. | Farming system/enterprise |
|---|---|
| 1 | Groundnut-Potato/tobacco -Pearl millet/Sorghum |
| 2 | Cotton/groundnut – Wheat- sorghum |
| 3 | Castor |
| 4 | Fennel |
| 5 | Pulses/Sesame –Cumin |
| 6 | Pulses-Mustard-Pearl millet/Sorghum |
| 7 | Pulses-Fennel |

**Agro ecological situation in district:**

| Sr. No | Agro-ecological situation | Soil texture | Rainfall (mm) | Altitude | Principal crop | Special Features | Approximate area ('000 ha) | Taluka |
|---|---|---|---|---|---|---|---|---|
| 1 | Alluvial sandy soils with medium rain fall | Sandy and loamy sand | 700-850 | 150-300 | Pearl millet , Sorghum | Pearl millet best cropping system | 134.8 (5.83 %) | Kheralu |
| 2 | Alluvial sandy soils with low rain fall | Sandy loam | 500-700 | 150-300 | Pearl millet , Mustard | Pearl millet best cropping system | 48.8 (2.11%) | Visnagar |
| 3 | Alluvial sandy loam soils with medium rain fall | Sandy loam | 700-850 | 150-300 | Pearl millet , Sorghum | Flat topography with 5 % slope | 377.8 (16.34%) | Vijapur, Major(80%) part of Kadi and Mehsana |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | Medium black ill-drained soils with medium rainfall | Sandy, Clay loam and clay | 700-850 | 25-75 | Rice, Cotton | Area has impeded drainage with saline sub-soil water | 48.6 (2.1 %) | Parts (20 %) of Kadi |

**Soil type and Characteristics**

| S. No | Soil type | Characteristics | Area in ha |
|---|---|---|---|
| 1 | Medium black | • Medium water holding capacity,<br>• Medium permeability | 64500 |
| 2 | Sandy loam | • Retain more water and nutrient than sandy soil and black soil | 259700 |
| 3 | Sandy | • Low water holding capacity<br>• High permeability | 28900 |
| 4 | Saline/salt affected | • Salt accumulâtes on soil surface,<br>• Water logging condition,<br>• Crack formation during summer season<br>• It contain excess neutral soluble salts chiefly chlorides and sulphate of Na, Mg and Ca | 81900 |
| **Total** | | | **435000** |

**This empowers professionals to suggest the tests that are well on the way to uncover valuable data.**

Lab tests frequently check for plant supplements in three classes:

- Major supplements: nitrogen (N), phosphorus (P), and potassium (K)
- Secondary supplements: sulphur, calcium, magnesium
- Minor supplements: press, manganese, copper, zinc, boron, molybdenum, chlorine

## EXPERIMENTAL WORK

### Identification of soil samples

We are collecting soil sample from different village of Mehsana and Patan district, north Gujarat for soil quality analysis. And table for soil sample identification are as under.

| Sample no | Name of Village | Name of Taluka |
|---|---|---|
| 1. | Sujanpur | Sidhpur |
| 2. | Meloj | Sidhpur |
| 3. | Jetpur | Mehsana |
| 4. | Jetalvasna | Mehsana |

### pH Of Soil

**Soil PH ranges as follows**

| Sr. No. | Denomination | pH range |
|---|---|---|
| 1. | Ultra acid | <3.5 |
| 2. | Extremely acidic | 3.5-4.4 |
| 3. | Very strongly acidic | 4.5-5.0 |
| 4. | Strongly acidic | 5.1-5.5 |
| 5. | Moderately acidic | 5.6-6.0 |
| 6. | Slightly acidic | 6.1-6.5 |
| 7. | Neutral | 6.6-7.3 |
| 8. | Slightly alkaline | 7.4-7.8 |
| 9. | Moderately alkaline | 7.9-8.4 |
| 10. | Strongly alkaline | 8.5-9.0 |
| 11. | Very strong alkaline | >9.0 |

**Result table of ph for Soil:**

| Sample no. | Reading | Inference |
|---|---|---|
| Blank | 0 | -- |
| 1. | 8.48 | Moderately alkaline |
| 2. | 8.41 | Moderately alkaline |
| 3. | 8.58 | Moderately alkaline |
| **Mean** | **8.49** | **Moderately alkaline** |
| **Minimum** | **8.41** | **Moderately alkaline** |
| **Maximum** | **8.58** | **Moderately alkaline** |

### CONCLUSION:

Based on the pH values, the soils may be classified as follows: The conclusion should be given as per following criteria.

- If pH of soil test is under 6.5 (Acidic) than it is require liming for recovery.
- If pH of soil test is 6.5 to 7.5 (Normal) than it is Optimum for generally trims.
- If pH of soil test is 7.5 to 8.5 (Alkaline) than it is require utilization of organization. fertilizers.
- If pH of soil test is more noteworthy than 8.5 (Alkali) than it is requires gypsum for enhancement.

### Electrical conductivity of soil

**Result table of EC for soil:**

| Sample no. | Reading of EC (in mmhos/cm) | Inference |
|---|---|---|
| 1. | 0.2054 | Normal |
| 2. | 0.1764 | Normal |
| 3. | 0.3640 | Normal |
| **Mean** | **0.2486** | **Normal** |
| **Minimum** | **0.1764** | **Normal** |
| **Maximum** | **0.3640** | **Normal** |

### CONCLUSION:

Based on the EC values, the soils may be classified as follows:

- If EC of soil test results 0.8 to 1 than it is basic for salt touchy harvests.
- If EC of soil test results 1.6 to 2.5 than it is basic for salt tolerant.
- If EC of soil test is under 2.5 than it is damaging to generally edits.

### Organic carbon

On the basis of organic carbon content, soil can be classified as follows.

| Amount of OC in soil | Parameter |
|---|---|
| <0.5% | Law |
| 0.5% to 0.75% | Medium |
| >0.75% | High |

**RESULT TABLE OF ORGANIC CARBON:**

| Sample no. | Reading (ml) | Result (%) | Inference |
|---|---|---|---|
| **Blank** | 21.9 | --- | --- |
| 1. | 20.1 | 0.90 % | High |
| 2. | 20.9 | 0.15 % | Medium |
| 3. | 16.9 | 0.75 % | Medium |
| **Mean** | **---** | **0.6 %** | **Medium** |
| **Minimum** | **---** | **0.15 %** | **Low** |
| **Maximum** | **---** | **0.90 %** | **High** |

**Observation**

1) Weight of soil W = 1 gm
2) Normally of $K_2Cr_2O_7$ used = 1.0N
3) Volume of $K_2Cr_2O_7$ added in soil sample = 10ml
4) Volume of 0.5N Fe $(NH_4)(SO_4)_2 6H_2O$ used for blank (B) =21.8ml

**Calculation**

$$\% \text{ organic carbon} = \frac{(x-y)\times 0.003\times 100}{2\times W(\text{weight of soil}=10gm)}$$

Or

$$=(X-Y)\times 0.15\,(factor)$$ Where, X= Blank reading and Y= Sample reading

**Calculation of 3 samples is as follow by above equation.**

1. % organic carbon $=(21.8-20.1)\times 0.15=0.90\%$
2. % organic carbon $=(21.8-20.9)\times 0.15=0.15\%$
3. % organic carbon $=(21.9-16.9)\times 0.15=0.75\%$

### CONCLUSION:

The conclusion should be given as following criteria, on the basis of organic carbon content soil is classified as following If the estimation of % OC is under 0.5% than this dirt example is law in OC.

If the estimation of % OC is 0.5-7.5% than this dirt example is medium in OC.

If the estimation of % OC is more prominent than 0.75% than this dirt example is high in OC.

## ESTIMATION OF VARIOUS ELEMENTS OF SOIL

### Nitrogen

**Result Table of Nitrogen:**

| Sample no. | Reading (ml) | Result (kg/ha) | Inference |
|---|---|---|---|
| **Blank** | 1.4 | --- | --- |
| 1. | 3.9 | 78.4 | Low |
| 2. | 2.8 | 43.909 | Low |
| 3. | 2.8 | 43.909 | Low |
| **Mean** | --- | **55.406** | **Low** |
| **Minimum** | --- | **43.909** | **Low** |
| **Maximum** | --- | **78.4** | **Low** |

**Observation**

1. Weight of soil sample = **10 gm**
2. Volume of 0.01N $H_2SO_4$ used for blank (B) = **1.0 ml**
3. Volume of 0.01 N $H_2SO_4$ used for soil sample = **S**

**Calculation**

1000 ml 1.0 N $H_2SO_4$ = 14 g N
1000 ml 0.1 N $H_2SO_4$ = 1.4 g N
1.0 ml 0.1 N $H_2SO_4$ = 0.0014 g N

$$\text{N (In kg/ha)} = \frac{(S-B)\times 0.00014\times 100\times 1000\times 2.24}{\textit{Weight of soil sample (10 gm)}}$$

Where, B = Blank reading
S = Sample reading
Or
$$\text{N (In kg/ ha)} = \text{reading (R)} \times 31.36\ (\textit{Factor})$$

**Calculation of 3 soil samples is as follow by above equation.**

1) N (In kg/ ha) = (3.9 − 1.4) × 31.36 = 78.4
2) N (In kg/ ha) = (2.8 − 1.4) × 31.36 = 43.904
3) N (In kg/ ha) = (2.8 − 1.4) × 31.36 = 43.904

**CONCLUSION:**

In light of the pH esteems, the dirts might be named takes after: in view of the accessible N, soil being delegated taken after:

- If the estimation of open nitrogen in soil results under 250 kg/ha, than the measurement of nitrogen in soil considered less.
- If the estimation of open nitrogen in soil results 250 to 500 kg/ha, than the measurement of nitrogen in soil considered medium.
- If the estimation of open nitrogen in soil is more noticeable than 500 kg/ha, than the measurement of nitrogen in soil considered high.

### Phosphorus

| Sample no. | Reading (O.D) | Result (kg/ha) | Inference |
|---|---|---|---|
| 1. | 0.028 | 28.98 | High |
| 2. | 0.020 | 17.94 | Low |
| 3. | 0.030 | 31.74 | Medium |
| **Mean** | --- | **43.47** | **Medium** |
| **Minimum** | --- | **20.70** | **Low** |
| **Maximum** | --- | **71.76** | **High** |

**Calculation**

$$\text{P}_2\text{O}_5\text{(In kg/ha)} = \textit{ABSreading}\ (R) \times 1380$$

**Calculation of 3 soil samples is as follow by above equation.**

1) $P_2O_5$ (In kg/ha) = (0.028 − 0.007) × 1380 = 28.98
2) $P_2O_5$ (In kg/ha) = (0.020 − 0.007) × 1380 = 17.94
3) $P_2O_5$ (In kg/ha) = (0.039 − 0.004) × 1380 = 48.30
4) $P_2O_5$ (In kg/ha) = (0.030 − 0.004) × 1380 = 31.74

**CONCLUSION:**

In light of the pH esteems, the dirts might be named takes after: in light of the measure of accessible P2O5, soil being delegated takes after:

- If the estimation of available phosphorus in soil under 28 kg/ha than the measure of nitrogen in soil is less.
- If the estimation of available phosphorus in soil is 28 to 56 kg/ha than the measure of nitrogen in soil is medium.
- If the estimation of available phosphorus in soil is more noticeable than 546 kg/ha than the measure of nitrogen in soil is high.

**Potash :** Result Table of Potash:

| Sample no. | Reading (PPM) | Result (kg/ha) | Inference |
|---|---|---|---|
| 1. | 13 | 174.72 | High |
| 2. | 18 | 241.91 | High |
| 3. | 21 | 282.24 | High |
| **Mean** | --- | **232.9567** | **High** |
| **Minimum** | --- | **174.72** | **High** |
| **Maximum** | --- | **282.24** | **High** |

**Calculation**

$$\text{K2O (In kg/ha)} = \textit{ReadingOFflamephotomet}(R) \times 13.44(\textit{factor})$$

Calculation of 3 soil samples is as follow by above equation.

1) $K_2O$ (In kg/ha) = 13 × 13.44 = 174.72
2) $K_2O$ (In kg/ha) = 18 × 13.44 = 241.91
3) $K_2O$ (in kg/ha) = 21 × 13.44 = 282.24

**CONCLUSION:**

Based on the pH values, the soils may be classified as follows based on the amount of available potash, soil being classified as follows:

- If the estimation of accessible potash in soil is under 140 kg K2O/ha than the amount of potash in soil is low.
- If the estimation of an accessible potash in soil is 140 to 280 kg K2O/ha than the amount of potash in soil is medium.
- If the estimation of accessible potash in soil is more noteworthy than 280 kg K2O/ha than the amount of potash in soil is high.

## ESTIMATION OF MICRONUTRIENTS

### Micronutrients

**Result Table of Iron:**

| Sample no. | Reading (PPM) | Result (PPM) | Inference |
|---|---|---|---|
| 1. | 1.88 | 3.76 | Medium |
| 2. | 2.71 | 5.42 | Medium |
| 3. | 3.15 | 6.30 | Medium |
| **Mean** | --- | **5.16** | **Medium** |
| **Minimum** | --- | **3.76** | **Medium** |
| **Maximum** | --- | **6.60** | **Medium** |

**CONCLUSION:**

The conclusion should be given as per following criteria, based on the amount of available iron, soil being classified as follow:

- If the estimation of accessible Iron in soil is under 5 mg Fe/kg than the amount of iron in soil is Low.
- If the estimation of accessible Iron in soil is 5 to 10 mg Fe/kg than the amount of iron in soil is Medium.
- If the estimation of accessible Iron in soil is more prominent than 10 mg Fe/kg than the amount of iron in soil is high.

**Manganese:s** Result Table Of Manganese:

| Sample no. | Reading (PPM) | Result (PPM) | Inference |
|---|---|---|---|
| 1. | 4.47 | 8.94 | High |
| 2. | 5.01 | 10.02 | High |
| 3. | 3.34 | 6.68 | High |
| **Mean** | --- | **8.547** | **High** |
| **Minimum** | --- | **6.68** | **High** |
| **Maximum** | --- | **10.02** | **High** |

**CONCLUSION:**

The conclusion ought to be given as per following criteria, in light of the measure of accessible manganese, soil being delegated takes after:

- In the event that the estimation of available manganese in soil is under 5 mg Mn per kg than the measure of manganese in soil is Low.
- In the event that the estimation of available manganese in soil is 5 to 10 mg Mn per kg than the measure of manganese in soil is Medium.
- If the estimation of open manganese in soil is more essential than 10 mg Mn per kg than the measure of manganese in soil is high.

### Zinc

**Result Table of Zinc:**

| Sample no. | Reading (PPM) | Result (PPM) | Inference |
|---|---|---|---|
| 1. | 0.01 | 0.02 | High |
| 2. | 0.05 | 1 | High |
| 3. | 0.01 | 0.02 | High |
| **Mean** | --- | **0.52** | **High** |
| **Minimum** | --- | **0.02** | **High** |
| **Maximum** | --- | **1** | **High** |

**CONCLUSION:**

The conclusion ought to be given as following criteria, in view of the measure of accessible zinc, soil being named takes after:

- If the estimation of available zinc in soil is under 0.5 mg Zn/kg than the measure of zinc in soil is Low.
- On the off chance that the estimation of open zinc in soil is 0.5 to 1.0 mg Zn/kg than the measure of zinc in soil is Medium.
- On the off chance that the estimation of open zinc in soil is more imperative than 1.0 mg Zn/kg than the measure of zinc in soil is high.

**Copper**

Result Table of Copper:

| Sample no. | Reading (PPM) | Result (PPM) | Inference |
|---|---|---|---|
| 1. | 0.08 | 0.16 | Medium |
| 2. | 0.49 | 0.98 | High |
| 3. | 0.29 | 0.58 | High |
| **Mean** | **---** | **0.573** | **High** |
| **Minimum** | **---** | **0.16** | **Medium** |
| **Maximum** | **---** | **0.98** | **High** |

**CONCLUSION:**

The conclusion ought to be given as following criteria, in light of the measure of accessible copper, soil being named takes after:

- If the estimation of open copper in soil is under 0.2 mg Cu/kg than the measure of zinc in soil is Low.
- If the estimation of open copper in soil is 0.2 to 0.4 mg Cu/kg than the measure of zinc in soil is Medium.
- If the estimation of open copper in soil is more noticeable than 0.4 mg Cu/kg than the measure of zinc in soil is high.

**Conclusion for pH, EC and OC**

| Sample no. | pH | EC | OC |
|---|---|---|---|
| 1. | 8.48 | 0.2054 | 0.90 % |
| 2. | 8.41 | 0.1764 | 0.15 % |
| 3. | 8.58 | 0.3640 | 0.75 % |
| **Mean** | **8.49** | **0.2486** | **0.6 %** |
| **Minimum** | **8.41** | **0.1764** | **0.15 %** |
| **Maximum** | **8.58** | **0.3640** | **0.90 %** |

From the above data we can say that the average soil of Mehsana and Patan district pH is slightly alkaline, EC is Normal, and organic carbon is low.

**CONCLUSION**

**Conclusion for nitrogen, phosphorus and potash**

| Sample no. | Nitrogen | Phosphorus | Potash |
|---|---|---|---|
| 1. | 78.4 | 28.98 | 174.72 |
| 2. | 43.909 | 17.94 | 241.91 |
| 3. | 43.909 | 31.74 | 282.24 |
| **Mean** | **55.406** | **43.47** | **232.9567** |
| **Minimum** | **43.909** | **20.70** | **174.72** |
| **Maximum** | **78.4** | **71.76** | **282.24** |

For the data we can say that the soil of Mehsana and Patan district of nitrogen present in low amount, potash is high amount and phosphorus is present in medium amount**.**

**Conclusion for micronutrients**

| Sample no. | Fe | Mn | Zn | Cu |
|---|---|---|---|---|
| 1. | 3.76 | 8.94 | 0.02 | 0.16 |
| 2. | 5.42 | 10.02 | 1 | 0.98 |
| 3. | 6.30 | 6.68 | 0.02 | 0.58 |
| 4. | 5.16 | 8.547 | 0.52 | 0.573 |
| **Mean** | **3.76** | **6.68** | **0.02** | **0.16** |
| **Minimum** | **6.60** | **10.02** | **1** | **0.98** |
| **Maximum** | 3.76 | 8.94 | 0.02 | 0.16 |

From the data we can say that the soil of Mehsana and Patan district contain high amount of zinc and copper, medium amount of manganese and iron.