Evaluation Of Soil Nutrient Index and Physico-Chemical Parameters of Soil From Different Blocks Of Kurnool District,
Andhra Pradesh, India

ABSTRACT

The evaluation of Physico-chemical properties of soil of different blocks of Kurnool district was carried out in 2021-2022. The main objectives of this study is to evaluate the Physico-chemical properties of soil and to analyze the soil nutrient index of soil. For evaluation 9 sampling sites were selected with different depths of 0-15cm, 15-30cm and 30-45cm. The research findings revealed that the Bulk density ranged from 1.33 to 1.52 (Mg m^{-3}). The Particle density ranged from 2.36 to 2.66 (Mg m^{-3}). The Pore space ranged from 46.66 to 59.09 (%). The Water Holding Capacity ranged from 49.52 to 60.22 (%). The Soil pH ranged from 7.66 to 8.44. The Electrical Conductivity ranged from 0.15 to 0.57 (dS m^{-1}). The Soil Organic Carbon ranged from 0.35 to 0.66 (%). The Available Nitrogen ranged from 94.30 to 218.58 (kg ha^{-1}). The Available Phosphorous ranged from 12.7 to 52.6 (kg ha^{-1}). The Available Potassium ranged from 135.42 to 402.4 (kg ha^{-1}). The Exchangeable Calcium ranged from 13.66 to 34.62 (cmol (p^{+}) kg^{-1}). The Exchangeable Magnesium ranged from 4.21 to 8.35 (cmol (p^{+}) kg^{-1}). The Available Zinc ranged from 0.16 to 0.57 (ppm). The Available Copper ranged from 0.18 to 0.77 (ppm). The Available Iron ranged from 3.22 to 6.89 (ppm). Based on the outcomes soil is good for cultivation of different crops and this data will aid farmers in application of nutrients to soil and also in maintaining good soil health.

Keywords: Physico-chemical properties, Soil nutrient index, Kurnool district, nutrients etc.

INTRODUCTION:

Soil is the vital natural resource for the survival of life on the earth and its assessment is the prerequisite for the determination of productivity of soil and the sustainability of the ecosystem. The biggest challenge to the mankind today, is to provide the basic necessities for living, from the ever shrinking and non-renewable soil resource. Precise scientific information on characteristics, potentials, limitations and management of different soils are indispensable for planned development of soil resources to maintain their productivity and to meet the demands for the future (Sathish *et al.,* 2018). Soil testing makes complete nutrient control a possibility; fertilizer experiments are being patterned to determine economically optimum rates of nutrients application high yields with low production costs per unit area must in modern farming. Farmers of today are different in the failure is more certain and sooner unless they are obtain-

ing reasonably high yields, improved drainage, many improved cultural practices, better varieties, and control of insects and disease have helped to set the stage for high yields. As a result, the demand on the soil has gradually increased. Soil testing lets farmers know how much and what kind of fertilizer they must apply to be sure of returns from their investments in other improved practices (Joshi *et al.,* 2013). Soil fertility evaluation of an area is an important aspect in context of sustainable agriculture production. The macro nutrients govern the fertility of soils and control the growth and yields of crops. In developing countries like India, where land-person ratio is rapidly narrowing, the only means of meeting the needs of agricultural produce is through increased productivity without detriment to environment and sustainability. Soil characterization in relation to evaluation of fertility status of soils of an area is an important context of sustainable agriculture production. Nitrogen, phosphorus, potassium, sulphur, calcium and magnesium are important soil nutrients which control the fertility and yield of the crops. **(**Ramana *et al*., 2015). Soil and water are the greatest natural resources gifted to mankind. Our country basically depends upon agriculture; thus, it becomes more so important study, analyse and effectively manage "soil". Soil being the basic media for the plants to stand and grow and water becomes the lifeline to the plants. In view of this, a greater importance has been attached for management of soil and water by way on analysis, there by contributing increased productivity in modern agriculture (Reddy, 2015).

Andhra Pradesh is a state in the south-eastern coastal region of India. It is the seventh-largest state by area covering an area of 162,975 km^2. 60 percent of the population is engaged in agriculture and related activities. Rice is the major food crop and staple food of the state. It is an exporter of many agricultural products and is also known as "Rice Bowl of India".

The proposed work is to be undertaken for the analyses of the soil for its physical state, its constituents and the nutrients, present in the soil. Different Physico-chemical characteristics of different blocks of Kurnool district region of Andhra Pradesh State has been determined by using standard methods.

MATERIALS AND METHODS

Kurnool is a city in the state of Andhra Pradesh, India. It formerly served as the capital of Andhra State (1953–1956). The city is often referred to as "The Gateway of Rayalaseema".

Kurnool is located at 15.8333°N 78.05°E. It has an average elevation of 273 metres (898 feet). Kurnool lies on the banks of the Tungabhadra River. The Hundri and Neeva rivers also flow through the city. Major soils in Kurnool District are black soils comprising 5,84,000 ha (61.4%) and red soils comprising 317000 ha (33.3%) and other soils comprising 51000 ha. (5.3%). The proposed research includes 3 blocks of Kurnool district i.e., Kallur block, Kurnool block, Orvakal block. Methods used for analysis of Physico-chemical parameters are given in table 1.

Soil Nutrient Index

In order to compare the levels of soil fertility of one area with those of another it was necessary to obtain a single value for each nutrient. Nutrient index (N.I) value is a measure of nutrient supplying capacity of soil to plants (Singh *et al.,* 2016).This index is used to evaluate the fertility status of soils based on the samples in each of the three classes, i.e., low, medium and high. The Nutrient index values of Organic carbon, Nitrogen, Phosphorus, Potassium, Sulphur, Zinc, Iron, Manganese and Copper are shown in the fig: 1. The nutrient index is calculated by using the formula as given by (Muhr *et al.,* 1963).

$$\text{Nutrient Index (N.I.)} = (N_L \times 1 + N_M \times 2 + N_H \times 3) / N_T$$

where

N_L: Indicates number of samples falling in low class of nutrient status

N_M: Indicates number of samples falling in medium class of nutrient status

N_H: Indicates number of samples falling in high class of nutrient status

N_T: Indicates total number of samples analysed for a given area

The nutrient index value of less than 1.5 is rated as low, 1.5 to 2.5 is rated as medium and more than 2.5 is rated as high fertility status as suggested by (Ramamurthy and Bajaj, 1969).

RESULTS AND DISCUSSION-

Physical properties-

The Soil colour in dry condition varies from dark brown to very dark greyish brown and the colour in wet condition varies from dark greyish brown to very dark greyish brown. Dark colour of the soil is due to the presence of organic matter. Similar results were reported by (Vilakar *et al.,* 2021). The soil texture was dominantly sandy clay loam in every site. Similar results were reported by (Sivaprasad *et al.,* 2015). The Bulk density ranged from 1.33 to 1.52 (Mg m^{-3}). Both the solid portion and the pore spaces are included in the bulk density. The maximum value found is 1.52 Mg m^{-3} in singavaram at 30-45cm depth and the minimum value found is 1.33 in peddatekur at 0-15cm depth. The bulk density increases with the increase in soil depth because of lower organic carbon and higher compactness of soils. Similar results were reported by (Satish *et al.,* 2015). The Particle density ranged from 2.36 to 2.66 (Mg m^{-3}). Particle density refers to the density of the solid portions of the soil, not the pore space. The mineral makeup of soil particles influences particle density. The maximum value found is 2.66 Mg m^{-3} in chinnatekur at 30-45cm depth which indicates that the soil has comparatively lower organic matter and the minimum value found is 2.36 Mg m^{-3} in nidzur at 0-15cm depth which indicates the presence of high organic matter. Similar results were reported by (Geetha Sireesha and Naidu, 2020). The Pore space ranged from 46.66 to 59.09 (%). The maximum value found is 59.09% in thadakanapalli at 0-15cm depth and the minimum value found is 46.66% in singavaram at 30-45cm depth. Pore space decreases with increase in depth due to increase in compaction of soil in the sub surface. Similar results were reported by **(**Ramana *et al*., 2015). The Water Holding Capacity ranges from 49.52 to 60.22 (%). The maximum value found is 60.22% in loddipalle at 0-15cm and the minimum value found is 49.52% in singavaram at 30-45cm depth. WHC value decreases with the increasing depth because of soil compaction and reduction in pore space. Similar results were reported by (Balaji *et al*., 2019).

Chemical properties-

The Soil pH ranged from 7.66 to 8.44. The maximum value found is 8.44 in nannur at 30-45cm and the minimum value found is 7.66 in munagalapadu at 0-15cm thereby indicating soils are alkaline. 100% of samples are alkaline in nature. pH value increases with the increasing depth because the upper horizons receive maximum leaching by rainfall and by dissolved carbonic acids and presence of high amount of exchangeable sodium ions. Similar results were reported by (Reddy *et al.,* 2015). The Electrical Conductivity ranged from 0.15 to 0.57 (dS m^{-1}). The maximum value found is 0.57 (dS m^{-1}) in nidzur at 30-45cm depth and the minimum value found is 0.15 (dS m^{-1}) in peddatekur at 0-15cm depth. Similar results were

reported by (Sivaprasad *et al.,* 2015). The Soil Organic Carbon ranged from 0.35 to 0.66 (%). The maximum value found is 0.66 % in thadakanapalli at 0-15cm and the minimum value found is 0.35 % in nidzur at 30-45cm depth. The organic carbon decreases with increasing depth due to the fact that surface soil contains undecomposed and partial decomposed organic matter while subsoil contains decomposed organic matter. Similar results were reported by (Sivaprasad *et al.,* 2015). The Available Nitrogen ranged from 94.30 to 218.58 (kg ha^{-1}). The maximum value found is 218.58 kg ha^{-1} in munagalapadu at 0-15cm depth and the minimum value found is 94.30 kg ha^{-1} in nidzur at 30-45cm depth. The available nitrogen decreases with the increasing depth due to the fact it is positively correlated with organic matter content which decreases with depth and also due to higher pH at the depth. Similar results were reported by (Supriya *et al.,* 2019). The Available Phosphorous ranged from 12.75 to 52.6 (kg ha^{-1}). The maximum value found is 52.6 kg ha^{-1} in munagalapadu at 0-15cm depth and the minimum value found is 12.75 kg ha^{-1} in peddatekur at 30-45cm depth. The available phosphorous decreases with the increasing depth. Higher level of available phosphorous in surface soil could be attribute of favourable soil pH and organic matter content. Similar results were reported by (Supriya *et al.,* 2019). The Available Potassium ranged from 135.42 to 402.4 (kg ha^{-1}). The maximum value is 402.4 kg ha^{-1} in thadakanapalli at 0-15cm depth and the minimum value is 135.42 kg ha^{-1} in singavaram at 30-45cm depth. The available potassium decreases with increasing depth. The high content of available potassium on surface soil may be due to the release of liable K from organic residues and application of potash fertilizers. Similar results were reported by (Supriya *et al.,* 2019). The Exchangeable Calcium ranged from 13.66 to 34.62 (cmol (p^+) kg^{-1}). The maximum value found is 34.62 cmol (p^+) kg^{-1} in nannur at 0-15cm depth and the minimum value found is 13.66 cmol (p^+) kg^{-1} in singavaram at 30-45cm depth. The exchangeable calcium decreases with the increasing depth due to the attribute of high pH towards the depth. Similar results were reported by (Geetha Sireesha and Naidu, 2020). The Exchangeable Magnesium ranged from 4.21 to 8.35 (cmol (p^+) kg^{-1}). The maximum value found is 8.35 cmol (p^+) kg^{-1} in uyyalawada at 0-15cm depth and the minimum value found is 1.04 (cmol (p^+) kg^{-1}) in nannur at 30-45cm depth. The exchangeable magnesium decreases with the increasing depth due to the attribute of high pH towards the depth. Similar results were reported by (Geetha Sireesha and Naidu, 2020). The Available Zinc ranged from 0.16 to 0.57 (ppm). The maximum value found is 0.57 ppm in thadakanapalli at 0-15cm depth and the minimum value found is 0.16 ppm in uyyalawada at 30-45cm depth. The available zinc decreases with the increasing depth might be due to altitude may thus attributed to the accumulation of high organic matter, the major source of Zn in surface

soils. Similar results were reported by (Ismail and Umamahesh, 2018). The Available Copper ranged from 0.18 to 0.77 (ppm). The maximum value found is 0.77 ppm in thadakanapalli at 0-15cm depth and the minimum value found is 0.18 ppm in munagalapadu at 30-45cm depth. The available copper decreases with increasing depth and this significant decrease in copper content with depth may be attributed to increase in pH which makes it less soluble after oxidation thereby reducing its availability. Similar results were reported by (Reddy *et al.*, 2015). The Available Iron ranged from 3.22 to 6.89 (ppm). The maximum value found is 6.89 ppm in nannur at 0-15cm depth and the minimum value found is 3.22 ppm in nidzur at 30-45cm depth. The available iron decreases with the increasing depth. The greater amount of value in surface soil has possible due to the accumulation of water and organic material. Similar results were reported by (Supriya *et al.*, 2019).

CONCLUSION

It is concluded from the trial that the soils of three blocks of the Kurnool district are sandy clay loam with adequate Bulk density, Particle density and Pore space. All samples are alkaline in reaction and EC is in permissible limit suitable for most of the crops. More than half of samples are low to medium in organic carbon content. Macro-nutrients such as Nitrogen is low, Phosphorus and Potassium is medium to high range at all sites. Secondary nutrients calcium and magnesium are high and micro-nutrients such as Zinc is deficient, copper is adequate and iron is sufficient to excess at all sites. The usage of organic and inorganic fertilizers can help to compensate for nutritional deficiencies. Based on results it shows that soils are good for cultivation of different crops in this region. Farmers must maintain a Soil Health Card in accordance with state and central government norms for crop production, and are advised to use appropriate management practices and supply proper nourishment to soil health.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

REFERENCES

Balaji, N.S., Balaguravaiah, D., Ramana, K.V., Giridharakrishna, T., Munirathnam, P. and Ravindra, R.B. (2019) Spatial variability of soil physical and Physicochemical properties of Kurnool division of Andhra Pradesh. *Journal of Pharmacognosy and Phytochemistry*; **8**(**4**): 427-429.

Bouyoucos, G.J. (1927). The hydrometer as a new method for the mechanical analysis of soils. *Soil Science*, **23**:343-353

Cheng, K.L. and Bray, R.H. (1951). Determination of Calcium and Magnesium in soil and plant material. *Soil Sci.*, **72**:449-458.

Geetha Sireesha, P.V. and Naidu, M.V.S (2020) Production Potential Appraisal: A Case Study in Banaganapalle Mandal of Kurnool District in Andhra Pradesh, India. *Int.J. Curr. Microbiol. App. Sci*, **9(6)**: 787-798.

Ismail, M. and Umamahesh, M. (2018) Analysis of Soil Samples for its Physicochemical Parameters in Adoni Region, Kurnool District, (A.P). *Journal of Emerging Technologies and Innovative Research,* Volume **5(4),** 776-778.

Jackson. M. L. (1973) Soil Chemical Analysis. Prentice Hall of India Pvt Ltd., New Delhi.

Joshi, P.C., Pandey, P. and Kaushal, B.R. (2013) Analysis of some Physico-chemical parameters of soil from a protected forest in Uttarakhand. *Nature and Science*, **11(1):** 136-140.

Lindsay. W. L. and Norvell, W. A. (1978). Development of a DPTA soil test for heavy metals. *Soil Science Society of America Journal*, **42:** 402-403.

Muhr, G.R., Datta, N.P., Shankara, S.N,., Dever, F., Lecy, V.K., Donahue, R.R. 16 Soil Testing in India, USAID Mission to India.

Munsell, A.H. (1954). Munsell Soil Color Charts. Munsell Color Company Inc., Baltimore.

Muthuvel, P., Udayasoorian, C., Natesan, R. and Ramaswami, P.R. (1992). Introduction to Soil Analysis. Tamil Nadu Agricultural University, Coimbatore.

Olsen, S. R., Cole, C. V., Watnahe, F. S. and Dean, L. A. (1954). Estimation of available phosphorus in soils by extraction with sodium bicarbonate. *U.S. Deptt. Agr. Circ.,* 939.

Ramamurthy. B, Bajaj. J.C. (1969). Nitrogen, Phosphorus and Potash status of Indian soils.

Fertilizer News, 14:25-28.

Ramana, Singh, Y.V., Jat, L.K., Santosh, K.M., Singh, L., Jatav, H.S. and Paul, A. (2015) Available Macro Nutrient Status and their Relationship with Soil Physico-Chemical Properties of Sri Ganganagar District of Rajasthan, India. *Journal of Pure and Applied Microbiology*, Vol. **9(4)**, p. 2887-2894.

Reddy, P.V.R.M, Venkaiah, K., Naga, M.K.V. and Maheswara, P. (2015) Preparation of soil nutrient status thematic maps of nandyal mandal of Kurnool district by geographic information system, Andhra Pradesh. J. Agril. Sci, **1(3):** 118-124.

Sathish, A., Ramachandrappa, B.K., Devaraja, K., Savitha, M.S., Gowda, M.N.T. and Prashanth, K.M. (2018) Assessment of spatial variability in fertility status and nutrient recommendation in alanatha Cluster Villages, Ramanagara District, Karnataka using GIS. Journal of The Indian Society of Soil Science, **66(2):**149.

Satish, S., Sreenivasulu Reddy, K. and Venkaiah, K. (2018) Correlation Studies of Bt Cotton Growing Soils of Kurnool District in Andhra Pradesh. *Int. J. Pure App. Biosci.* **6(5**): 402-409, doi: http://dx.doi.org/10.18782/2320-7051.6980.

Singh, G., Sharma, M., Manan, J., and Singh, G. (2016) Assessment of soil fertility status under different cropping sequences in District Kapurthala. J Krishi vigyan, **5(1)**, 1-9.

Siva prasad, P.N., Kavitha, P., Sreenivasa, C.M. and Srinivasa, R.M. (2015) Soil Properties and Forms of Potassium in Rice Growing Soils of Kurnool district. The Andhra Agric. J 62(4): 841-846

Subbiah, B. V. and Asija, C. L. (1956). A rapid procedure for the estimation of available nitrogen in soils. *Current Sci.,* **25**: 259-260.

Supriya, K., Kavitha, P., Naidu, M.V.S. and Srinivasa Reddy, M. (2019) Assessment of Nutrient Status of Soils in Mahanandi Mandal, Kurnool district, Andhra Pradesh. Bulle

tin of Environment, Pharmacology and Life Sciences Bull. Env. Pharmacol. Life Sci., Vol 8 [8], 115-121.

Toth, S. J. and Prince, A. L. (1949). Estimation of cation exchange capacity and exchangeable Ca, K and Na content of soil by flame photometer technique. *Soil Sci.,* **67**:439-445.

Walkley, A. (1947). Critical examination of rapid method for determining organic carbon in soils, effect of variation in digestion conditions and of inorganic soil constituents, *Soil Sci.*, 632: 251.

S.No.	Particulars	Methods	Scientist

Wilcox, L. V. (1950). Electrical conductivity, *Amer. Water Works Assoc. J.*, **42**:775-776.

Table: 1. Procedure used for Physico-chemical analysis of soil

1.	Soil colour	Munsell colour chart	Albert Henry Munsell, (1971)
2.	Soil texture	Bouyoucos Hydrometer	Bouyoucos, (1927)
3.	Bulk density (Mg m^{-3})	Graduated measuring cylinder	Muthuvel *et al*. (1992)
4.	Particle density (Mg m^{-3})	Graduated measuring cylinder	Muthuvel *et al*. (1992)
5.	Pore space (%)	Graduated measuring cylinder	Muthuvel *et al*. (1992)
6.	Water Holding Capacity (%)	Graduated measuring cylinder	Muthuvel *et al*. (1992)
7.	Soil pH	Digital pH meter	Jackson, (1958)
8.	EC	Digital conductivity meter	Wilcox, (1950)
9	Organic carbon (%)	Walkley and Black wetoxidation method	Walkley and Black, (1947)
10.	Available Nitrogen (kg ha^{-1})	Modified alkaline permanganate oxidation method	Subbiah and Asija, (1956)
11.	Available phosphorus (kg ha^{-1})	Olsen's extraction followed by spectrophotometric method	Olsen *et al*. (1954)
12.	Available potassium (kg ha^{-1})	Neutral normal ammonium acetate extraction followed by Flame photometric method	Toth and Prince, (1949)
13.	Exchangeable calcium and magnesium (cmol (p+) kg ha^{-1})	Versenate titration method	Cheng and Bray, (1951)
14.	Zinc, Iron, Copper (ppm)	DTPA method /Atomic absorption spectroscopy	Lindsay and Norvell, (1978)

Table: 2. Physical properties of soil at various depths i.e., 0-15, 15-30 and 30-45cm from different blocks of Kurnool district

Villages	Depth (cm)	BD (Mg m^{-3})	PD (Mg m^{-3})	Porosity (%)	WHC (%)
Thadakanapalli (B_1V_1)	0-15	1.33	2.36	59.09	56.81
	15-30	1.38	2.43	56.25	55.55
	30-45	1.47	2.60	52.94	52.17
Chinnatekur (B_1V_2)	0-15	1.36	2.36	56.66	55.62
	15-30	1.41	2.53	53.63	54.71
	30-45	1.52	2.66	51.09	53.63
Peddatekur (B_1V_3)	0-15	1.33	2.43	58.42	59.09
	15-30	1.39	2.50	53.15	55.55
	30-45	1.49	2.60	52.75	53.52
Munagalapadu (B_2V_1)	0-15	1.36	2.50	57.89	59.23
	15-30	1.42	2.53	55.55	56.66
	30-45	1.50	2.60	55.55	53.15
Singavaram (B_2V_2)	0-15	1.39	2.43	56.66	56.87
	15-30	1.44	2.36	52.85	53.75
	30-45	1.52	2.43	46.66	49.52
Nidzur (B_2V_3)	0-15	1.38	2.36	57.89	56.66
	15-30	1.42	2.43	55.55	52.50
	30-45	1.44	2.50	52.63	51.53
Nannur (B_3V_1)	0-15	1.36	2.43	58.82	59.97
	15-30	1.42	2.43	55.55	58.05
	30-45	1.49	2.50	52.94	55.66
Loddipalle (B_3V_2)	0-15	1.38	2.36	58.75	60.22
	15-30	1.46	2.43	54.70	57.56
	30-45	1.47	2.43	52.50	54.42
Uyyalawada (B_3V_3)	0-15	1.33	2.43	56.66	58.15
	15-30	1.41	2.36	54.70	56.50
	30-45	1.49	2.53	52.50	55.53

Table: 3. Chemical properties (pH, EC, OC, N, P, K) of soil at various depths i.e., 0-15, 15-30 and 30-45cm from different blocks of Kurnool district

Villages	Depth (cm)	pH	EC (dS m^{-1})	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})
Thadakanapalli (B_1V_1)	0-15	7.89	0.16	0.66	210.48	28.83	402.40
	15-30	8.25	0.17	0.50	169.46	24.96	396.23
	30-45	8.26	0.18	0.36	130.08	22.36	375.64
Chinnatekur (B_1V_2)	0-15	8.13	0.30	0.61	190.58	18.50	298.72
	15-30	8.05	0.33	0.62	152.36	18.82	180.37
	30-45	8.14	0.35	0.50	133.60	16.82	175.65
Peddatekur (B_1V_3)	0-15	7.92	0.15	0.62	188.36	14.59	326.49
	15-30	7.96	0.18	0.53	147.34	13.43	290.85
	30-45	8.23	0.19	0.35	105.59	12.75	258.55
Munagalapadu (B_2V_1)	0-15	7.66	0.18	0.61	218.58	52.60	398.27
	15-30	7.95	0.18	0.57	158.46	42.14	376.76
	30-45	8.12	0.19	0.37	114.83	41.67	260.84
Singavaram (B_2V_2)	0-15	7.96	0.15	0.60	195.83	27.97	192.83
	15-30	8.13	0.16	0.53	163.02	23.68	165.55
	30-45	8.25	0.19	0.36	110.08	21.18	135.42
Nidzur (B_2V_3)	0-15	7.75	0.42	0.60	173.46	18.82	294.65
	15-30	7.89	0.50	0.50	153.15	18.50	250.31
	30-45	8.22	0.57	0.35	94.30	16.06	257.11
Nannur (B_3V_1)	0-15	7.85	0.23	0.57	192.80	46.69	291.38
	15-30	7.88	0.25	0.50	139.68	44.33	257.25
	30-45	8.44	0.29	0.37	97.47	42.19	255.69
Loddipalle (B_3V_2)	0-15	8.04	0.19	0.58	172.24	25.36	283.43
	15-30	8.10	0.20	0.53	151.34	20.90	272.55
	30-45	8.27	0.27	0.36	103.60	20.79	253.91
Uyyalawada (B_3V_3)	0-15	8.06	0.28	0.53	183.88	20.71	327.58
	15-30	8.23	0.30	0.50	142.74	18.37	330.26
	30-45	8.35	0.40	0.37	116.31	16.06	295.45

Table: 4. Chemical properties (Ca, Mg, Zn, Cu, Fe) of soil at various depths i.e., 0-15, 15-30 and 30-45cm from different blocks of Kurnool district.

Villages	Depth (cm)	Ca (cmol (p^+) kg^{-1})	Mg (cmol (p^+) kg^{-1})	Zn (ppm)	Cu (ppm)	Fe (ppm)
Thadakanapalli (B_1V_1)	0-15	20.56	7.99	0.57	0.77	6.02
	15-30	20.13	7.15	0.35	0.46	4.76
	30-45	19.24	7.10	0.31	0.22	3.97
Chinnatekur (B_1V_2)	0-15	19.87	6.14	0.31	0.68	5.12
	15-30	19.16	4.52	0.25	0.59	4.33
	30-45	18.13	4.29	0.20	0.32	3.39
Peddatekur (B_1V_3)	0-15	22.57	8.12	0.44	0.55	6.44
	15-30	21.43	6.93	0.40	0.31	5.03
	30-45	19.12	5.44	0.33	0.20	4.78
Munagalapadu (B_2V_1)	0-15	26.67	8.32	0.48	0.42	5.67
	15-30	23.13	5.79	0.43	0.28	5.25
	30-45	21.45	4.32	0.34	0.18	4.32
Singavaram (B_2V_2)	0-15	16.30	7.19	0.32	0.63	6.10
	15-30	14.72	6.33	0.31	0.42	5.13
	30-45	13.66	5.21	0.28	0.27	4.21
Nidzur (B_2V_3)	0-15	26.26	7.37	0.36	0.55	6.16
	15-30	27.93	7.71	0.23	0.39	4.57
	30-45	20.15	6.28	0.20	0.26	3.22
Nannur (B_3V_1)	0-15	34.62	6.75	0.52	0.68	6.89
	15-30	32.53	5.93	0.44	0.48	4.65
	30-45	31.13	4.21	0.40	0.40	4.06
Loddipalle (B_3V_2)	0-15	27.53	7.94	0.43	0.65	5.29
	15-30	26.79	7.46	0.34	0.49	4.13
	30-45	25.21	6.72	0.27	0.42	3.67
Uyyalawada (B_3V_3)	0-15	23.24	8.35	0.36	0.71	6.25
	15-30	22.13	7.27	0.20	0.53	5.34
	30-45	18.32	5.86	0.16	0.45	3.84

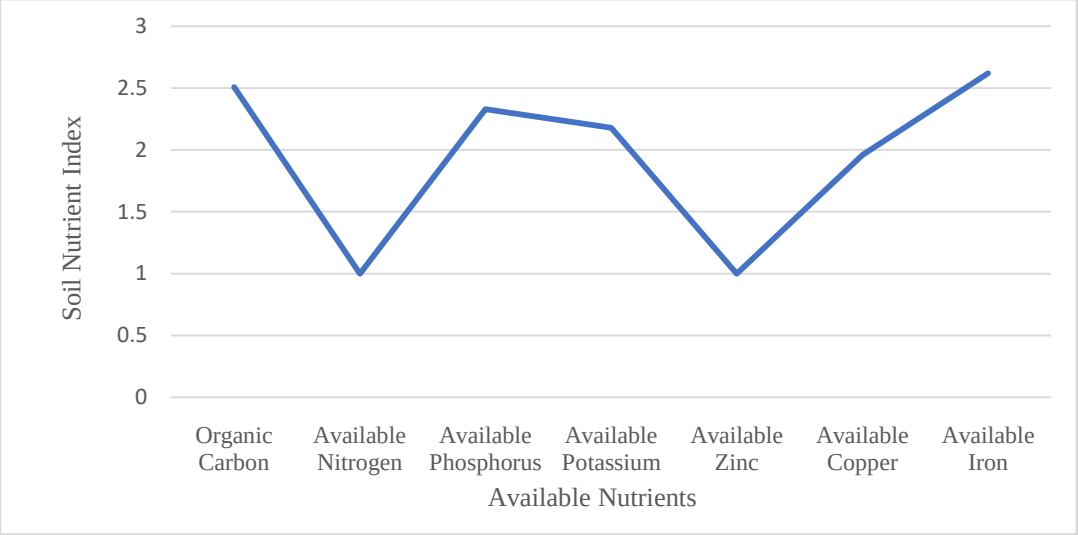

Fig. 1. Graphical representation of Nutrient Index range of different nutrients