ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES OF DIFFERENT SOILS GROWING RABI SORGHUM IN SOLAPUR TEHSIL (MAHARASHTRA)

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Abstract:
Soil is a dynamic property that varies with the soil structural conditions. In general, it increases with profile depth, due to changes in organic matter content, porosity and compaction. The main objective of this work was to investigate the properties of Shallow, Medium and Deep Soil depth based rabi sorghum growing conditions. Crop dependence of bulk density on physico- chemical prperties in soil qulaity and Physical parameter like pH, Electrical conductivity (EC) & Organic carbon (%), Chemical parameter like Available Nitrogen (N), Available Phosphorus (P), Availble (K) content and for soil of solapur tehsil area. In Solapur city due to industrialization and other anthropogenic activity the soil from its North Solapur and South Solapur part has been polluted. The sewage water in the Hipperga lake water flows supply through the Banegoan Village and Shivaji Nagar, Bale village and hence it is felt necessary to carry out the soil analysis to understand the pollution levels of the soils in the adjoining area. In the present study the analyses of Soil samples collected from the experimental research farms of Centre on Rabi Sorghum, ICAR-IIMR, Solapur, Located in North Soalpur, Mulegoan Farm (CRS- Solapur) Located in South Solapur, Banegoan (Farmer 1st) and Shivaji Nagar, Bale (Farmer 2nd). part of the Solapur city which is influenced by the solid waste disposal as well as industrial effluents. In the first place soils samples from 04 different locations and were collected for their analysis.

Key words: Soil fertility status and Sustainable soil management, Sorghum crop, Soil analysis, Solapur.

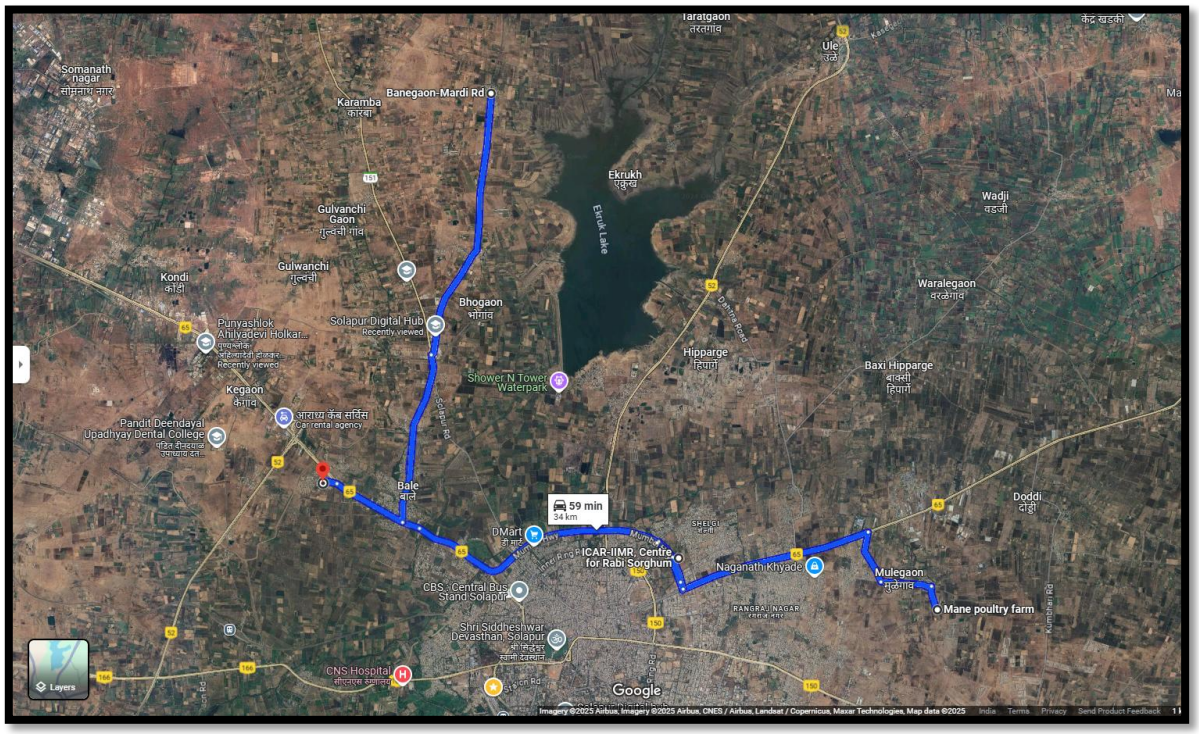
INTRODUCTION:

Soil is a major component of the Earth's ecosystem. Soil may be defined as “A dynamic natural body on the surface of the earth in which plants grow, composed of mineral and organic materials and living forms” (Buckman and Brady et al., 1969). The world's ecosystems are impacted in far-reaching ways by the processes carried out in the soil, with effects ranging from ozone depletion and global warming to rainforest destruction and water pollution. With respect to Earth's carbon cycle, soil acts as an important carbon reservoir and it is potentially one of the most reactive to human disturbance and climate change. Soil, also commonly referred to as earth or dirt, is a mixture of organic matter, minerals, gases, liquids, and organisms that together support life. Soil is a naturally occurring porous medium that supports the growth of plant roots by retaining air, heat, water and nutrients; and provides mechanical support to the plant. It is the most important resource required for Agricultural production, Soil-test based fertility management is an effective tool for increasing productivity of agricultural soils that have high degree of spatial variability resulting from the combined effects of physical, chemical or biological processes (Goovaerts, 1998). Sorghum is the staple food grown in this region, which meets the food, fodder and fuel requirements. The yields of sorghum in this region during the post-rainy season (rabi) are not only unstable but also low due to insufficient moisture and nutrients for normal growth during cropping season.

Soil nutrients availability depends highly on soil pH. At low pH some metallic elements like zinc and aluminum are overly abundant and highly mobile causing metal toxicity while reducing the availability of elements like calcium and phosphorus which may react to form precipitants. The EC measures the quantity of salts in soil. Organic Carbon is a component of soil organic matter that can be measured. Nitrogen (N) it plays a fundamental role in energy metabolism and protein synthesis and plant cannot complete its life cycle in absence of that particular nutrient. Cell membranes, proteins and nucleic acids all include Phosphorus (P). Potassium (K) it is a mineral that is required in the growing parts of the plants in large amounts. Awareness about crop quality and soil health increased the attention of people towards organic manures. Balanced use of nutrients through organic sources like farmyard manure, vermicompost, green manuring and poultry manure are prerequisites to sustain soil fertility, to produce maximum crop yield with optimum input level (Balasubramanian and Hill, 2002). Soil testing is one of the best available tools, to ascertain the physical characteristics & nutrient status of a field so as to assess the fertilizer requirements for a crop or a cropping system or for knowing the reclamation requirements if the soil is saline/sodic in nature. Fertilizer application based on soil tests is the best available approach for harvesting the economically viable potential yields of crops by increasing input use efficiency and maintaining soil health. (Joshi et al., 2013).

STUDY AREA

The research study includes 36 Soil samples collected from 04 different location which is located in Solapur tehsil (North Solapur & South Solapur) area, location 1st soil site is Experimental Research farm Centre on Rabi Sorghum ICAR-IIMR, Regional Station, Solapur, 2nd soil site is Experimental Research farm Mulegaon (CRS, Solapur), 3rd soil site is Farmer 1st is Shivaji Nagar, Bale & 4th soil site is Farmer 2nd Banegaon, Mardi Road, Solapur. The experimental soil analysis was carried out at the Department of Soil Science, Zonal Agricultural Research Station Solapur.



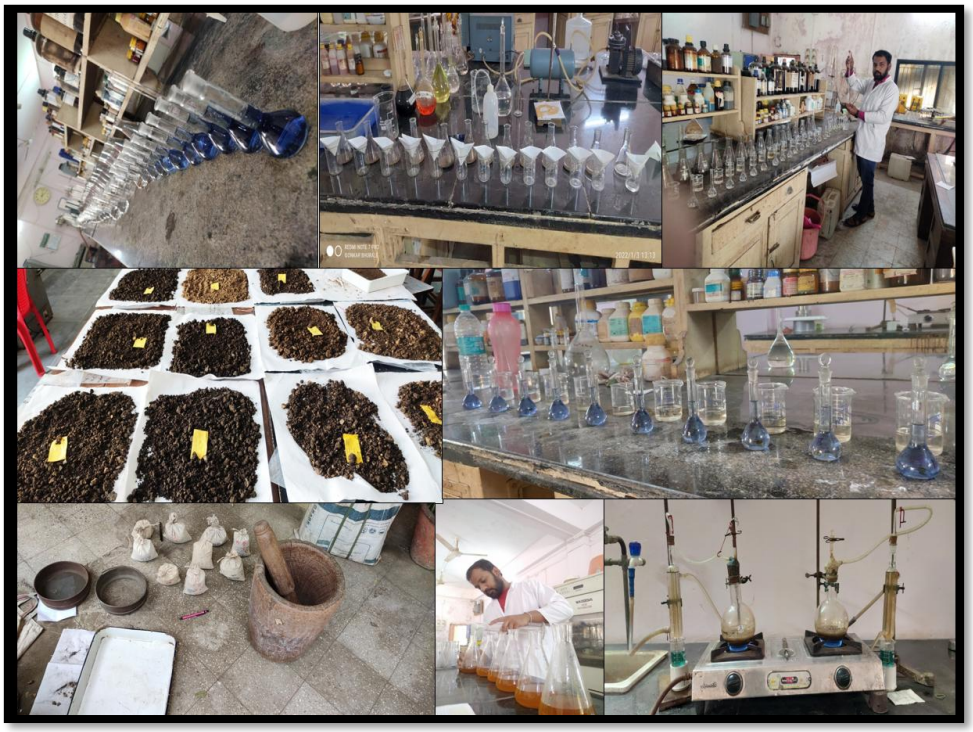
HYDROLOGY

The well and Dam are the main sources of irrigation in Solapur. Hipparga Talav, Ekrukh Talav are present in the tehsil. Total area under irrigation is 22,374 ha. Total rain fed area is 95426 ha. Area under well irrigation is 78.48 per cent and area under surface irrigation is 21.56 per cent.

METHODOLOGY:

Simple correlation was computed using Pearson's equation to reveal the magnitudes and directions of relationship between selected soil parameters. Step down multiple regressions was worked out to determine the most contributing soil factor to the variability of the nutrient content in soils. We followed some standard laboratory methods as follows: pH- Determination of soil pH (Thomas 1957). Electrical conductivity (EC)-Determination of electrical conductivity of soil. Availble Nitrogen (N): Determination of available nitrogen in the soil. Alkaline KMnO4 method,Subbiah and Asija,1956. , Availble Phosphorus (P): Determination available Phosphorus from alkaline soil, Ascorbic acid method, murphy and Riley,1962. Watanabe and Olsen,1965., Availble Potassium (K): Determination of available Potassium from soil Knudsen and Peterson,1982.

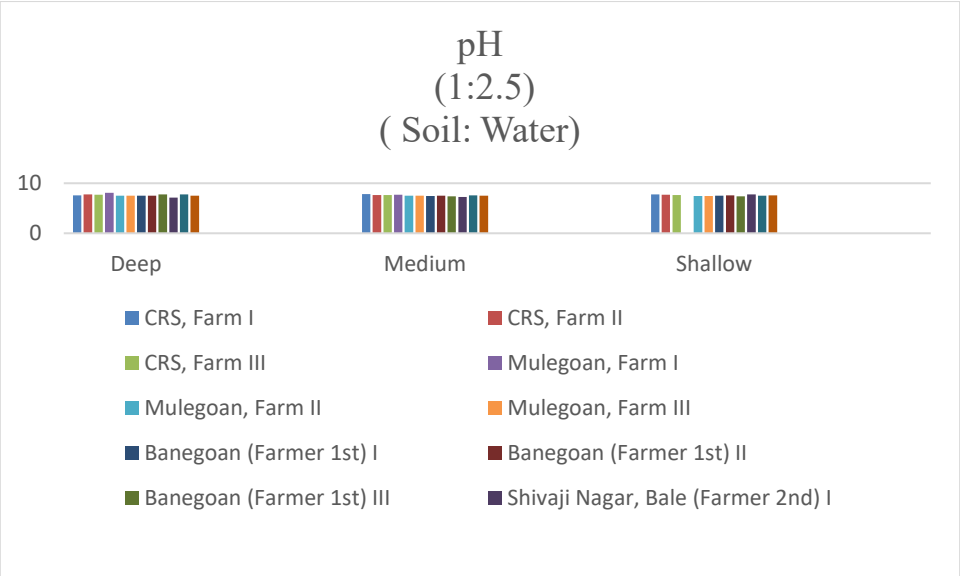
Experimental Sites:-

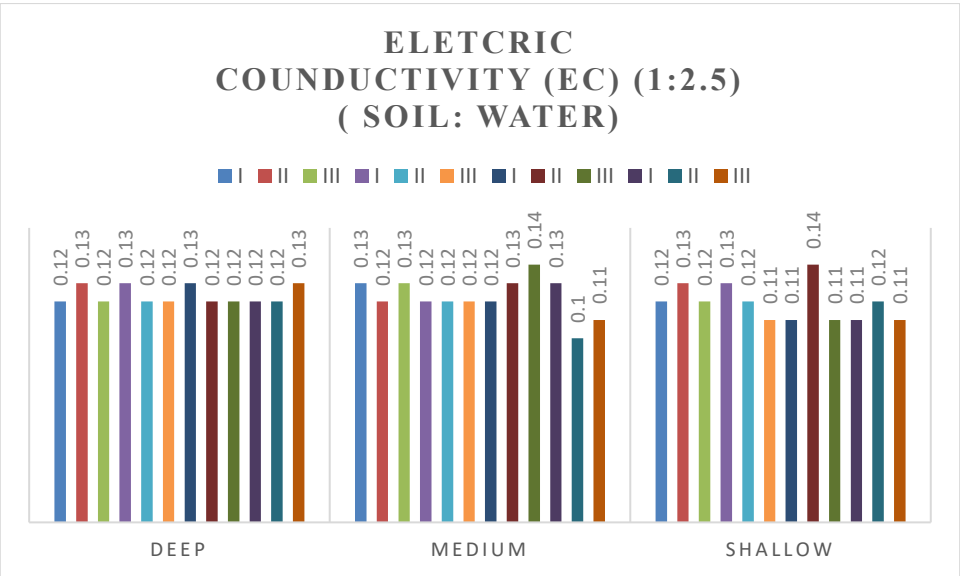


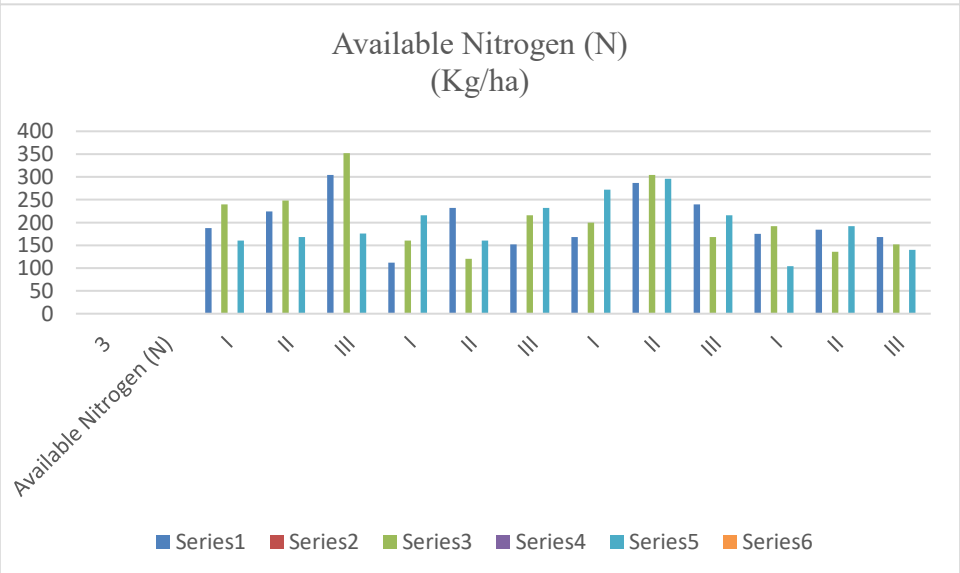
❖ RESULTS AND DISCUSSION:

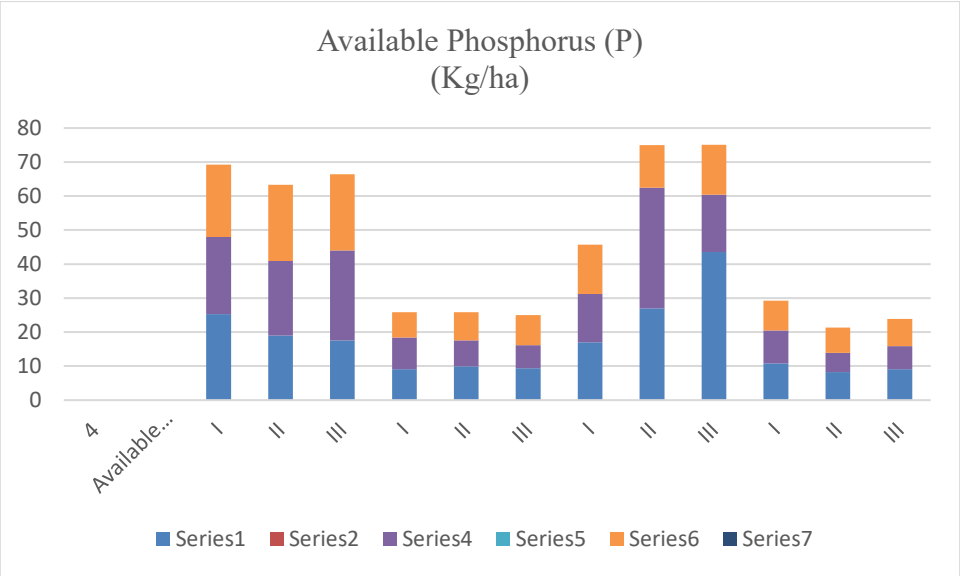
Sr. No.	Parameters of Soil	CRS, Farm			Mulegoan, Farm			Banegoan (Farmer 1st)			Shivaji Nagar, Bale (Farmer 2nd)		
01.	pH (1:2.5) (Soil: Water)	I	II	III	I	II	III	I	II	III	I	II	III
	Deep	7.57 (Alkaline)	7.75 (Alkaline)	7.70 (Alkaline)	8.09 (Alkaline)	7.50 (Alkaline)	7.50 (Alkaline)	7.50 (Alkaline)	7.52 (Alkaline)	7.80 (Alkaline)	7.15 (Alkaline)	7.75 (Alkaline)	7.50 (Alkaline)
	Medium	7.86 (Alkaline)	7.65 (Alkaline)	7.67 (Alkaline)	7.73 (Alkaline)	7.53 (Alkaline)	7.53 (Alkaline)	7.47 (Alkaline)	7.50 (Alkaline)	7.40 (Alkaline)	7.23 (Alkaline)	7.60 (Alkaline)	7.54 (Alkaline)
	Shallow	7.80 (Alkaline)	7.70 (Alkaline)	7.65 (Alkaline)	7.32. (Alkaline)	7.45 (Alkaline)	7.45 (Alkaline)	7.50 (Alkaline)	7.55 (Alkaline)	7.38 (Alkaline)	7.80 (Alkaline)	7.54 (Alkaline)	7.60 (Alkaline)
02.	Eletcric Counductivity (EC) (1:2.5) (Soil: Water)	I	II	III	I	II	III	I	II	III	I	II	III
	Deep	0.12	0.13	0.12	0.13	0.12	0.12	0.13	0.12	0.12	0.12	0.12	0.13
	Medium	0.13	0.12	0.13	0.12	0.12	0.12	0.12	0.13	0.14	0.13	0.10	0.11
	Shallow	0.12	0.13	0.12	0.13	0.12	0.11	0.11	0.14	0.11	0.11	0.12	0.11
03.	Available Nitrogen (N) (Kg/ha)	I	II	III	I	II	III	I	II	III	I	II	III
	Deep	188 (Low)	224 (Low)	304 (Medium)	112 (Very low)	232 (Low)	152 (Low)	168 (Low)	287 (Medium)	240 (Low)	175 (Low)	184 (Low)	168 (Low)
	Medium	240 (Low)	248 (Low)	352 (Medium)	160 (Low)	120 (Very low)	216 (Low)	200 (Low)	304 (Medium)	168 (Low)	192 (Low)	136 (Very low)	152 (Low)
	Shallow	160 (Low)	168 (Low)	176 (Low)	216 (Low)	160 (Low)	232 (Low)	272 (Low)	296 (Medium)	216 (Low)	104 (Very low)	192 (Low)	140 (Very low)
04.	Available Phosphorus (P) (Kg/ha)	I	II	III	I	II	III	I	II	III	I	II	III
	Deep	25.27 (Moderatly high)	19.02 (Medium)	17.60 (Medium)	9.08 (Low)	9.93 (Low)	9.36 (Low)	17.03 (Medium)	26.97 (Moderatly high)	43.53 (Very high)	10.79 (Low)	8.23 (Low)	9.08 (Low)
	Medium	22.71 (Moderatly high)	21.86 (Moderatly high)	26.40 (Moderatly high)	9.36 (Low)	7.66 (Low)	6.81 (Low)	14.20 (Low)	35.49 (Very High)	16.82 (Medium)	9.65 (Low)	5.68 (Very low)	6.82 (Very low)
	Shallow	21.29 (Moderatly high)	22.43 (Moderatly high)	22.43 (Moderatly high)	7.38 (Low)	8.23 (Low)	8.80 (Low)	14.48 (Low)	12.49 (Low)	14.76 (Medium)	8.80 (Low)	7.38 (Low)	7.95 (Low)
05.	Available Potassium (K) (Kg/ha)	I	II	III	I	II	III	I	II	III	I	II	III
	Deep	449 (Very high)	483 (Very high)	468 (Very high)	453 (Very high)	430 (Very high)	242 (Moderatly high)	700 (Very high)	663 (Very high)	407 (Very high)	600 (Very high)	680 (Very high)	651 (Very high)
	Medium	419 (Very high)	495 (Very high)	400 (Very high)	410 (Very high)	336 (Very high)	280 (High)	573 (Very high)	520 (Very high)	427 (Very high)	652 (Very high)	775 (Very high)	669 (Very high)
	Shallow	553 (Very high)	557 (Very high)	514 (Very high)	561 (Very high)	245 (Moderatly high)	110 (Low)	578 (Very high)	559 (Very high)	528 (Very high)	673 (Very high)	687 (Very high)	622 (Very high)
06.	Soil Organic Matter (%)	I	II	III	I	II	III	I	II	III	I	II	III
	Deep	0.54	0.48	0.54	0.36	0.09	0.18	0.60	0.42	0.60	0.69	0.54	0.66

- The pH alkaline and Electric Conductivity (EC) is in normal range of all samples.
- The Organic carbon content is **Very low** in (Sample no. 13), **Low** (Sample No. 3, 5, 8, 10, 12, 14, 15, 16, 18, 20, 26, 27, 29, 30, 36) **Medium** (Sample No. 1, 4, 6, 7, 9, 11, 17, 19, 21, 22, 23, 24, 25, 31, 32, 33) & **Moderatly high** (Sample no. 2, 28, 34, 35), hence it is advocated to use organic fertilizers if available @5-6MT/ha/Year or use green manuring crops like Dhaincha, Sunhemp, Subabhul, Glyricidia, Clusterbeans & Sesbania rostrata, etc. to maintain the soil fertility.
- Hence the recommended dose given to the crops is increased or decreased as follows:
- ***1. Av. Nitrogen (N):*** Total available Nitrogen (N) content is **Very Low** in (Sample No. 10, 14, 30, 32, 36) we recommended dose of nitrogen is increased by 50 percent. **Low** in (Sample No. 1, 2, 3, 4, 5, 6, 9, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 25, 26, 27, 28, 29, 31, 33, 34, 35) we recommended dose of nitroigen is increased by 25 percent. **Medium** in (Sample No.7, 8, 22, 23, 24) recommended dose of nitrogen is given as it is.

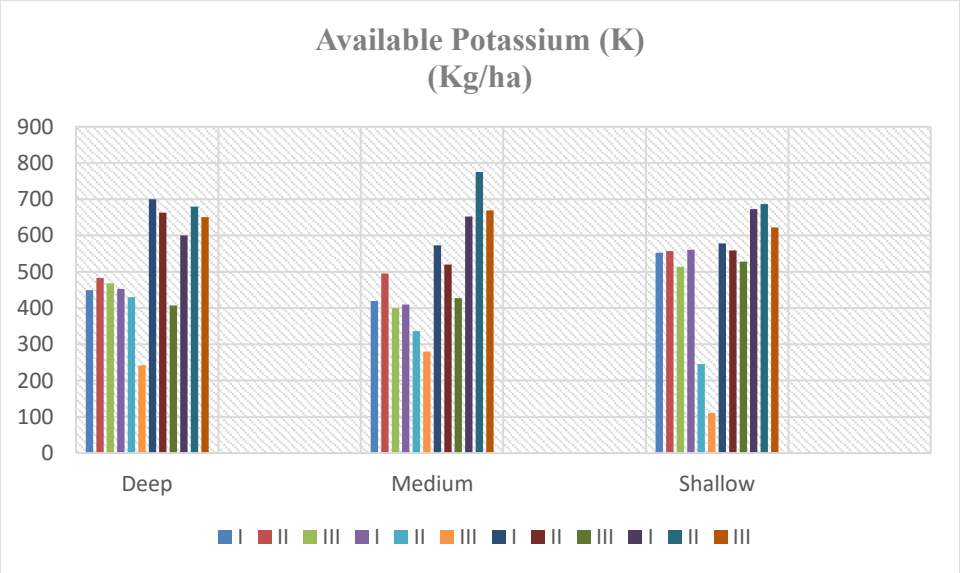

pH
(1:2.5)
(Soil: Water)
10
0
Deep
Medium
Shallow
CRS, Farm I
CRS, Farm II
CRS, Farm III
Mulegoan, Farm I
Mulegoan, Farm II
Mulegoan, Farm III
Banegoan (Farmer 1st) I
Banegoan (Farmer 1st) II
Banegoan (Farmer 1st) III
Shivaji Nagar, Bale (Farmer 2nd) I


ELETCRIC
COUNDUCTIVITY (EC) (1:2.5)
(SOIL: WATER)
I II III I II III I II III I II III
0.12 0.13 0.12 0.13 0.12 0.12 0.13 0.12 0.12 0.12 0.12 0.13
0.13 0.12 0.13 0.12 0.12 0.12 0.13 0.14 0.13 0.1 0.11
0.12 0.13 0.12 0.13 0.12 0.11 0.11 0.14 0.11 0.11 0.12 0.11
DEEP
MEDIUM
SHALLOW

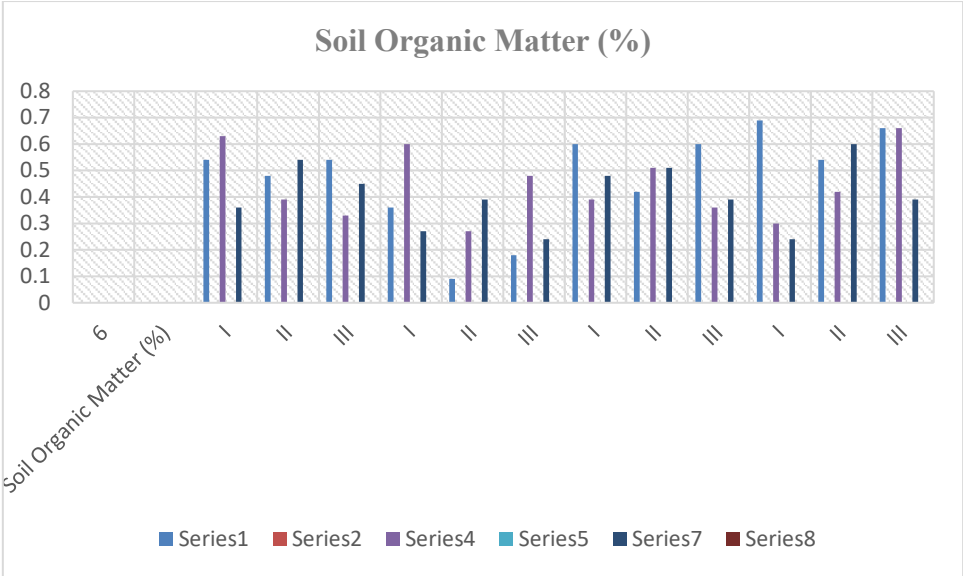

Available Nitrogen (N)
(Kg/ha)
400
350
300
250
200
150
100
50
0
3
Available Nitrogen (N)
I II III I II III I II III I II III
Series1 Series2 Series3 Series4 Series5 Series6



2. Av. Phosphorus (P): Total available Phosphorus (P) content is **Very Low** in (Sample No.32,35) we recommended dose of phosphorus is increased by 50 percent. **Low** (Sample No. 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 24, 28, 29, 30, 31, 33, 34, 36) we recommended dose of phosphorus is increased by 25 percent. **Medium** in (Sample No.4, 7, 19, 26, 27) we recommended dose of phosphorus is given as it is. **Moderatly high** in (Sample No. 1, 2, 3, 5, 6, 8, 9, 22) we recommended dose of Phosphorus is given as it is. **Very high** in (Sample No. 23, 25) we recommended dose of phosphorus is decreased by 50 percent.



3. Av.Potassium(K): Total available Potassium (K) content is **Low** in (Sample No. 18) recommended dose of potassium is increased by 25 percent. **Moderatly high** in (Sample No. 15,16) recommended dose of potassium is given as it is. **High** in (Sample No. 17) recommended dose of potassium is decreased by 25 percent. **Very high** in (Sample No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29,30, 31, 32, 33, 34, 35, 36) recommended dose of potassium is given as it is.



Irrigated agriculture is under the pressure of meeting the challenges of the Sustainable Development Goals (SDGs) related to food, water and health. The productive utilization of the available saline-water resources can reduce the growing pressure on the natural resources important for food security. Soil salinization because of inadequate water management is widespread in the semi-arid part of the world. In the present study, the salinity developed in surface soil was the resultant of the salt addition through saline-water irrigation and cyclic downward and upward salt flux in different seasons.

Conclusion

Soil is one of the most important and valuable natural resources that sustain life on earth. The maintenance of fertile soil primarily depends on its ability to provide the nutrients needed for plant growth. Soil fertility is one of the factors that control crop production. Nitrogen, phosphorus, potassium and sulfur are important soil elements that control crop fertility and production. Soil limitations that affect crop yields, including nutritional disturbances, can be determined by assessing soil fertility status. The present study revealed that there is wide variation in micronutrient status is soils of Solapur city in Maharashtra. The soils are low in available zinc, iron and magnase, medium in available sulphur and high in available copper and boron. Deficient nutrients have to be restored through chemical fertilizers and / or organic manures to maintain soil health. The current status of available sulphur and micronutrients in soils of Solapur city will be helpful to suggest the efficient ways and methods of balanced nutrient application for enhancing the yields by using recommended quantities of organic manures and inorganic fertilizers in the areas of major and micro-nutrients deficiency. From the study, it can be concluded that, soils of North Solapur Tehsil are have wide variation in chemical nature and nutrient status, it is because of rainfall variation, temperature, natural vegetation, parent material and agricultural management practices of soil.

REFERENCES:

1. Assessment of Physico-Chemical Properties of Soil from Different Blocks of Prakasam District, Andhra Pradesh, India A. Hima Bindu a , Amreen Hasan a* , Tarence Thomas a , Arun Alfred David a and Anurag Kumar Singh a
2. An Assessment of Soil Fertility Status of National Maize Research Program, Rampur, Chitwan, Nepal Dinesh Khadka1 , Sushil Lamichhane1 , Binita Thapa1 , Bandhu R. Baral2 & Parbati Adhikari3 1Soil Science Division, Khumaltar, Lalitpur, 2Ginger Research Program, Kapoorkot, Salyan and 3National Maize Research Program, Rampur, Chitwan, Nepal
3. Assessment of Physico-Chemical Characteristics of the Soil of Lahar Block in Bhind District of Madhya Pradesh (India) Y.V. Singh1 *, Shashi Kant1 , S.K. Singh1 , P.K. Sharma1 , L.K. Jat1 , M. Kumar1 , S.K. Shahi2 , H.S. Jatav1 and R.N. Yadav1 1Department of Soil Science and Agricultural Chemistry, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi- 221 005 (U.P.), India 2Department of Soil Science and Agricultural Chemistry, U.P. College Varanasi-221002 (U.P), India

4. Assessment of soil health parameters from different blocks of West Tripura District, Tripura, India Samadrita Paul, Narendra Swaroop, Tarence Thomas and Akshita Barthwal.
5. A Review on Role of Physico-Chemical Properties in Soil Quality Ku. Smita Tale* 1 and Dr. Sangita Ingole2.
6. Analysis of some Physico chemical parameters of soil from a protected forest in Uttarakhand P.C. Joshi 1 , P. Pandey 1 , B.R. Kaushal 2 1 Department of Zoology & Environmental Sciences, Gurukula Kangri University Haridwar 2 Department of Zoology, D.S.B. Campus, Kumaun University, Nainital
7. Balasubramanian V, Hill JE. Direct seeding of rice in Asia: emerging issues and strategic research needs for the 21st century. International Rice Research Institute, Los Banos, Philippines, 2002, 15-42.
8. Buckman HO, Brady NC. The Nature and properties of soils, 3rd Indian Reprint, Eurasia Published House (Pvt.) Ltd. New Delhi 1969, 1971.
9. Soil physico-chemical properties and yield as influenced by tillage practices and soybean based crop sequences in inceptisol Deshmukh DP, VK Kharche, DV Mali, BA Sonune and BV Saoj
10. CORRELATION ANALYSIS AMONG SOIL MOISTURE, SOIL PHYSICO-CHEMICAL PROPERTIES, NUTRIENT UPTAKE AND YIELD OF WINTER SORGHUM S.L. Patil*, M.N. Sheelavantar, S.K. Nalatwadmath, V.S. Surkod**, S. Mana Mohan* and Vasudev K. Lamani* Department of Agronomy, University of Agricultural Sciences, Dharwad - 580 005, India
11. Effect of cultural practices on soil properties, moisture conservation and grain yield of winter sorghum (Sorghum bicolar L. Moench) in semi-arid tropics of India S.L. Patil a,∗, M.N. Sheelavantar b a Central Soil and Water Conservation Research Training Institute, Research Centre, Bellary-583 104, Karnataka State, India b University of Agricultural Sciences, Dharwad-580 005, Karnataka State, India Accepted 4 April 2003
12. Effect of integrated nutrient management practices on physical and physico-chemical properties of soil under rice-sorghum cropping system in clay loamy soils GK Surya Krishna, CH Sujani Rao, P Venkata Subbaiah, M Sree Rekha and V Srinivasa Rao
13. Geo-reference based soil fertility status in Hassan district of Karnataka, India for development of nutrient plan 1,4 2 1 1 P.K. Basavaraja , P. Dey , H. Mohamed Saqeebulla and N.D. Yogendra 1 2 AICRP on STCR, University of Agricultural Sciences, GKVK, Bengaluru-560065, Karnataka; AICRP on STCR, Indian Institute of Soil Science, Bhopal-462038, Madhya Pradesh
14. Physicochemical Analysis of Soils from Eastern Part of Pune City Wagh G. S.1 , Chavhan D. M.,1 and Sayyed M. R. G.2 1 Department of chemistry, SharadchandraPawarMahavidyalaya, Lonand (M.S.) India.415521 2 Department of Geology, Poona College, Camp, Pune 411001
15. Soil Bulk Density as related to Soil Texture, Organic Matter Content and available total Nutrients of Coimbatore Soil Pravin R. Chaudhari* , Dodha V. Ahire* , Vidya D. Ahire* , Manab Chkravarty** and Saroj Maity** *Microwave Research Laboratory, Z. B. Patil College, Dhule - 424002, India **Space Application Centre, ISRO, Ahmedabad – 380015, India