IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024

DOI: 10.17148/IARJSET.2024.11712

Study on Physico-Chemical Characteristics of Soil Supporting the Crop Plant Growth of Paddy Crop in Chodavaram Mandal, Anakapalle District, A.P, India.

M. Lokeswari[1*], Dr. Neela Victor Babu[2] and N. Gayathri[3]

Department of Geo-Engineering & RDT, College of Engineering, Andhra University,

Visakhapatnam-530003, A.P, India. [1,2,3]

Abstract: Soil is the most diverse, nutrient-rich loose surface material that covers most of our land. Soil contains both organic and inorganic matter. The presence of soil is necessary to prevent direct leaching of the inorganic pollutants in the groundwater. Color, texture, structure, porosity, density, consistency, temperature, and air are the physical properties of soil. Suitability of soil for agriculture is determined by the physical properties. There are different properties for different soils. Soil is the source of the water and provide mechanical stability to the plants. There are various types of soil in the environment for example – loamy soil, sandy soil, chalk, peat, silt, and clay soil. Soil analysis refers to a set of various chemical processes which help us determine the available plant nutrients which are either in micronutrient or macronutrient form. In this study, various physiochemical parameters (pH, electrical conductivity, organic carbon, nitrogen, potassium, phosphorus) were analyzed. physio-chemical Parameters of soil are conducted in the study area based on various parameters are as pH, (6.91 - 8.56) electrical conductivity, (0.085 - 0.432) nitrogen, (100 - 200) potassium, (114 - 408) and phosphorus, (14 - 24) soil organic matter (0.72 - 0.98) contents in the study area. A soil analysis is used to determine the level of nutrients found in soil. As such, it can only be as accurate as the sample taken in a particular field. The results of a soil analysis provide the agricultural producer with an estimate of the number of fertilizer nutrients needed to supplement those in the soil. In modern agriculture, excess use of chemical fertilizers affects the pH, EC, Organic carbon, N, P, and K, which are within the permissible limit. and Electrical conductivity which is harmful to germination. Due to overdose of chemical fertilizers its affects soil fertility resulting to decreases crop yield production.

Keywords: Physico-chemical Analysis, soil Parameters, Soil health

I. INTRODUCTION

Agriculture is the backbone of the Indian economy. In India, agricultural yield primarily depends on weather conditions. Rice cultivation mainly depends on rainfall. Timely advice to predict future crop productivity and analysis is to help farmers maximize crop production. Soil nutrients play an important role in crop yield. The Chodavaram Mandal Anakapalle district in Andhra Pradesh The study area is covered by 145.5 sq. km. The latitude and longitudes are 17.82’77” N, and 82.93’45”E, and the population of the study area is 88,493 people.

It consists of 31 Panchayats. Thimmannapalem is the smallest Village and Chodavaram is the biggest Village. The major river of Sarada flows in this Mandal. It is a non-perineal river. The catchment area of the basin is 2,665 square kilometers. It rises at an elevation of 1,000 meters in the Eastern Ghats. It runs eastwards for a distance of 122 kilometers and joins the Bay of Bengal.

The basin is surrounded by River Nagavali in the north, River Gosthani, Gambiramgedda, Megadrigedda in the east Bay of Bengal in the South, and Machhkund sub-basin of the River Godavari in the west. The Lakshmi Cheruv is the major water source of agriculture and consists of water throughout the year. In the study area, Chodavaram Coop-Govada sugar Refining Mill and the processing capacity of the sugar factory is 2,500 tonnes of crushing daily of sugar cane, throughout the year Continuously cropping area. Major crops are Paddy, sugarcane, and vegetables. The study area location map in Fig.1

IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024

DOI: 10.17148/IARJSET.2024.11712

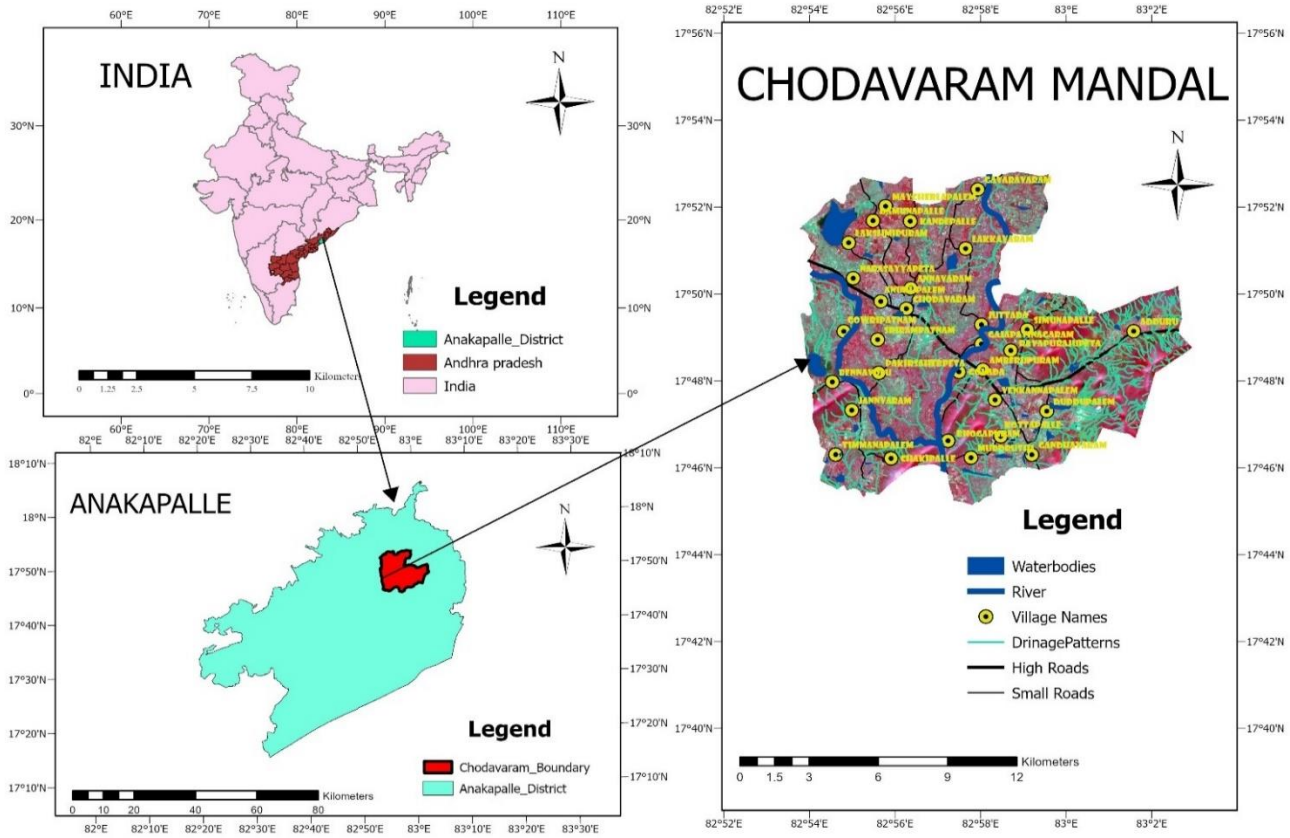

Fig1. Location Map of Study Area

The importance of soil in agriculture cannot be overstated. Soil is the foundation for plant growth and is critical in sustaining agricultural productivity. It provides plants with essential nutrients, water, and physical support while serving as a habitat for beneficial microorganisms. Here are some key points highlighting the significance of soil in agriculture. Agriculture production will depend on the soil types and the soil parameters used. Nowadays, regular soil testing intervals are due to some of the soil composition, constituents like pH, electrical conductivity, nitrogen, potassium, and phosphorus soil organic matter. Soil is an important system of the terrestrial ecosystem. The quality of the soil depends on its physical properties (pH, moisture content, texture, color, and organic substance content, etc.) and the chemical properties of nitrate, Nitrogen, Organic matter content, Nitrite, Cation exchange capacity, phosphate phosphorous, etc). Soils are the main terrestrial reservoir of carbon and nutrients (Quinton et al, 2010, Carvalhais et al, 2014), which determine soil fertility, plant growth, and ecosystem sustainability (Doran and Zeiss, 2000, Lal, 2004), and thus soils are crucial for human being (Lal, 2004).

Soil quality may include the capacity of water retention, carbon sequestration, plant productivity, waste remediation, and other functions or, it may be defined narrowly. the development of the concept of land quality and explores the use of soil chemical and physical attributes as determines of soil quality. For farming soil scientists to play a major role in the assessment and advancement of sustainable soil management in making the concept of soil quality an indicator of sustainability. After doing all these things the specific processes or properties that change depend on each other by combined actions of physical and chemical attributes. Soil testing management increases productivity by identifying the nutrients that are present in the soil and which contribute to their growth. Also increases fertilizer efficiency, and identifies soil erosions. Soils provide room for gaseous exchange between roots and the atmosphere and the important parameters are nitrogen, potassium, and phosphorus. These describe the plant analysis and content of soil in the pH range. A crop is suggested based on NPK values along with pH where nitrogen is responsible for the growth of leaves. Too little with the addition of nitrogen the leaf turns yellow and too much can delay flowering and produce poor quality fruit. Besides, phosphorus is important for plant genetics and seed development aiding plant maturity whereas potassium helps in the coloring of fruit and early growth. Different soils have their pH ranges on the respective grounds (conveys whether they are acidic, basic, or neutral).

IARJSET
ISSN (O) 2393-8021, ISSN (P) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024
DOI: 10.17148/IARJSET.2024.11712

These nutrients create a major issue in the agriculture sector even in different countries. In India, agriculture is the backbone of the economy that contributes to growth and has a proportion of 50% of the country's welfare. The major nutrients required for plant growth are nitrogen, phosphorus, and potassium. Around the study area although most of the population depends upon agriculture.

II. OBJECTIVE

1. To estimate the available nutrient levels in soil.
2. To evaluate the fertility status of the soil and plan a nutrient management program.
3. To provide an index of nutrient availability or supply in a given Soil. fertilizer recommendations for a given crop.
4. To evaluate the fertility status of the soil and plan a nutrient management program.

III. METHODOLOGY

SOILS:

The soil type plays a significant role in determining its suitability for different crops and agricultural practices. Some common types of soil are found in agriculture. In the study area, a total of 66no. of samples are collected in standard procedure. There are 8 different types of soils present in the study area in Table 1, a graphical representation of soils in Fig 2 and classes of soils are mapped in Fig 3.

Table1. Types of soils in the study area

TYPES OF SOIL	AREA
Clayey soils with high AWC	3.27
Clayey soils with medium AWC	22.75
Clayey soils with medium AWC	8.18
Clayey soils with high AWC	32.8
Clayey soils with high AWC	12.18
Clayey soil, gravelly clayey soils with high AWC	39.02
Cracking clayey soils with very high AWC	4.32
Gravelly clayey with low AWC	22.94

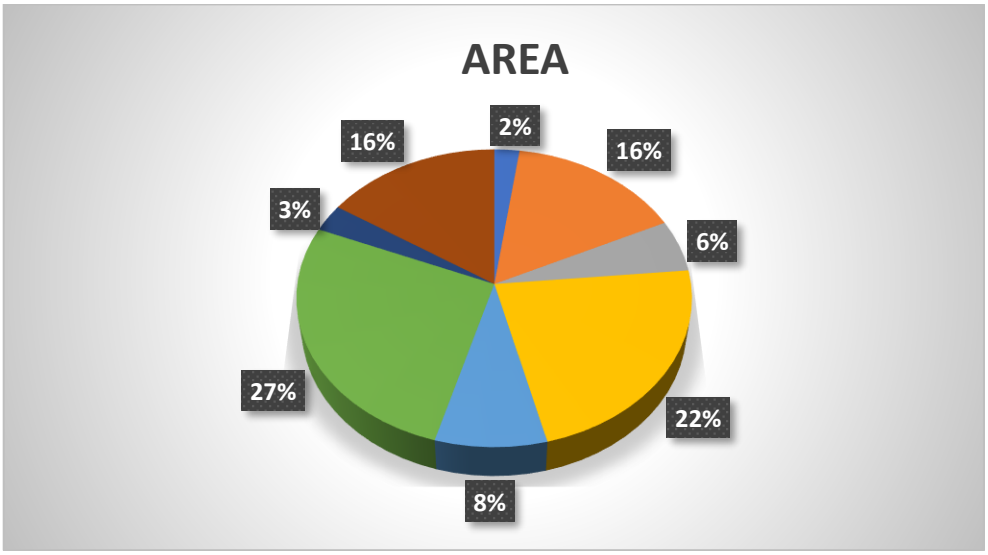

Fig2.Graphical Representation of Soil Occupied in the Study Area

IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024

DOI: 10.17148/IARJSET.2024.11712

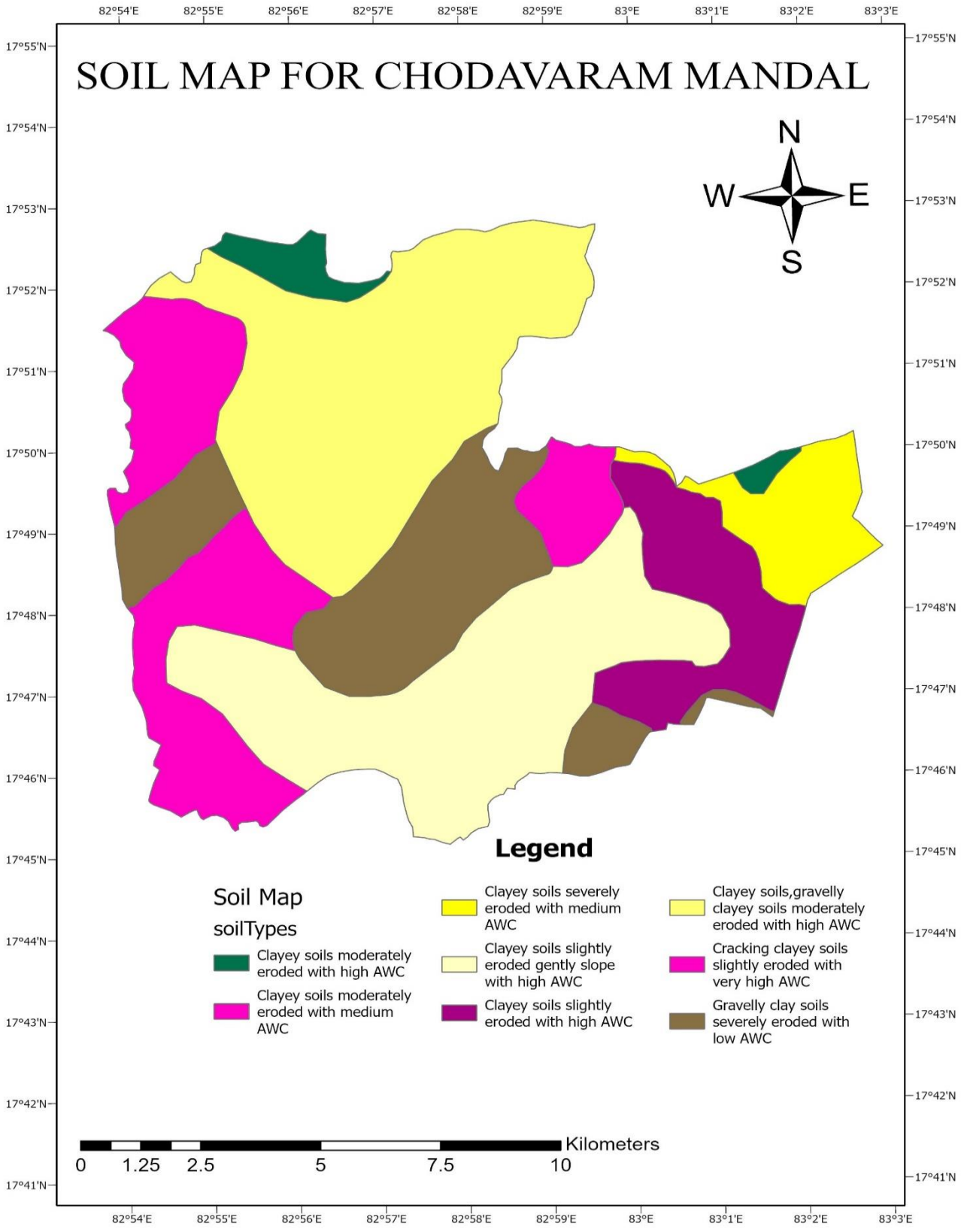

Fig3.Classification of Soil Map for the study area

IARJSET
ISSN (O) 2393-8021, ISSN (P) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024
DOI: 10.17148/IARJSET.2024.11712

Majorly clayey soils are found in chodavaram mandal. In the clayey soils, red and black clayey soils are present in the study area. Clayey soils are very useful for crops i.e. 1. water retention and nutrient availability.2. Temperature regulation & protection.3. soil fertility organic matter retention.4. improved root development and soil structure. Clayey soils improved for better crop growth by implementing soil management practices i.e. adding organic matter such as compost or well-rotted manure to enhance soil fertility and structure.

Clayey soil can support the growth of various crops, including vegetables like potatoes, cabbage, and broccoli, as well as fruits like apples and pears. It is also suitable for growing grains such as wheat and barley. However, the specific crop selection should be based on local climatic conditions, soil fertility, and the crop's adaptability to clayey soil.

Black soil: Black soil or cotton soil is good in moisture and hence is very suitable for growing cotton. The fertility of clayey soil is enhanced by its capacity to retain organic matter and support the growth of beneficial soil organisms. Clayey soil is useful for crops, clayey soil serves as a valuable asset for crop production and plays a pivotal role in supporting plant growth and contributing to overall agricultural productivity. Other crops that can be grown in black soil are sugarcane, wheat, jowar, rice, citrus fruits, sunflower, linseed, etc.

Red soil: Red clayey soil is known as reddish clay minerals and is primarily composed of iron (hydro)oxides coated on soil particles. It has a high percentage of iron content, which is responsible for its color. It contains large amounts of clay and is generally derived from the weathering of ancient crystalline and metamorphic rock red clay has high natural water content, a high liquid limit, and a large void but when used as a filling material, the compatibility is poor.

It is deficient in nitrogen, humus, phosphoric acid, magnesium, and lime but fairly rich in potash, with its pH levels ranging from neutral to acidic. It is used for agriculture because it is fertile and well-drained. It is especially beneficial for crops that require a lot of nutrients, such as bananas and sugarcane. Crops suitable for red soil are cotton, wheat, rice, pulses, millets, tobacco, oilseeds, potatoes, and fruits. The red soils are mostly loamy and therefore cannot retain water like the black soils.

SOIL SAMPLE COLLECTION LOCATIONS:

In the study area total of 66 no. of soil samples were collected by the state Agricultural Department soil sample collection procedure guidelines and analyzed as per the Indian standard (IS). Majorly clayey soils are occupied in the study area.

The soil sample located areas are Adduru, Adduru to Venkannapalem near, Venkannapalem, Muddruthi, Amberupuram, Govada (sugar factory back side), Chodavaram, P.S. Peta, Lakkavaram, Juttada (Sarada river right side), Maycheralapalem, Lakshmi Puram, Gavaravaram, Gajapathinagaram, Sriramunapatnam, Gowripatnam etc. The soil sample collection map is in Fig 4, and the soil analysis methods/instruments are shown in Table 2.

Soil quality analysis:

The soil quality analysis is conducted as per (ICAR) standards.

Table2. Soil quality analysis in Analytical methods

Analysis	Methods/Instruments
Soil Reaction (pH)	1:2.0 soil water suspension by using a pH meter
Electrical Conductivity (EC)	1:2 soil water suspension by using a Conductivity bridge
Organic carbon (OC)	Organic carbon (Volumetric method by Walkley & Black, 1934
Nitrogen	Alkaline permanganate method (Subbaiah and Asija, 1956)
Phosphorus	Olsen's method (Olsen et al., 1954) Colour development by Ascorbic method (Watanabe and Olsen, 1965)
Potassium	Ammonium acetate extract method (Mervin and Peech, 1951)

IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024

DOI: 10.17148/IARJSET.2024.11712

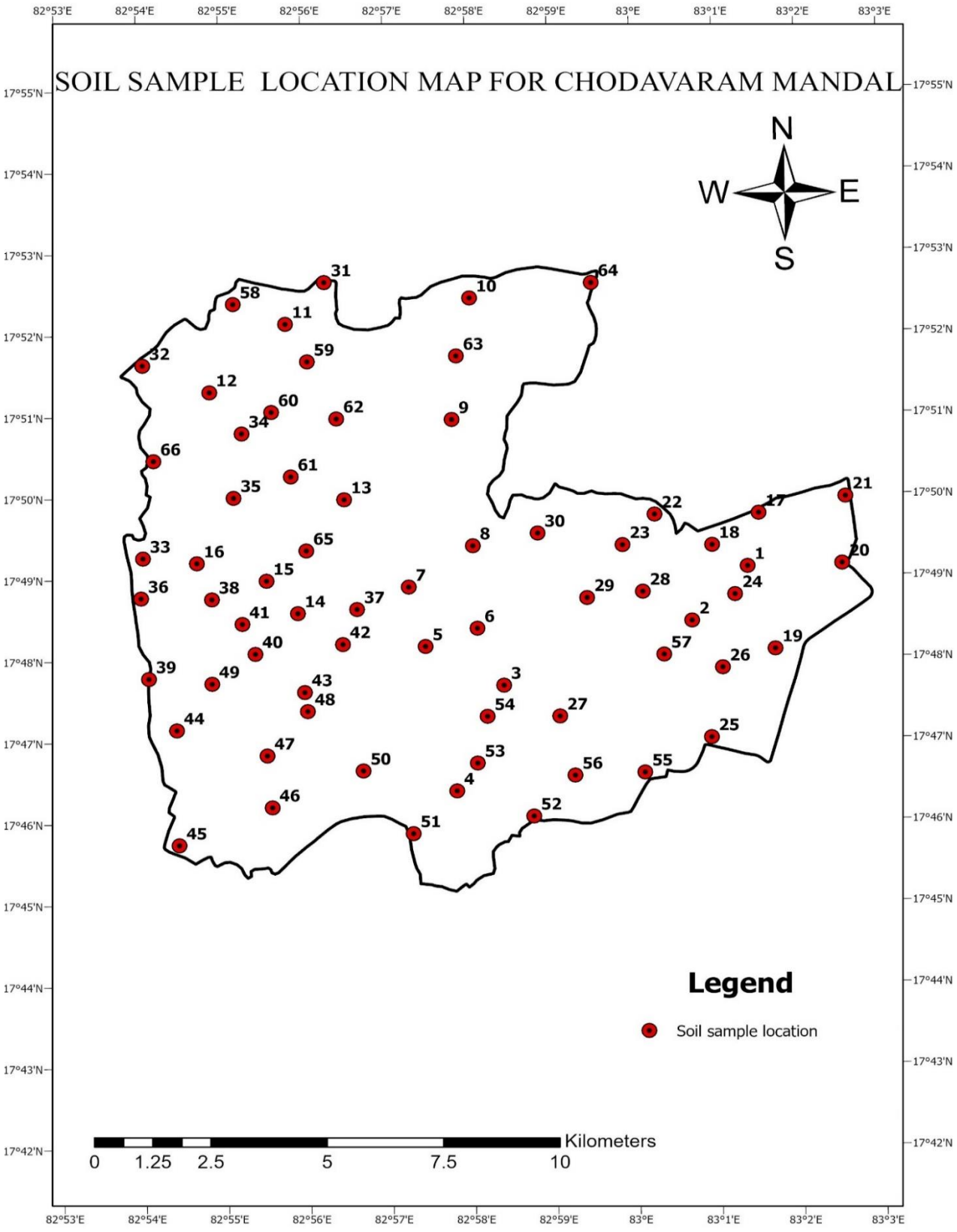

Fig 4. Soil Sample Location Map of the study area

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024

DOI: 10.17148/IARJSET.2024.11712

Physico-Chemical Properties of Soils:

pH

The most significant property of soil is its pH level, and its effects on all other parameters of soil. Therefore, pH is considered while analyzing any kind of soil. If the pH is less than 6 then it is said to be acidic soil, the pH ranges from 6-8.5 it's normal soil and greater than 8.5 then it is said to be alkaline soil. Soil pH value is considered one of the most vital factors determining crop yield

- Soil pH influences the availability of nutrients to plants and maintaining the optimal pH range for a given crop.
- Adjusting soil pH to the optimal range can improve fertilizer use efficiency by ensuring that nutrients are available in a form that plants can use.

Electrical conductivity: Soil, electrical conductivity (EC)is a measure of the ability of the soil to conduct an electrical current. Most importantly to fertility, EC is an indication of the availability of nutrients in the soil. Electrical conductivity is also a very important property of the soil; it is used to check the quality of the soil. It is a measure of ions present in the solution

Organic matter: Organic matter plays a significant role in crop production and soil health by improving the soil's physical, chemical, and biological functions. Increasing levels of organic matter aid in soil structure, water-holding capacity, nutrient mineralization, biological activity, and water and air infiltration rates.

Nitrogen: Nitrogen is necessary for all forms of life. It is the most important essential plant nutrient for crop production as it is constituted of the building blocks of almost all the plant's structures. Nitrogen is a primary plant nutrient for plants. It is a very crucial element for its growth and metabolism. Nitrogen is like a daily multivitamin for plants it facilitates photosynthesis, produces lush green growth, and helps plants resist disease.

Phosphorus: Phosphorus is one of the most important micronutrients essential for plant growth. Phosphorus most often limits nutrients that remain present in plant nuclei and acts as an energy storage. In these methods, specific color compounds are formed with the addition of appropriate reagents in the solution, the intensity of which is proportionate to the concentration of the element being estimated. The color intensity is measured spectrophotometrically.

Potassium: Potassium (K) is an essential macronutrient for plants involved in several physiological processes. Potassium is considered second only to nitrogen when it comes to nutrients needed by plants and is commonly considered as the 'quality nutrient'. Plants absorb potassium in its ionic form, K+. Normally agricultural plants contain 1.1 to 6.0% K.

IV. RESULTS AND DISCUSSION

Physical parameters: 66 no. of samples were investigated from different locations and results were found of physical parameters such as pH, organic carbon, EC, nitrogen, phosphorus, and potassium in the study area. The result is seen in (Table 3) and a graphical representation of the soil-occupied area in the study area (fig3).

This contains the main observation table of the project. All parameters with respect to all location are mention in this part along with the units. This also includes the standard value described by different authorities for different parameters to maintain quality and ultimately to compare the result with the standard to conclude. As the soil directly maintains the nutrient balance in the ecosystem, it is very important to maintain the health of the soil which can be done according to the result of soil analysis.

Hence it is important to analyze the soil condition after a certain time. As result of soil analysis in the study area indicates that the soil quality is affected due to some natural activities as it shows an imbalance in the nutrient content in some areas. The physicochemical analysis of soil nutrient values is shown in Table 3.

IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024

DOI: 10.17148/IARJSET.2024.11712

Table 3. Physio-chemical Analysis of soil samples in the study area

VILLAGE NAME	Soil reaction (pH)	Electrical conductivity (ds/m)	Organic carbon (OC)	Nitrogen (N) (kg/a)	Phosphorus (P) (Kg/ac)	Potassium (K) (Kg/ac)
Juttada (Sarada river right side)	7.6	0.246	0.98	200	16	174
Adduru to venkannapalem	7.36	0.242	0.79	100	18	348
Lakkavaram	8.17	0.342	0.76	100	14	125
Chodavaram	8.24	0.347	0.81	100	14	114
Maycheralapalem	7.23	0.085	0.86	200	20	125
Muddruthi	7.5	0.288	0.91	150	18	320
Adduru	7.41	0.234	0.72	150	20	136
Lakshmipuram	8.56	0.432	0.76	100	24	152
P.S. Peta	8.07	0.118	0.84	200	20	217
Gajapathinagaram	7.35	0.164	0.85	100	14	266
Venkannapalem	8.35	0.235	0.9	150	14	348
Amberupuram	7.62	0.23	0.9	100	18	408
Sriramunapatnam	7.54	0.248	0.86	100	22	152
Gowripatnam	7.35	0.164	0.8	150	18	331
Govada (sugar factory back side)	6.91	0.517	0.76	100	18	252
Gavaravaram	8.31	0.248	0.79	200	24	158
Near to Dumunapalle	8.15	0.21	0.8	170	20	120
Dumunapalle to kandepalle	8.2	0.08	0.8	150	18	110
Dumunapalle to Narasayyapeta	8.19	0.27	0.75	165	16	120
Narasayyapeta to Annavaram	8.23	0.3	0.8	190	14	115
Gavaravaram toLakkavaram	8.02	0.33	0.78	155	14	117
Right corner of Gavaravaram	8.05	0.345	0.77	200	24	158
Annavaram to Lakkavaram	8.1	0.339	0.81	130	16	127
chodavaram to Srirampatnam	8.16	0.34	0.8	140	15	150
Gajapathinagaram to P.S. Peta	7.97	0.15	0.76	190	20	200
Northside Maycheralapalem	7.1	0.088	0.89	200	20	125
West side of Lakshmipuram	8.3	0.431	0.74	100	24	152
Lakshmipuram to Narasayyapeta	8.35	0.359	0.74	100	20	150

IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024

DOI: 10.17148/IARJSET.2024.11712

VILLAGE NAME	Soil reaction (pH)	Electrical conductivity (ds/m)	Organic carbon (OC)	Nitrogen (N) (kg/a)	Phosphorus (P) (Kg/ac)	Potassium (K) (Kg/ac)
South corner of Narasayyapeta	7.9	0.25	0.79	100	17	120
Northside Gowripatnam	7.25	0.27	0.79	150	18	330
Southwest of Gowripatnam	7.19	0.29	0.78	145	18	325
Southwest of Srirampatnam	7.95	0.24	0.84	100	17	215
Noth side of Bennavolu	8.03	0.25	0.84	190	17	200
Southwest of Bennavolu	8.07	0.3	0.82	195	17	200
East of Bennavolu	8.09	0.3	0.83	200	19	209
Southwest of P.S. Peta	7.98	0.31	0.85	200	20	215
South East of P.S Peta	8.09	0.117	0.82	200	20	210
East of P.S Peta	8.06	0.117	0.82	200	20	215
North of Thimmannapalem	7.99	0.32	0.82	170	19	200
South East of Thimmannapalem	8.1	0.3	0.85	170	18	200
Near to Chakipalle	7.2	0.29	0.88	100	18	310
Jannavaram to Chakipalle	7.29	0.31	0.82	150	17	300
Near to Jannavaram	7.05	0.32	0.83	150	17	300
East of Jannavaram	7.45	0.116	0.86	100	17	300
West side of Bhoagapuram	7.29	0.29	0.88	100	18	315
South corner of Muddruthi	7.49	0.27	0.89	100	18	320
East corner of Muddruthi	7.52	0.23	0.89	100	17	300
Bhoagapuram to kothapalle	7.6	0.25	0.9	100	17	330
Kothapalle to Venkannapalem	7.97	0.24	0.89	150	18	340
Venkannapalem to Duddupalem	8.19	0.23	0.91	150	18	348
North of Duddupalem	7.97	0.22	0.88	145	18	345
North East of Duddupalem	8.1	0.24	0.89	120	18	343
East side of Gandhavaram	8.17	0.24	0.86	100	18	250
South East of Gandhavaram	7.87	0.241	0.83	100	18	253

IARJSET

ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024

DOI: 10.17148/IARJSET.2024.11712

VILLAGE NAME	Soil reaction (pH)	Electrical conductivity (ds/m)	Organic carbon (OC)	Nitrogen (N) (kg/a)	Phosphorus (P) (Kg/ac)	Potassium (K) (Kg/ac)
East side of Duddupalem-1	8.19	0.21	0.89	100	16	320
South East of Duddupalem	7.92	0.2	0.86	100	17	320
East side of Duddupalem-2	8.16	0.21	0.87	100	14	321
East side of Sample No. 2	8.2	0.22	0.79	100	18	340
North West of Sample No. 2	8.17	0.21	0.88	100	19	330
North Side of SampleNo. 2	7.97	0.2	0.76	150	18	333
southeast of Sample No. 2	8	0.22	0.78	120	19	335
South corner of Adduru	7.3	0.21	0.78	100	20	136
East corner of Adduru	7.19	0.2	0.72	150	20	133
North East corner of Adduru	7.39	0.22	0.7	100	20	130
North corner of Adduru	7	0.21	0.84	200	20	135
East of Narasayyapeta	8.19	0.339	0.8	100	14	114

V. CONCLUSION

Soil Testing: soil tests to determine nutrient deficiencies and pH levels. This information will help you make informed decisions about nutrient management the sampling was done during this project and only representative places were selected for the analysis of soil from respective areas which can be considered as restricted data and hence the soil condition of each area is analyzed. Continue sampling and analysis from each location of the district has to be done. Also, some recommendations are given which can be applied to maintain the soil quality especially where can be applied to maintain the soil quality especially where agricultural activities are carried out.in the physicochemical analysis, Lakshmi Puram and Gavaravaram have high phosphorus content in the study area.

To stabilize the phosphorus in the soil, avoid overloading of soil, avoid winter application, avoid surface applications of fertilizers/manure, and minimize soil erosion. Potassium is high in some areas Amberupuram, venkannapalem Duddupalem, etc, Soil test potassium levels become elevated when potassium is applied in manure or fertilizer over the long term at rates well above crop requirements. other nutrient values are within the permissible limits. Above the permissible limits nutrient values to void fertilizers applications and add organic matter in the field then to stabilize the nutrient values it can increase crop yield.

REFERENCES

[1]. Karande Sucheta, Gamit Sheela, and Prajapati Dhaval,2020.” Analysis of soil samples for its physical and chemical parameters from Mehsana and Patan District”. In the journal International Research Journal of Science &Engineering, Issue A9, page:86-94, ISSN: 2322-0015.

[2]. Amorna Rai, Narendra Swaroop, Tarence Thomas, Satya Ranjan Mohanta, and, Ashima Thomas,2024.” Assessment of Physico-chemical Properties of Soil from Different Blocks of Namchi District of Sikkim, India”. Journal of Advances in Biology &Biotechnology, Volume27, Issue7, Page1118-1130,2024.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 7, July 2024

DOI: 10.17148/IARJSET.2024.11712

[3]. Ankit Kumar, Tarence Thomas, Kamlendra Kumar, and, Ashima Thomas, 2024. "Influence of Integrated Nutrient Management with Foliar Application of Mono Potassium phosphate on Soil Health in Cultivation of Cowpea (Vigna unguiculate L.) Var.Mohini34". journal of, International Journal of Plant & Soil Science, Volume 36, Issue7, Page535-540,ISSN:2320-7035.

[4]. Pramod Manohar Ghare, Amruta Prakash Kumbhar,2021." Study on physicochemical parameters of soil sample". Journal of International Advanced Research Journal in Science, Engineering, and Technology Vol. 8, Issue 9, ISSN (P) 2394-1588, ISSN (O) 2393-8021.

[5]. Sunil, Vikas Kumar Bharti, Arun Kumar, Om Prakash, and Prashant,2023." Physico-chemical Analysis of Soil", Journal of International Journal of Creative Research Thoughts, Volume 11, Issue 2, ISSN: 2320-2882, page d596-d599.

[6]. Torane S.N, Chavan S.J, Mali B.S, Patil V.S, and Shete R.S,2022." Physico-chemical characteristics of soil supporting to the growth of wheat jowar and maize crop plants from Baramati Tehsil Dist. Pune, Maharashtra, India", Journal of IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS), Volume 15, Issue 12 Ser. II, page 16-26 e-ISSN: 2319-2380, p-ISSN: 2319-2372.

[7]. Recommended chemical soil test procedures for the north-central region,2011

[8]. Wagh P. B, Deshpande A. D, and Ingle S,2021." Study of Physico-Chemical Parameter of Soil Analysis in Buldana District". International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), Volume 12, Issue 4, pages 256-260, ISSN (Online) 2581-9429.

[9]. INDIAN COUNCIL OF AGRICULTURAL RESEARCH KRISHI BHAVAN https://icar.org.in

