ARTIFICIAL INTELLIGENCE (AI) TECHNIQUES TO STUDIES THE PHYSICOCHEMICAL PARAMETERS OF SOIL

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Abstract
Artificial intelligence doing studies like soil conservation, water harvesting, and agroforestry, which contribute to improved agricultural productivity. These practices, often passed down through generations, can help maintain or restore soil fertility and prevent degradation. The physico-chemical study of territory is very significant because both physical and chemical properties which bear upon the soil productivity. The quality of soil and availability of water are essential factor for the good yield of the crop. Hence it is necessary to analyze some quality parameters of the soil to determine the quality of soil. The present work has been carried out using Artificial intelligence study some parameters of soil samples collected from Digras Taluka region District Yavatmal, Maharashtra. The soil characterization was carried out for the parameters like pH, Conductivity, TDS, organic carbon, available nitrate nitrogen, calcium and magnesium. The variation of values observed in the different parameters due to the soil quality in different places.
***Keywords**: Artificial intelligence, Parameters, Conductivity, TDS, Organic carbon.*

Introduction

An Overview of AI Techniques and their applications[1]. Recognizing the fast advancement of artificial intelligence (AI) in soil science, themain objective of this commentary paper is to discuss how this technology is beingincorporated into the discipline, focusing on the most common algorithms and theirapplications. Artificial intelligence in soil science: Where do we go now[2] Applying machine learning to soil analysis for accurate farming. A crucial component of agriculture is soil. Soil analysis is critical for optimizing agricultural practices and ensuring sustainable crop production[3]. The effects of various land use types on particular physicochemical characteristics of the soil in mante watershed, south regional government of ethiopia[4]. The review starts by gathering soil tests from different ranches across the locale, taking into account factors, for example, geology, land use, and yield types. Micronutrients, including iron (Fe), zinc (Zn), and manganese (Mn), are fundamental in more modest amounts yet are similarly basic for compound capabilities, chlorophyll amalgamation, and in general plant[5]. Evaluating microbial action is fundamental for understanding supplement cycling, decay cycles, and in general soil organic wellbeing[6]. In this research paper using artificial intelligence soil is in Babhulgaon Taluka region, this soil is not getting polluted due to no industrial waste problem in this region. All samples were collected in summer season. Analysis of soil in carried out for the studies of various parameters like pH. Conductivity, TDS, Organic Carbon, Available Nitrate Nitrogen, Calcium and Magnesium.

Material And Methodology

Soil observation using Artificial intelligence: Artificial intelligence techniques like mulching, crop rotation, and terracing, which help prevent soil erosion and maintain soil structure.

Plant conservation using AI: Integrating trees into agricultural systems can improve soil health by adding organic matter, improving soil structure, and reducing erosion

Soil Fertility using AI: Artificial intelligence used knowledge about local plant species, animal manures, and composting practices, which can be used to improve soil fertility and nutrient availability. Using artificial intelligence the soil samples were collected from different village of differce taluka and District in state Maharashtra, India and world at the time from different sampling stations. We can collect the Soil samples V1, V2, V3, V4, and V5 were collected in the depth of 0-30 cm from the surface of soil from Pahur, Dabha, Chondi, Falegaon and Kopra villages were collected for analysis[7] as shown in the Table 1.

Table 1: Soil samples from different sampling stations

Name of Village	Pahur	Dabha	Chondi	Falegaon	Kopra
Sample Site	V_1	V_2	V_3	V_4	V_5

The soil samples were preserved in polythene bags for further analysis[8]. The chemicals and reagents used for analysis were of A. R. grade. Method used for Estimation of parameters physicochemical analysis were carried out in the different laboratory using artificial intelligence. To studie the parameter and method are shown in the following Table 2

Table 2: Method used for Estimation of Some Parameters.

S.N.	Parameter	Method
1	Colour	By viewing Soil
2	Moisture	By weighing
3	pH	pH-Metry
4	Conductivity	Conductometry
5	Available Nitrate Nitrogen	Titration
6	Alkalinity	Titration
7	Total Dissolved Solid	TDS Metry
8	Organic Carbon	Titration
9	Calcium	Titration
10	Magnesium	Titration

Result and Discussion:

Direct observation was used to confirm the types of modern and indigenous systems used by farmers for soil and water conservation and their integration in the farmland. Observations also focused on agricultural production of farmers, natural and socio-economic conditions in the study

area, level and form of soil erosions and land degradation and agroforestry situations. The purpose of direct observation was also to have a full understanding about the integration of indigenous knowledge techniques and its effectiveness on soil and water conservation. Direct observation was used to confirm the types of modern and indigenous systems used by farmers for soil and water conservation and their integration in the farmland. Observations also focused on agricultural production of farmers, natural and socio-economic conditions in the study area, level and form of soil erosions and land degradation and

agroforestry situations. The purpose of direct observation was also to have a full understanding about the integration of indigenous knowledge techniques and its effectiveness on soil and water conservation.

Including the technique of AI observed that crop rotation, and the use of animal manure, which all contribute to improved soil fertility and water retention. Furthermore, AI can inform effective soil and water conservation strategies, leading to reduced erosion and increased productivity. Physicochemical parameters just like a Colour, Moisture, pH, Conductivity, Alkality, Total Dissolved Solid, Organic Carbon, Calcium and Magnesium of soil samples[9,10] are presented in Table 3.

Colour: In the earth soil there is lot of colour soil sample but some presented Soil samples are V_1, V_2, and V_3 are Black and V_4 and V_5 are Brown in colour.

Moisture: The moisture content value ranges from 19.41% to 25.20% It is clear from result sample V_1 have highest moisture content than samples V_2, V_3, V_4 and V_5.

Table 3: Physicochemical parameters of Soil sample

S.N.	Soil Parameters	V_1	V_2	V_3	V_4	V_5	IAS Soil Analysis
1	Colour	Black	Black	Black	Brown	Brown	
2	Moisture (%)	25.10	19.51	21.81	23.79	21.69	17-30% Per Crop
3	pH	8.03	7.76	6.94	7.07	7.98	6.0 -8
4	Conductivity	0.58	0.70	0.50	0.48	0.41	< 0.8 Ds/M
5	ANN (kg/ha)	400	581	408	320	400	Variable
6	Alkalinity (%)	301	360	415	408	400	Variable
7	TDS	376	391	300	312	367	< 1000 PPM
8	Organic Carbon (%)	0.40	0.76	0.76	0.41	0.49	0.1-3%
9	Calcium (ml/100gm)	509	538	500	412	451	Variable
10	Magnesium(mg/100gm)	23	43	40	36	40	Variable

[IAS- Agriculture Standard, ANN-Available Nitrate Nitrofen, TDS-Total Dissolve Solid.]

pH: The pH of soil is one of the most important physicochemical Parameter. It affects minerals nutrient soil quality and much microorganism activity. The pH was observed in the ranges from 6.9 to 8.0 The samples V_2, V_3 and V_4 are very slightly alkaline and samples V_1 and V_5 are medium alkaline.

Conductivity: The measurement of conductivity is for measure the current that given a clear idea of soluble salt present in the soil. conductivity depends upon the dilution of soil suspension. The conductivity vales range from 0.41 μS to 0.70 μS. Conductivity of sample V_5 is less as compared to samples V_1, V_2, V_3 and V_4.

Available Nitrate Nitrogen: Available nitrate nitrogen in the soil from 320kg/hectare to 581 kg/hectare. Soil sample V_1 & V_5 has high nitrate nitrogen as compared to samples V_2, V_3 and V_4.

Alkalinity: Alkalinity was observed in the ranges from 301% to 415% Alkalinity of sample V_1 is less as compare to samples V_2, V_3, V_4, and V_5.

Total Dissolved Solid (TDS): TDS values for soil sample ranges from 300 to 391 Soil sample V_3 has lowest TDS as compared to V_1, V_2, V_4, and V_5.

Organic Carbon: Organic carbon is the index for nitrogen content in the soil. The source of organic carbon in the cultivated soil included crop residue, animal manure, cover crops, green manure and organic fertilizer etc. Organic carbon values range from 0.40% to 0.76% Organic carbon of sample V_2, & V_3 is high as compared to samples V_1, V_4 and V_5.

Calcium: Calcium ranges from 412ml/100gm to 538ml/100gm Soil sample V_2 have high calcium content as compared to samples V_1, V_3, V_4 and V_5.

Magnesium: Magnesium available to plants as the ions Mg^{2+} it content in the soil samples ranges from 23ml/100gm to 43ml/100gm. Sample V_1, contains less amount of magnesium

Conclusion

By integrating artificial intelligence it's possible to improve soil health, enhance agricultural productivity, and reduce Industrial parameter and physicochemical analysis of soil for various sites. It is important to agricultural chemists for plant growth and soil management. On the basis of this study farmers can be get various idea about the fertilizers and nutrients needed to soil for increase the percentage yield of crop and plants.

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