

Analysis of Soil for Agriculture

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Abstract- Soil monitoring is a basic procedure which is required for farming. 26 per. of the Earth's surface is uncovered as land. All mankind lives on the earthbound, strong Earth included bedrock and the weathered bedrock called soil. Soil is a blend of inorganic mineral particles and natural matter of differing size and arrangement. The particles make up around 50 per. of the dirt's volume. Pores containing air and water involve the rest of the volume. The vital parameters should have been measured in the dirt are temperature, dampness, mugginess and light. At long time past days, the agriculturists used to see the dirt and will develop the required harvest so the parameters are not precisely known to them to test the dirt. At that point after the dirt testing labs are utilized to test the highlights of soil in which numerous dull procedures happens to gauge every parameter of the dirt. After that numerous continuous activities for self-sufficient soil observing reason for existing were finished utilizing test frameworks and wired sensors. The information gathered is transmitted through GSM, GPS and different advancements

Index terms- GSM, GPS, NPK Sensor

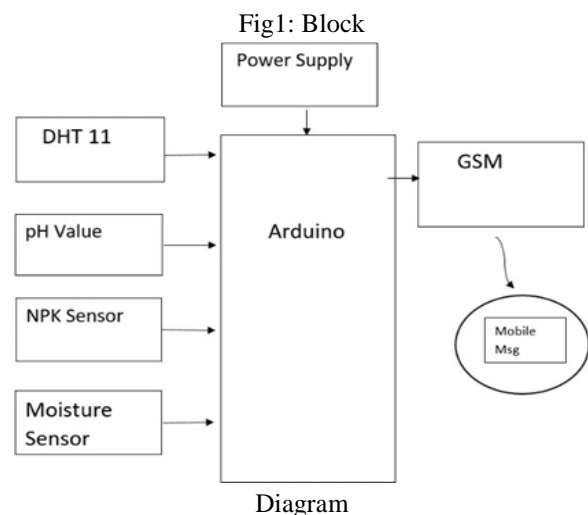
I. INTRODUCTION

Soil analysis provides information which can be used to improve soil fertility through management. The extent to which soil fertility can be improved depends on the inherent properties of the site soil texture, mineralogy, slope and climate. Soil structure is also key to plant performance as it affects the ability of plant roots to access available nutrients.

Now a days the population of the country is increasing day by day and hence there is requirement of more food, so to fulfil the increasing demand of growing population over the years there is a need of increase in food production. But looking at the weather it is impossible to cultivate the food as the fertility of the soil is getting decreased. Due to less rainfall in some year there is shortage of water which again leads to less production of food. Hence there is the requirement of working smart to increase the

productivity and fulfil the demand the society. So the objective of the proposed work is to analyse the soil fertility, water contain, temperature so as to determine the parameters and work accordingly.

II. BLOCK DIAGRAM



The basic block diagram of a Analysis of Soil Parameters using Arduino is shown in the above figure. Mainly this block diagram consists of the following essential blocks. The block diagram show that there are different sensors used like soil moisture sensor, pH sensor, DHT11 sensor who output is given to the Arduino uno and then the information collected is send through GSM to mobile in the form of message. The power supply is required for NPK sensor as it require 9v to 24v supply to work.

- Power Supply
- Arduino Uno
- DHT11 Temperature and Humidity Sensor
- Soil Moisture Sensor
- pH Sensor
- GSM module
- NPK Sensor

III. COMPONENTS USED

1. Power supply

The main function of this block is to provide the required amount of voltage to essential circuits. Here we used +12V dc power supply. +5V is given to microcontroller, water level sensor, temperature sensor, flow measurement sensor. +12V is given to the Relay circuit.

2. Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.



Fig 2: Arduino Uno

3. DHT11 Temperature and Humidity Sensor

DHT11 digital temperature and humidity sensor is a calibrated digital signal output of the temperature and humidity combined sensor. It uses a dedicated digital module capture technology and the temperature and humidity sensor technology to ensure that products with high reliability and excellent long-term stability. Sensor includes a resistive element and a sense of wet NTC temperature measurement devices, and with a high-performance 8-bit microcontroller connected.

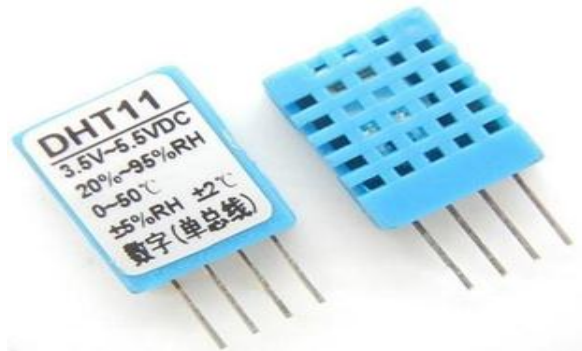


Fig 3: Temperature Sensor

4. Soil Moisture Sensor:

The soil moisture sensor or the hygrometer is usually used to detect the humidity of the soil. So, it is perfect to build an automatic watering system or to monitor the soil moisture of your plants. The sensor is set up by two pieces: the electronic board (at the right), and the probe with two pads, that detects the water content (at the left).

The sensor has a built-in potentiometer for sensitivity adjustment of the digital output (D0), a power LED and a digital output LED.

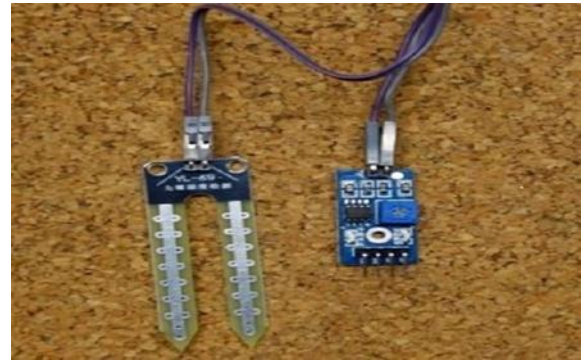


Fig :4 Soil Sensor

5. pH Sensor:

The pH of a substance is an indication of how many hydrogen ions it forms in a certain volume of water. There's no absolute agreement on what "pH" actually stands for, but most people define it as something like "power of hydrogen" or "potential of hydrogen."

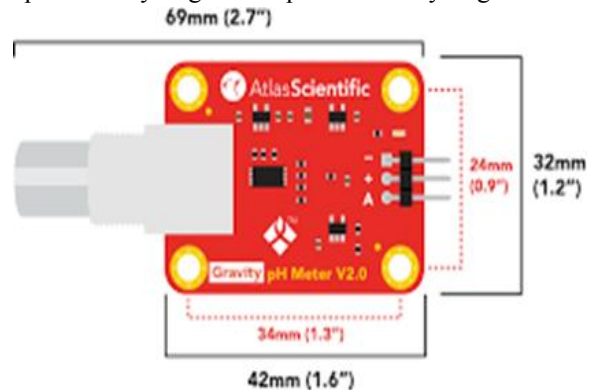


Fig:5 pH Sensor

6. NPK Sensor

This project measures the amount of nitrogen (N), phosphorus (P) and potassium (K) in soil and displays the contents of NPK on LCD. The NPK contents in soil can be measured by adding solution into it and comparing it with color chart. NPK are mainly required in soil and their contents must be in specific amount in soil. If they will become greater or less, it will directly affect the growth of crop. NPK

rating (or N-P-K) is used to label fertilizer based on the relative content of the chemical elements nitrogen (N), phosphorus (P), and potassium (K) that are commonly used in fertilizers. The three elements promote plant growth in three different ways.

- N Nitrogen: promotes the growth of leaves and vegetation.
- P phosphorus: promotes root and shoot growth
- K potassium: promotes flowering, fruiting and general hardiness



Fig :6 NPK Sensor

7. GSM Module:

Designed for global market, SIM900D is a quad-band GSM/GPRS engine that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz. SIM900D features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of 33mm x 33mm x 3mm, SIM900D can meet almost all the space requirements in your applications, such as M2M, smart phone, PDA, FWP, and other mobile device. The physical interface to the mobile application is a 48-pin SMT pad, which provides all hardware interfaces between the module and customers boards.



Fig 7:GSM Module

8. Alternate Solution For NPK Measurement: Soil Testing Kit

Use Soil Test Kit to assess primary nutrients (N-P-K) as well as pH levels. By testing your soil, you

determine its exact condition so you can fertilize more effectively and economically. Soil should be tested periodically throughout the growing season.

Soil Test Kit includes everything you need to perform ten tests for each of the following factors: nitrogen, phosphorus, potassium, and pH (acidity/alkalinity). It contains test capsules, mixing chambers, dropper, color comparison chart, pH preferences for over 450 plants and instructions on how to alter your soil.

How To Use: We found this kit easy to use and informative. Simply mix your soil sample with water, transfer some of the solution to the test chamber, add powder from matching color capsule, and wait while solution develops. Then compare the color of soil solution to the chart on the reference chamber. For N-P-K test results, the nutrient level is indicated on a scale from 0 (depleted) to 4 (surplus). pH test results are indicated on a scale from 4.5 to 7.5.

Make sure your soil contains the three main nutrients: Nitrogen, Phosphorus and Potassium (N-P-K) which are vital to growing plants effectively. Organic matter and fertilizers are rich in these. Soil acidity or alkalinity influences how easily plants take up nutrients from the soil. The standard pH for soils usually ranges between 4.0 and 8.5. Most garden plants favor soil which has a pH between 6.5 and 7 because this is the level where nutrients and minerals naturally thrive.



S Fig :Soil Test Kit

IV. ADVANTAGES

1. This project will help farmers to get the real time information about the parameters of soil on the field. Due to which the farmer can take the decision and take the action.
2. This will help the farmer to control the nutrient contains and even the soil water contains which will reduce the excess use of fertilizers and even water.
3. By this action the yield of the farmer will increase and their economical conditions to.

V. LIMITATIONS

1. Crop yields are determined by a variety of factors including crop variety selection, available moisture, soil fertility, crop adaptation to the area, and the presence of diseases, insects, and weeds. The soil analysis and its interpretation deal only with the fertility level (plant nutrients) of the soil. Recommended fertilizer will provide sufficient nutrients for the best possible yields. Other factors of production or management may still cause low yields, even though nutrients are adequate.
2. As in India there are different soil structure in a single field and due to some part of the field is dry where as some is wet .hence it is difficult to define the number of sensors required field.
3. As now the cost of the sensor are bit expensive so very farmer could not afford it.

VI. ACKNOWLEDGMENT

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VII. CONCLUSION

Growing concern about environmental pollution by excessive use of fertilizers lead to increases in needs to monitor soil nutrients required for crop growth. The sensor network technology will help the farmers to know the soil requirements which will help them take better decisions and preventive measures at the right time. This will lead to tremendous improvement in the crop productivity. This, intern, will save their

time, labour, money and make effective use of resources.

Smart agricultural system can prove to be helpful for farmers. But In the present situation it has been released that the use of inorganic fertilizers should be integrated with renewable and environmentally friendly organic fertilizers and green manures. Sensor network and their usage in farm monitoring is the most useful innovation for the people of INDIA. In smart farming, there is need to increase the productivity with decrease in cost, time and human effort. In this paper we use IOT sensor and cloud to monitor the soil nutrient, intrusions for the betterment of agricultural yield. As outcome of challenge, soil nutrient, animal and human intrusion if occurred in the field are monitored.

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