SOIL NUTRIENT DETECTION AND SUITABLE CROP SUGGESTION USING IOT

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Abstract — Development of agriculture using technology will be very much useful in cultivation. For a new agricultural area, without knowing or monitoring the important parameters of the soil, cultivation will be difficult and so the farmers suffer financial losses. This project provides a brief overview of the soil monitoring system using sensors. Various soil sensors are used to measure temperature, moisture and light, humidity and ph value. The information from the sensors in the soil is sent to the MCP3204 A/D converter then from A/D converter it sends to the cloud through Raspberry pi. Finally we can see the information saved to cloud on mobile phone as well as laptop. On the basis of information we know which crop is suitable with given soil parameter. Thus this advanced technology helps the farmers to know the accurate parameters of the soil thus making the soil testing procedure easier

Technical Keyword: soil monitoring system, MCP3204 A/D converter, Raspberry pi.

I. INTRODUCTION

Soil monitoring is a basic procedure which is required for farming. 26% 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 % 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 ZigBee, GSM, GPS and different advancements.

The current creation for soil observing is the four-wheel meanderer which is a robot that has complex usage that requirements to fuse a suspension outline and high cost. To conquer the impediments of this wanderer, a brilliant remote sensor based soil checking application "Savvy AGRO" is produced for the simplicity of measuring soil highlights. The framework is utilized to quantify the vital parameters of soil, for example, temperature, dampness and light utilizing sensors which is appropriate for a wide range of soil. These dirt sensors can be utilized at multilayer's and multi purposes of the dirt. The information gathered is transmitted to the thing speak utilizing Wi-Fi innovation. The MCP3204 A/D converter is utilized to interface the sensors with the raspberry pi. By knowing the highlights of soil, the development of products can be made less demanding and proficient.

Nowadays, an agricultural industry is one part that is an imperative wellspring of economic growth. Horticulture is viewed as the nation's best field that productive. A rural part utilizes the labor to work, for example, utilizes the manual framework to screen the dirt condition yet they not effectiveness and temperamental to gather information. What's more, by utilizing the manual framework; a great deal issue can happen, and for instance, it will diminish the efficiency and nature of the item. No sensor to control the clammy and makes trouble to people to investigate the dirt condition. It will take more expenses to research or screen the issue and sit around idly or vitality to get the outcome. In the meantime, the client will rely upon the lab framework to know the past information. Besides, in farming, for example, seed palm oil need to watch the dirt for development. Envision when the plant has debased, the buyer or rancher will have less cash and how much time that they have to recoup. So to diminish such drawback we need such framework which is helpful for development of agriculture field.

The main objective of this project is to implement Wireless sensor network (WSN) for monitoring agricultural data using sensors such as soil, moisture etc.

II. RELATED WORKS

In literature, the problem and the previous techniques of pedestrian crossing is described. In this paper Embedded Based Soil Analyzer is utilized to investigate different soil supplements with the assistance of pH esteem. As per the accessibility of supplements, proposals of developing the specific product will be given. This venture utilizes microcontroller which decides PH of weakened soil. The framework incorporates Microcontroller Unit, Signal molding, Sensors, Display, Warm Printer and Power supply. In this

framework, keypad is utilized to associate the client and the framework. [1]

In this paper it was proposed to actualize a remote sensor organize associated with unified essential hub utilizing ZigBee, which was Central Monitoring Station (CMS) through Global System for Mobile (GSM) technologies or General Packet Radio Service (GPRS). This framework infers checking different factors, for example, moistness, soil dampness and give remote observing utilizing ZigBee which sends information remotely to a focal server which gathers information store it and enable it to be shown as required and furthermore be sent to the customer versatile.[2]

W.S. Lee et al. [3] proposed different detecting innovation that are exceptionally valuable for assurance of different soil physical and concoction data and properties. They proposed different detecting framework like field-based electronic sensors, photospectro meters, machine vision, remote detecting, satellite symbolism, warm imaging, RFID, and machine olfaction framework. These all detecting advancements are valuable for recognition of soil supplements; trim water content, and edit discovery, weed and biomass location.

Bah A. et al. [4] discussed the potential of various on the go sensor like electrochemical sensors, optical and radiometric sensors, acoustic sensors and mechanical sensors and they can play an important role for nondestructive and rapid characterization of soil nutrient variability and various soil nutrients. They proposed different sensors that are exclusively appropriate to decide maybe a couple soil traits. Acoustic sensors are helpful to separate the physical and mechanical attributes of soil.

Hak-Jin Kim et al. [5] talked about the two detecting advances for assurance of soil macronutrients like nitrogen, phosphorous and potassium. In a hurry vehicle based detecting framework additionally can effectively and quickly describing changeability of soil supplements in the field. In electrochemical technique nitrate particle layers and cathodes gives the best reaction to the nitrate in the dirt

Sinfield et al. [6] talks about different techniques for assurance of soil micronutrients. This strategy gives the great consequence of aggregate phosphorous substance in the soil having the r2 esteem almost around 0.63 to 0.68. For potassium assurance they examined the reflectance spectroscopy and potassium particle particular terminal strategies giving r2 esteem almost around 0.7.

III. PROPOSED ARCHITECTURE

The below figure shows the block diagram of soil nutrient detection and suitable crop suggestion.

In this project we design the system which is useful for the agriculture. The temperature sensor, analog moisture sensor, humidity sensor and ph value should be kept in the soil of two samples i.e. one with chemical pesticides and another with compost which has to be tested. Each sensor is separately connected to the MCP3204 (ADC) transmit the information on about the parameters to the raspberry pi. This raspberry pi Module sends the information to the cloud then the user can see the soil parameter information on the mobile phone as well as laptop using web browser in the form of graph. On the basis of this soil parameter we will get which crop is suitable with such soil parameter.

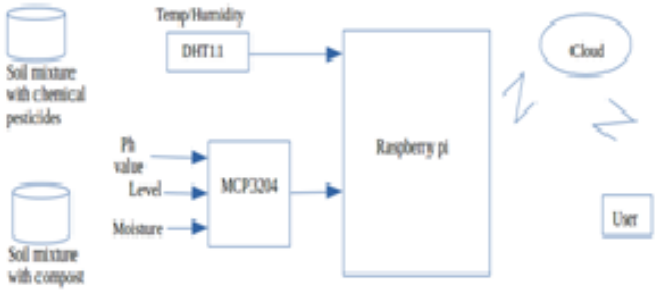


Fig.1. Block Diagram of proposed system

Atmospheric Digital Temperature & Humidity Sensor: DHT11 sensor is chosen to monitor ambient temperature and humidity. This sensor proved to be reliable and stable. The output from DHT11 is a calibrated digital signal which can be interfaced directly to Arduino Uno port pin. It utilizes exclusive digital-signal-collecting-technique and humidity sensing technology that calibrates automatically. With its small size, low power consumption, and ability to function in all kinds of harsh application occasions, makes the DHT11 suitable to use as a drought monitoring sensor.

Soil Moisture Sensor:

In spite of the significance of soil moisture data, broad and additionally ceaseless estimation of soil dampness is everything except non-existent. "The absence of a persuading approach regarding estimation of soil dampness is a significant issue". Unmistakably, a need exists for ceaseless estimations of surface soil dampness. Additionally, remote soil dampness detecting expands the efficiencies of water system frameworks by counteracting over watering and filtering of composts and different chemicals offsite. Soil Moisture sensor FC-28 accompanies a couple of tech tests that can be embedded in the dirt. A little current stream through the tests and the level of protection will be measured. The protection increments if the dirt is dryer. The yield from the sensor is a simple yield that can be associated with one of the simple to advanced port (ADC) accessible on the microcontroller board. FC-28 soil dampness sensor module has been adjusted keeping in mind the end goal to confirm precise operation of the gadget. A pot with gardening soil was taken and the dampness levels are changed frequently. The pot was presented to hot sun with a

specific end goal to dispose of the dampness. This enabled us to reenact a dry, parched soil condition.

IV. SYSTEM ALGORITHM

We propose an algorithm to describe the operation of the system.

a. Algorithm

Below is the algorithm of the proposed system

Step 1	Start
Step 2	Fit the sensors in soil.
Step 3	Digitally converted values are sending to the raspberry pi via MCP3204.
Step 4	Raspberry communicates with Apache server and sends the data of all sensors.
Step 5	Suitable crop and nutrients values are display on mobile application.
Step 6	Stop.

b. Flow Chart

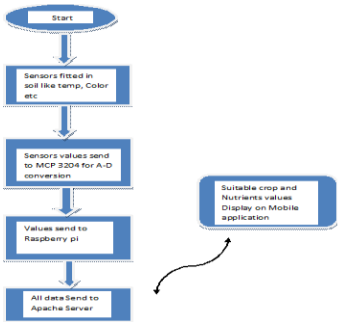


Fig 2 Flow of system operation

If either of the gas sensor or the LDR value goes beyond the optimum value of the system (i.e. predefined threshold) then the system took appropriate action against it. If LDR value is less that means there is dark outside therefore ON Street light and if after making that light ON it is still in off condition, suggest that the light is faulty. Similarly when gas sensor value goes beyond the threshold shows that gas is detected. If anyone of the above mention condition happens then the this information is updated on webpage.

V. RESULT

a. Hardware Model

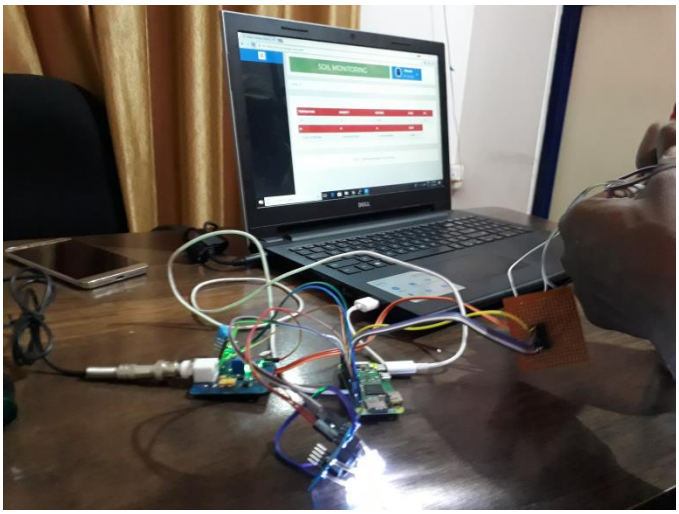
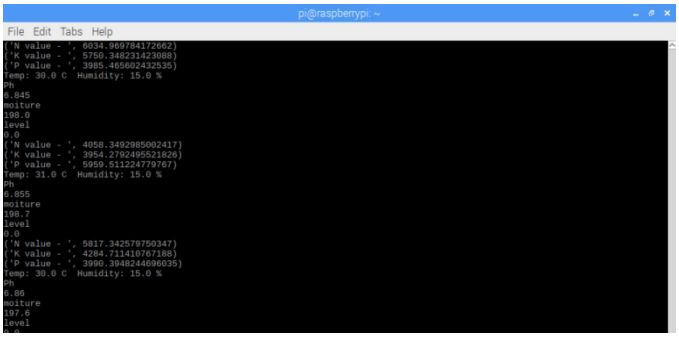


Fig 3 Hardware model of the system

Figure 3 shows the actual hardware model of the proposed system which consist of



b. Web page

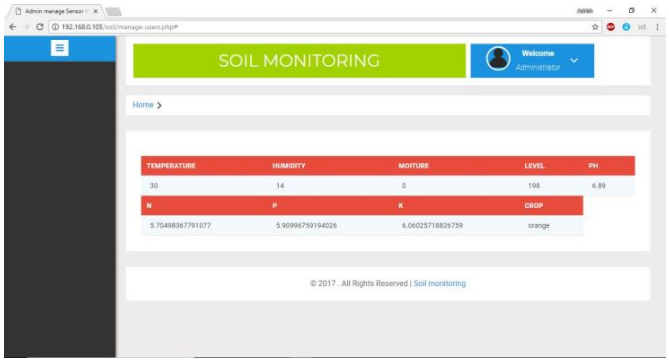


Fig 4: login page and status of Street light.

VI. CONCLUSION

This approach for measuring the soil parameters is used for the efficient plant growth. The results obtained from the measurement have shown that the system performance is quite reliable and accurate. The important parameters of the soil such as temperature, moisture, humidity and ph value are checked by the respective sensors. The measured parameters are transmitted to the cloud through the raspberry pi wifi. Finally we can see the graph of soil parameter and suitable crop for this parameter on mobile phone as well as laptop through browser.

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