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INFLUENCE OF ATMOSPHERIC CONDITIONS ON SOIL PROPERTIES IN VIDARBHA REGION: AN IoT BASED REMOTE MONITORING SYSTEM

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ABSTRACT:

Increasing air temperatures are probable to continue in the future. The relation between soil moisture and near surface air temperature, relative humidity is important for climate change and climate extremes. In this paper we are going to study the effect of atmospheric conditions like Air Temperature, Relative Humidity on soil properties. For this Microcontroller Arduino Nano V3.0, DHT22 & corrosion less Capacitive Soil Moisture sensor V2.0 are used and the results are transmitted to cloud with the help of ESP8266 Wi-Fi module.

KEYWORDS: Arduino, ESP8266, air temperature, humidity, soil temperature, soil moisture, luminosity.

Introduction:

According to recent report of the Intergovernmental Panel on Climate Change, global temperatures are likely to rise between 1.1 to 6.4 °C during the 21st century and rainfall patterns will be changed. Soils are complexity associated to the atmospheric system. Due to this, change climate will have an effect on soil processes and properties [1]. The economy of India is principally base on agriculture and the atmospheric conditions are isotropic and thus farmers are don't seem to be able to make full use of agricultural resources [2]. Modern agriculture needs implementation of technologies which can increase production efficiency, product quality, postharvest operations, and reduce their environmental impact [4]. Soil fertility changes with every harvest and varying weather condition, this affects the nutrient contents of soil [5]. In last few years atmospheric conditions are isotropic like unseasonal rain, globalization etc. though still today number of farmers doing conventional methods for farming but due to sudden changes in weather conditions, many farmers may reduce their crop productions hence we need to regulate this. So we proposed IoT based remote

monitoring system, for monitoring various factors of agricultural environment as well as soil parameters which affects from atmospheric changes such as air temperature, humidity, soil temperature, soil moisture and luminosity etc.

NECESSITY:

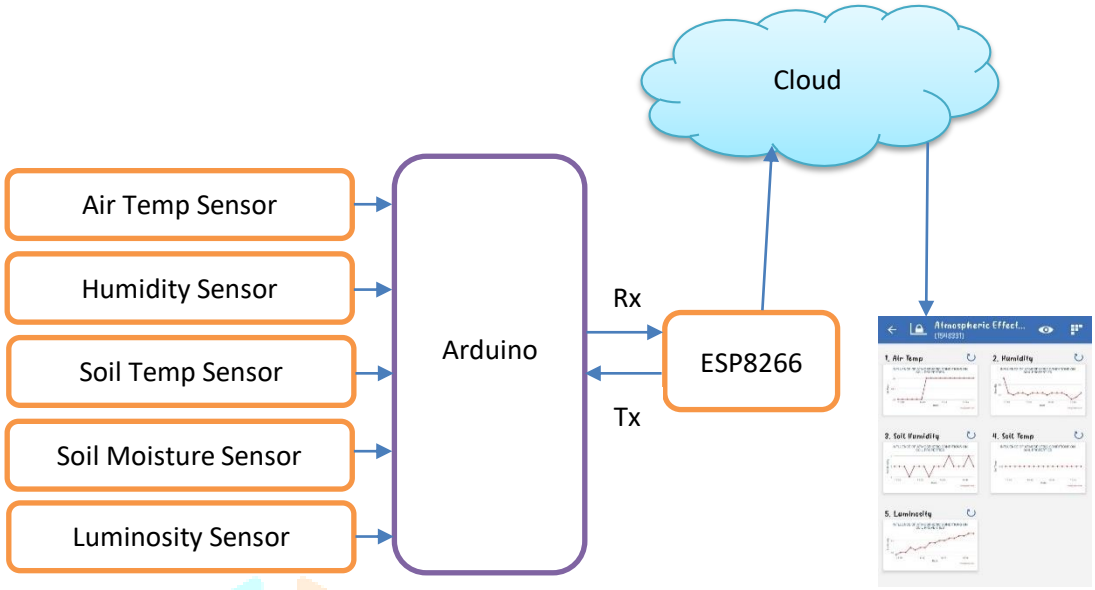
Soil atmospheric conditions varies seasonally and daily which may result from changes in radiant energy and energy changes taking place through the soil surface [3]. Due to sudden changes in weather conditions i.e. unseasonal rain and or cloudy environment, many farmers may reduce their crop productions & profitability. A wireless monitoring system has abilities to monitoring atmospheric conditions remotely. It can recognize the weather conditions at early stage so that farmer can take necessary action accordingly [6].

METHODOLOGY:

System Configuration: Several sensors are used for monitoring the environmental factors and the effect on soil parameters. The outputs of various sensors are connected to the microcontroller. At user defined intervals the signals are measured, transferred to cloud with the help of ESP8266 WIFI module and the data can be accesses remotely by farmer.

A. System Block Diagram:

It is proposed to implement an IoT based remote monitoring system consist of a microcontroller i.e. Arduino Uno, ESP8266 WIFI module and different sensors. In this system, readings are taken from Air temperature, Humidity, Soil Temperature, Soil Moisture and Luminosity sensors and store it on cloud server and graph is drawn as per the variations in sensor readings. The sensors and microcontroller are successfully interfaced to the cloud. The data is stored successfully on cloud server named ThingSpeak.com and can be accessed remotely by the farmer with the help of android app i.e. Thing Show freeware app available at google play store by putting read API key of their cloud channel. The coding is done through Arduino IDE, and for storing the sensor data in cloud server like Thingspeak.com used and interfacing of microcontroller with cloud server is done by using ESP8266 Wi-Fi module.



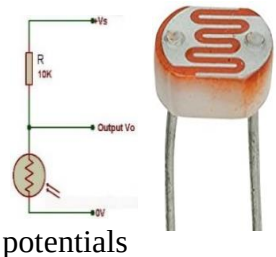
B. Hardware Description:

i. **Air Temperature & Humidity Sensor:** Here DHT22 sensor is used. DHT22 sensor is a digital sensor which is used for sensing the air temperature and humidity. Since library of DHT22 is directly available, this sensor generates the calibrated values, so manual calibration is not required. It needs 3 to 5V power and 2.5mA max current use during conversion. It measures 0-100% humidity readings with 2-5% accuracy and temperature measurement ranges from -40 to 80°C with ±0.5°C accuracy.

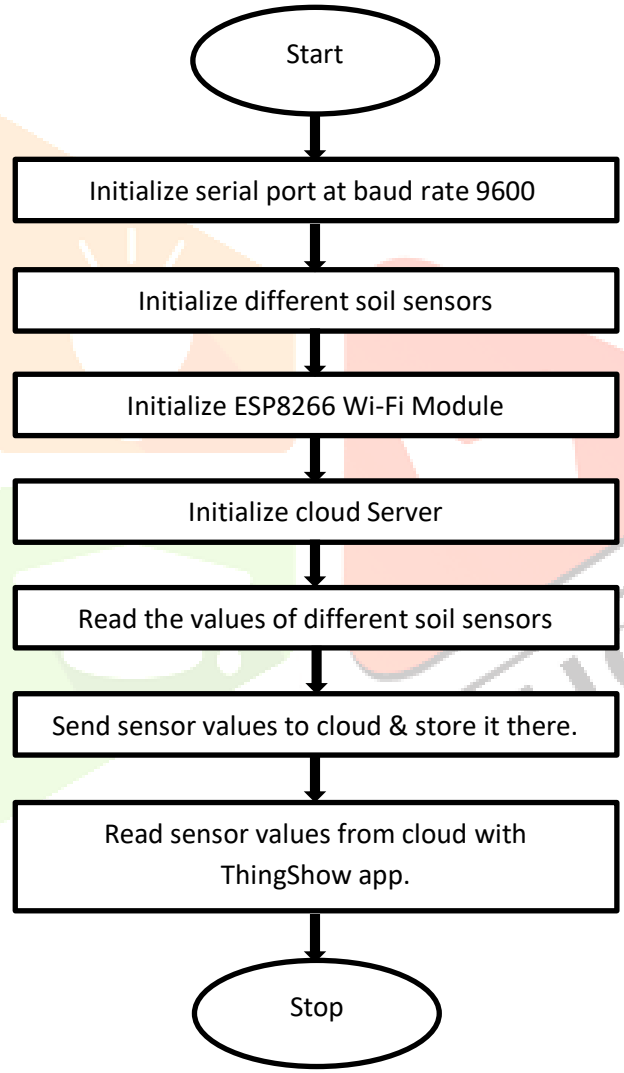
ii. **Soil Temperature Sensor:** Here DS18B20 sensor is employed for soil temperature measurement. This is often a pre-wired and waterproofed sensor used to measure in wet conditions. It can measure the temperature between -55 to 125°C (-67°F to +257°F). Its 1-wire digital temperature sensor and properly precise, i.e. ±0.5°C over considerable range. This sensor needs two libraries like Dallas Temperature Sensor Library & One-Wire Library**.** It also requires a 4.7k resistor, which is required as a pull-up from the DATA to the VCC line when using the sensor.

iii. **Soil Moisture Sensor:** Here we are using capacitive soil moisture sensor V2.0, is made of a corrosion-resistant material which provides it long service life. The capacitance of the electrodes changes with the amount of water once it inserted into the soil. This sensor supplied with 3.3V-5.5V DC voltages and output we get in analog form.

iv. **Luminosity Sensor:** Here LDR is employed as luminosity measurement. LDR is Light Dependent Resistor. As intensity of light increases, the resistance of LDR decreases, and vice versa. In this system, I have designed a voltage divider network using LDR and a 10KΩ resistance. As the intensity changes, the voltage drop across the LDR also changes, and hence potentials proportional to the intensity of light.



C. Software flowchart :



RESULTS:

The IoT based remote monitoring system capable for monitoring atmospheric conditions which affect on soil properties. For that we consider Air Temperature, Humidity, Soil Temperature, Soil Moisture, and Luminosity parameters and analyze them. From the sensor values, found that as the intensity of light and or

Air temperature are inversely proportional to the atmospheric humidity. As the atmospheric humidity increases soil temperature decreases which results decline in soil moisture evaporation and increases in water viscosity. Hence small amount of irrigation required. Which reduces irrigation time and electricity of the farmers. The output can be seen on serial monitor of the Arduino IDE as well as on Thingspeak.com Cloud server by login to it and on smartphones of farmer with the help of Thing Show App and read API key of their cloud channel. The graphs plotted in Thing speak server is shown in the below

Graphical representation of different sensors.

CONCLUSION:

The Proposed System results in the designing, development and optimization of a real time solution for application to the agricultural i.e. atmospheric conditions monitor to reduce potentially negative environmental impacts on crop production. So the propose system may be helpful to the farmers for accurate and precise measurement of different atmospheric parameters at their farm & also helps in increasing the profitability of crop production.

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