Soil & Water Compatibility Testing Based on IOT

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----------ABSTRACT----------

IoT (Internet of Things) is the technology where the physical devices are connected with the sensors and network to access the data and provide an easy way to control the devices remotely. Nowadays many organizations are using this technology to make smart objects. IoT plays a vital role in the development of society at an advanced level. In this paper, we summarized the IoT based device which is useful in agriculture and play a major role in helping the user to know about crop cultivation. We will be using this technology in informing the users on with the observed outcomes based on which, further measures can be taken.

Keywords - **IoT, Smart irrigation, soil, water, Sensor.**

I. INTRODUCTION

Agriculture is one among the major criteria in the uprisal of Indian economy. It involves the irrigation of soil for cultivating the crops and raising of animals for human needs and is carries over mainly for the purpose of producing food, clothing, shelter, medicine, weapons, tools etc., According to the Indian census, around 66% of its working people are engaged with agriculture when compared with 2 to 3% of people in U.K & U.S. More or less, Agricultural technologies in India also play a major role in increasing overall crop yields up to 67% globally. Thus agriculture should Ultimately aim at increasing the economy as well as fulfill the basic nutrition requirements of the people. The soil is a layer of earth which is composed of a complex mixture of minerals, water, air, organic matter and is capable of supporting plant lives on earth. Soil's characteristics are influenced by their physical, chemical, and biological factors. The soil nutrients such as Nitrogen, Phosphorous, and Potassium frame the basis in determining the richness for cultivation and harvest of the crops. The best soil for most plants to grow healthily is rich sandy loam. Water is yet another very important factor for plant growth as it helps to wash away the nutrients from the soil to plant's stem and leaves and finally regulates the photosynthesis process through which the food is synthesized. Water content takes over 90% of the plant body by green weight basis. It plays a vital role in pertaining to the germination of seeds, conversion of the starch to sugar and transpiration processes. Thus a healthy plant growth requires good irrigation of water resources. In Tamil Nadu, the average irrigation percentage ranges from a low of 0.1% in Nilgiris to a high of 88% in Thanjavur district. Soil moisture is a vital factor in enhancing plants growth. Very little moisture presence can result in yield loss, plant death, and wasted water. The soil for most plants should be somewhat moist of about 3 to 4 inches deep.

II. RELATED WORK

Soil testing is done by gathering values from sensor devices and transferring them through various interfaces with the help of GPS services. The mode of transmission made in here is secure and can cover a large area with much ease. It may refer to one or more ways of analysis of soil for various reasons. The outcomes obtained are maximum specific as per the need in the application. These solutions may or may not be accurate as they are obtained through Geo-Mapping and Visualizing by means of photographic images taken in a series. Physical involvement here is minimal as everything is done through automation, thus resulting in a faster and efficient computation A basic low-level sensor is used in this project. The design of this project sensor requires a breadboard, two long copper wires. The copper wires are then inserted into the breadboard at appropriate distances which acts as the desired sensor. The supposed end spots are inserted into the soil. The wires used are supported by upright apparatus of some sort to avoid bending while inserting into the soil. Multiple numbers of sensors modules are used here to increase the dynamic range and for the desired effect of the apparatus.

III. PROPOSED WORK

Soil testing is the only way of analyzing and computation of soil resources up until now, but many scenarios are taken into consideration such that other computations are also to be made into account like testing of water content that is being subjected to the crops on a regular basis. For that reason only, water components are to be tested based on their pH values in our consideration. Along with that, we will also be considering the seasonal changes at that

point in time. These values are generated with the help of sensors like Soil Moisture sensor, Soil pH sensor, Water pH sensor, Wi-Fi module and so on.

IV. ARDUINO BOARD

Arduino is an open source computer hardware that can sense and control objects with proper configurations and connections required to perform desired operations, thus producing optimum outcomes of various aspects.

Fig1:Arduino Board

V. SOIL MOISTURE SENSOR

The soil moisture sensor is used in measuring the moisture level of the soil. The soil moisture level may vary based on different varieties of soil. By using this water contents of the soil is measured, soil resistivity is measured and so on. This sensor is also used in many such research purposes including climatic variation research, agricultural science. Soil moisture sensors are basically simple to design and are easier for implementation and are moderately cheap.

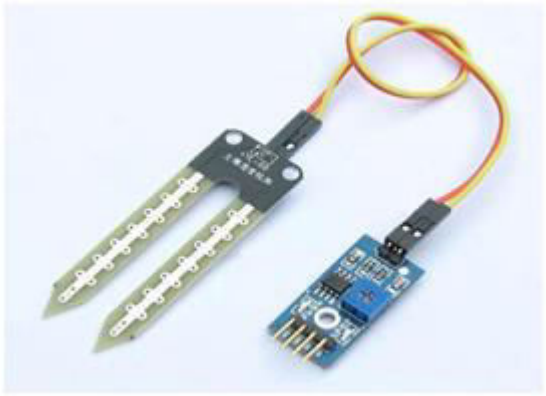

Fig2:Soil Moisture sensor

VI. SOIL PH SENSOR

Soil pH sensor is widely used in measuring the acidity or alkalinity of a soil. pH is defined as the value that standardizes the soil based on the activities of hydrogen ions in a liquid solution. In soils, it is generally measured in terms of a slurry mixture of soil mixed with water and it usually falls between 3 and 10, with 7 being its neutral value. Acidic soils have a pH value of at most 7 and alkaline soils have a pH value of at least 7. A soil pH meter is a soil specific instrument that measures the hydrogen-ion activity in water-based liquid solutions representing its acidity or alkalinity in terms of pH value. The pH meter compares the basic in-value difference in electrical values between a pH node and a reference end node.

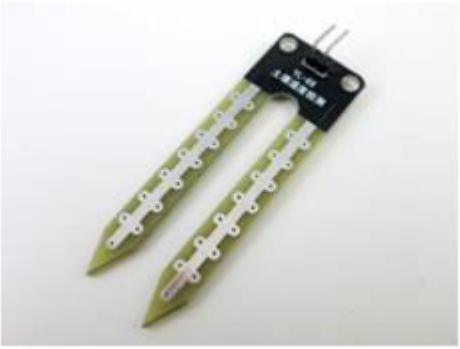

Fig3:Soil pH sensor

VII. WATER PH SENSOR

Water pH sensor is widely used in measuring the acidity or alkalinity of water-based solutions. pH is defined as the value that standardizes the water solutions based on the activities of hydrogen ions in a liquid solution. In liquids, it is generally measured in terms of a slurry mixture of solutions mixed with water and it usually falls between 3 and 10, with 7 being its neutral value. Acidic water solutions have a pH value of at most 7 and alkaline water solutions have a pH value of at least 7. A water pH meter is a liquid solution specific instrument that measures the hydrogen-ion activity in water-based liquid solutions representing its acidity or alkalinity in terms of pH value. The pH meter compares the basic in-value difference in electrical values between a pH node and a reference end node.

Fig4:Water pH sensor

Wi-Fi Module

Wi-Fi module is a device used to transfer the data via wireless network. The module is used to transfer the data obtained by the sender to another device like mobile, computer, etc, .This is also used for operating the devices remotely.

Fig5:Wifi module

VIII. SYSTEM DESIGN

The system design is given in the Fig 6. In which the workflow of the project is mentioned clearly and the transmission path is marked as line.

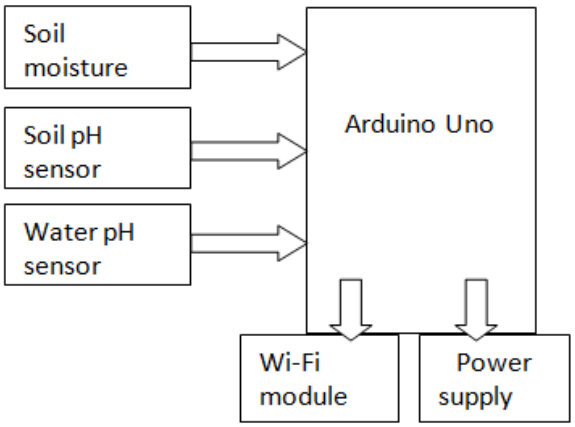

Fig6: Block diagram of our project

IX. RESULT AND DISCUSSION

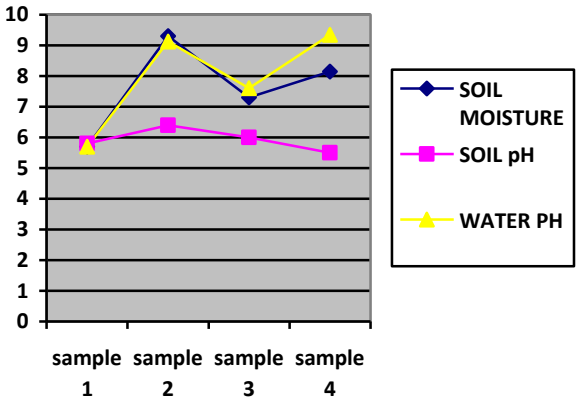

Chart1:Sample analysis

Table1:Result based on the analysis

Sample no	Soil moisture	Soil pH	Water pH	Crops
Sample 1	570	5.8	5.7	Bitter gourd
Sample 2	938	6.4	7.6	pumpkin
Sample 3	734	6	7.6	muskmelon
Sample 4	8.15	5.5	9.34	rice

The above tabulated sample values are obtained after testing and verifying the appropriate conditions needed in both soil and water components. Based on which, we'll be arriving with the so and so crops that can be cultivated and harvested properly.

X. CONCLUSION

The values obtained from dry soil are more likely to be compared with the values obtained out of wet soil because the conductivity level of soil increases drastically due to an implicit increase in ionic movements in the wet soil. The first method is quite effective in obtaining and monitoring soil moisture at various considered points in places. The second method is widely useful in over-viewing varying soil pH value distribution. At most 6 sensors can be made used in here simultaneously to reach appropriate accuracy in outcomes using Arduino UNO. This equipment costs reasonably and its implementation and procedures are simple and significant when compared with other recent technological methods. One of its outstanding features is simultaneously measuring the soil pH as well as water pH. The resultant data are transferred to the mobile device via wifi module. By analyzing the overall data, our module helps the user with knowing about their soil's fertility factor and crop growth. Our project also provides cultivation methods to the user for benefits.

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