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AGRISENSE: SMART IOT-BASED AGRICULTURAL SYSTEM

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Abstract---**Agriculture is most labor intensive as well as a very important field of occupation and because of environmental variations plant growth is affected a lot. Stabilizing the growth of plants and thereby increasing the output is a topic of major concern and by using the present technology automation can be provided in this field which will definitely help the farmers in the long run. Our idea is to build a system that will implement the use of microcontrollers and sensors to increase crop productivity. We aim to extract soil parameters like humidity, temperature, etc., and to display the same in a web interface (in this case a web page) for constant monitoring of the crop field. An irrigation system will also be installed which will operate according to the extracted parameters of the soil. The system will monitor the soil parameters constantly and in case of high humidity requirement the irrigation system will supply water to the field to meet the crop's moisture requirement.**

Keywords---**Smart agriculture, microcontroller-based irrigation system, humidity sensor, moisture sensor.**

I . INTRODUCTION

The state of agriculture in India is one of the country's major economic problems. Over 55% of Indians rely on agriculture for their livelihood, making it a crucial sector of our economy. Nevertheless, this industry is not as developed as it may be and confronts numerous difficulties that result in decreased production. Approximately 43% of the land in India is used for agriculture, although this sector only accounts for 18% of GDP. The entire population of India is concerned about the poor state of its agriculture. Poor and illiterate farmers in rural India suffer significantly, thus there aren't many reliable services available to them. Excessive reliance on rain is a common problem for farmers in India. Indian farmers are heavily reliant on the monsoon due to inadequate irrigation systems, hence during years with little or no rainfall, agricultural productivity suffers greatly.

As the world is trending into new technologies and implementations it is a necessary goal to trend up in agriculture also. Much research is done in the field of agriculture. Most projects signify the use of wireless sensor networks to collect data from different sensors deployed at various nodes and send it through the wireless protocol. The collected data provide information about the various environmental factors. The best way to boost agricultural output is not solely to monitor environmental elements. Additional elements contribute to a greater degree of productivity loss. Therefore, automation needs to be used in agriculture to solve these issues. Therefore, it is vital to create an integrated system that will take care of all elements affecting productivity at every level in order to offer answers to all such difficulties. However, due to a number of problems, agriculture cannot be completely automated. Although it is done at a basic level, farmers are not provided with a product to use as compensation for the resources.

Today most farmers are still using traditional farming techniques and most of their agriculture activities like sowing, and irrigation are based on prediction. But when it fails due to climatic conditions or lack of resources and adequate amounts of nutrients required for plant growth farmers have to bear great losses.

We are able to witness technological advancement in almost all fields but still, agriculture is deprived of the tech we have today.

This small step of ours aims to automate the farming process with the help of artificial intelligence and sensors for collecting environmental data. The program created is intended to make intelligent and smart decisions on the basis of the data gathered by the sensors.

II. LITERATURE REVIEW

India is one of the largest agricultural countries around the world. Farming in India is labor intensive and it provides employment to about 70% of India's residents who are dependent on farming. This indicates that our country is heavily dependent on agriculture and we need efficient ways to maximize our yield. This is where smart agriculture monitoring systems come into action.

Smart agriculture monitoring is an emerging technological concept in which data is collected from both small and large-scale farms using various types of sensors. This data is then collected and analyzed by experts to draw some

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conclusions regarding soil fertility, weather patterns, quality of crops, etc.
Generally, this smart agriculture monitoring system works with a microcontroller-based System (Internet of Things). This system reduces the manual labor needed to collect the data. The monitoring sensors can directly send their data to a server where the data can be stored and analyzed. So, the data always remains up-to-date and the data collection method is automated by using this system.
Using temperature and humidity sensors, an irrigation automation system based on microcontrollers keeps track of the soil's moisture level. The data is sent to the web server wirelessly. If the moisture content falls below a particular threshold the water pumps are started to get the optimum soil moisture content. All this process is automated so manual labor is needed to do it

III. PROBLEM STATEMENT

This project basically intends to focus on the problems faced in the agricultural field. Many solutions have come up in order to help provide better facilities but only a few have actually reached the people. The major problems that come into the limelight are the high manpower and cost required due to the absence of a technological interface.
Secondly, the absence of a crop monitoring process does not lead to intensification in crop output. Not only these but even some problems on a national level have an intense effect on this, for example, we know that India is still on the verge of development and is unaware of many new technologies.
The idea is to increase crop productivity by the use of smart irrigation systems along with renewable sources that will act as an upper hand in benefiting the nation.

IV. PROPOSED SYSTEM

In this section, the proposed microcontroller-based Smart Agriculture Monitoring System is discussed and the architecture is provided for the proposed system.
Initially, the system will be monitoring live readings from DHT11and Soil moisture sensor, the DHT11 sensor will output the air temperature and humidity and the soil moisture sensor will output soil humidity, the readings will be first displayed in a web interface for constant monitoring of the crop environment and also there will be an automatic irrigation system installed that will irrigate the crops if the temperature or humidity fall below the threshold value i.e. unfit for the crop. The irrigation system will consist of a DC pump and an L293 motor driver connected to the NodeMCU microcontroller and will pump water whenever required. For the monitoring of the crop Thing Speak platform will be used where temperature and humidity will be displayed on thingspeak.com. Therefore this system will be able to provide a suitable environment and sufficient water in order for the crop to grow properly thereby increasing crop productivity.
The moisture sensor continuously reads the value of moisture in the soil and sends this data to the Arduino. The input of the data is delayed by some amount of time. Arduino compares this value with the value of moisture predefined by the user and if the value is less than the predefined value then the relay is set to LOW. Since the relay is a low-level triggering device it will allow the current to pass through and thus in turn switch on the water pump.

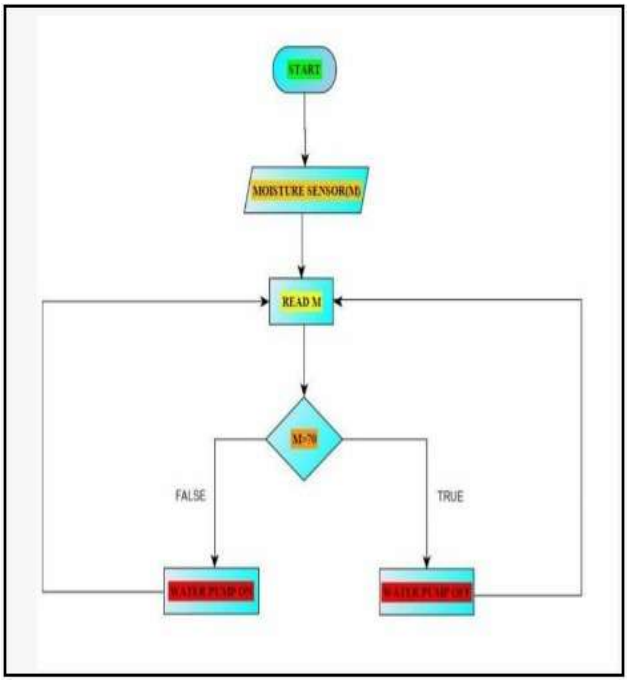
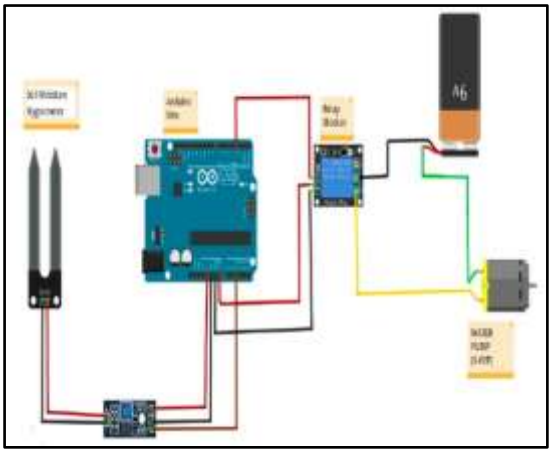


Fig. 1. Flow Diagram


Fig. 2. Architecture Circuit Diagram

As the value of moisture crosses the user-defined threshold value it is too HIGH and thus switches off and thus does not allow any current to pass through it, switching off the water

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pump in the process.

V.ANALYSIS

In this section, the analysis of the proposed system and the visualization for a sample scenario are given for the same.

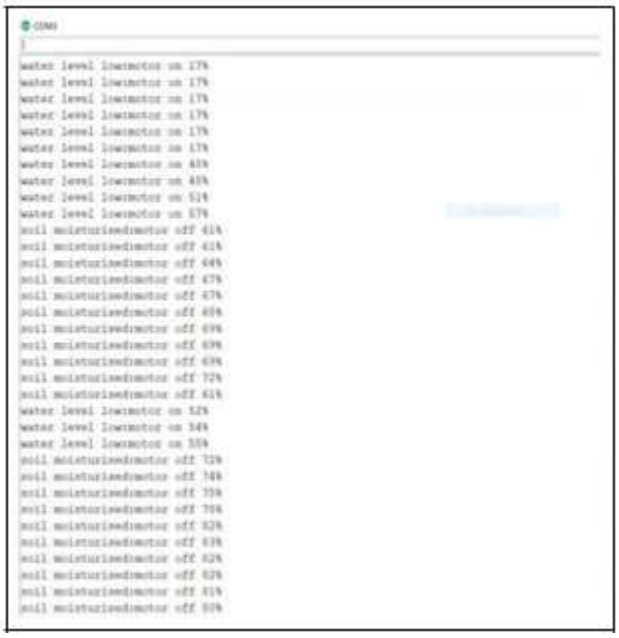


Fig. 3. Water Level, Soil Moisture Logs (in %)

Consider an instance where we've installed our setup across a field. The crop requires moisture content of 60% for its optimal growth. The initial moisture content of the soil is 17%. Since the value of moisture is less than the required predefined value, the relay is set to low (low-level triggered device) making the current pass through it, hence turning on the water pump. With time as the moisture content rises to more than or equal to the predefined, i.e., 60% value, the motor automatically turns off cutting off the water supply.
Thus, an efficiently implemented irrigation system can be seen, that accounts for the requirements of the crop as well as eliminates water wastage too.

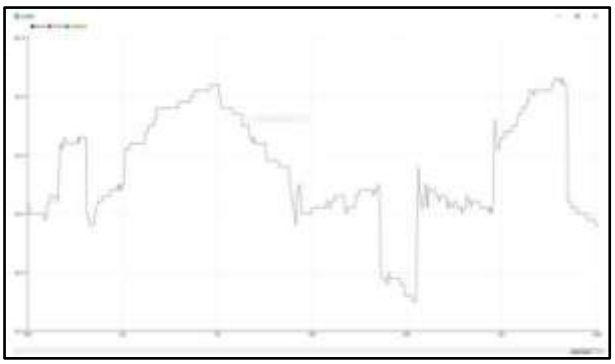


Fig. 4. Plot of Time v/s Soil Moisture

VI. CONCLUSION

As we know resources are scarce and we need an economical and sustainable approach towards efficient agriculture practices. In this paper, we tried to implement an efficient system to monitor soil moisture and accordingly control the flow of water to the plants. This system provides very accurate values with low maintenance requirements. By automating the process of irrigation, the farmer will not have to worry about the crops getting dry.
In the future, to get the precise value of moisture in the soil efficiently we can control the speed of the motor by using a controller so that as the threshold value of moisture is reached, the speed of the motor will be reduced and thus, in turn, the amount of water getting transferred per sec will get reduced. This will make the process even more efficient.

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