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Agriculture Spectation System Using Raspberry Pi

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***Abstract* - This is a project which helps the farmer overcome some of the hectic work in his day-to-day life. This project would help every single farmer with a better way of cultivation. This Farm Assist would help the person identify the type of soil on which he is going to cultivate. The color sensor in this project will recognize the color of the soil and classify it into black soil, red soil, loamy soil, sandy soil, and many more. As we know the type of soil, we can suggest the type of crops that can be grown. The farm assist has an inbuilt clock so that the farmer can set time which helps in plant watering automation. We would also tell the farmer how much water is in the bore well and we would recommend the right place to dig the bore well. We are using a pi noir camera to detect whether the plant is healthy or not.**

Keywords - lant Recognition, Raspberry Pi 4 Model B, IOT(Internet of Things), Agriculture Aid System

I. INTRODUCTION

When it comes to agriculture there are numerous agricultural implements and stages. One such implementation is Irrigation. Irrigation is recognised for the assistance of agricultural production. There are various irrigation techniques that have improved the way of development but there are still way more irrigational obstructions that make it harder for the farmer to overcome.Irrigation needs proper maintenance and observation. Farmers have to rely on groundwater resources as surface water will be unavailable due to evaporation and drought. Another main drawback is the less availability of farming loots and tools and less exposure to progress and innovation. Some major problems are:

(1) Deficiency Of Mechanical Advancement :

Lack of proper farm equipment is one of the biggest issues farmers deal with, which can make it difficult for them to adapt to the demands of contemporary agricultural methods.
Farmers' lives can considerably improve when they receive training using the equipment. The use of said equipment is crucial.Farmers' lives can considerably improve when they receive training using the equipment. The use of said equipment is crucial.

(2) Unawareness Of Climate Change :

Due to drought, heat waves, flooding, an increase in pests and plant diseases, and decreased food yields and nutritional quality, climate change's effects on agriculture may reduce crop yields. Effects of climate change make it harder for agriculture to satisfy human needs.

(3) Irregular Distribution Of Water :

Irregular distribution of water will result in less quality production of crops.With this we can also assure that irregular distribution of water is also one of the main conflicts.

II. LITERATURE REVIEW

[1]A paper was proposed in 2021 which stated that the sensors having humidity and soil moisture sensors justified the growth of the crops. It will also observe the system of rainfall in that particular area with the help of the rain sensor. Here, the motor will be operated without any human intervention.IOT plays a major role in this model.
[2]A paper that was proposed stated that soil frameworks like humidity sensors, and temperature are calculated for the paramount soil outcome. It is a fully automated process and stimulates the irrigation of the plant through the motor pump as per the moisture content present in the soil. Meteorology is not a constituent of this system.

[3]A paper was proposed in which solar cells or also known as photovoltaic cells are included to collect/receive the power where the system of electricity is not required. The soil moisture sensor is used here. The PIC microcontroller is assigned to ON/OFF the motor pump.

[4]A paper proposed another feature where irrigation was operated with the help of IOT(Internet of Things). Periodically the irrigation will be reclaimed/updated with a computer. Here sensors such as humidity, temperature, and ph sensors are used. The Internet is also needed for the stimulation of the soil conditions.

[5]Another paper that was submitted had the respective sensors placed inside the root area of the plant. This technique is not helpful to the farmers as it does not tell us the proper condition of the cultivator. A microcontroller is allocated for the regulation of water in that region.

[6]A paper presented a system of irrigation(using IOT). Here, the different types of sensors are used to calculate the different

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components of that particular soil. Here weather monitoring is not available. It is spectated through a web app/web interface.

[7]A paper presented an archetype that acts following the sensor's information and makes the device operate and thus results in transferring the data to the server. It contains two solar/photovoltaic panels. A communication link is present where the user schedules the irrigation through the web server from the mobile's internet.

III. FEATURES

1. SENSING SOIL BASED ON ITS HUMIDITY

The soil humidity sensor will measure the amount of soil humidity. The submersible motor will start pumping water to the field when the soil humidity drops below a specific threshold, making irrigation for the farmer easier.

2. SOIL RECOGNITION

3. We are using the color sensor to recognize the type of soil based on its color. By finding the type of soil we can assist the farmer with what crops can be grown in his soil. The farm assist also guides the farmer in the usage of proper fertilizers.
4.

5. THE BOREWELL CONCEPT

In order to gauge the amount of water in the bore hole, we are employing an ultrasonic distance sensor. The sound waves are first being sent into the bore well. The sensor detects echoes of the sound waves that are reflected by the water. We can determine the separation between the earth and the water by deriving echoes.
The farmer may simply determine his bore-well depth in this way. After that, we receive it as input along with the bore-well's radius. Since the bore-well is cylindrical, we may utilize the formulas r2h=Volume(Cylinder) by providing the inputs of height and radius.
We can calculate the cylinder's volume and, if necessary, translate it to liters (L)/m3/cm3.

6. IV. THE ACTUAL VARIATIONS

7. For the presence of a cut above or to make a difference between other projects. A few additional features are added and are replaced in our model with a package. The additional features are:

- The color sensor -It identifies the type of soil and suggests the types of crops that can be grown. The fertilizers will be displayed on the LCD for the crop which is selected from the list before.

8.

- The concept of bore well is also added to find the volume of water present inside the bore well through the ultrasonic distance sensor.
- The AI system is also included in this prototype to detect and distinguish the unhealthy plants from the healthy ones.Here a pi noir camera is also an assistance for this plan.

V. CONSTITUENTS OF THIS PROTOTYPE

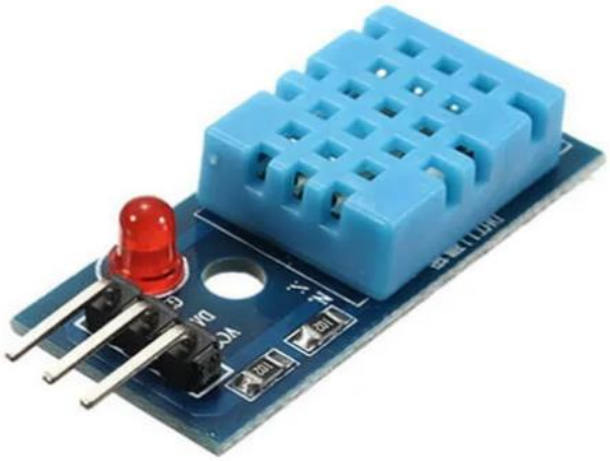

FIGURE 1.1

DHT-11(HUMIDITY SENSOR)

It is a simple digital humidity and temperature sensor. We'll use this sensor to record the air temperature as well as humidity. Here we use it to measure the soil humidity.

FIGURE 1.2

PI Cameras

A custom-designed add-on module for the Raspberry Pi hardware is the Camera Board. It uses a specialized CSI interface to connect to Raspberry Pi hardware. In still capture mode, the sensor has a native resolution of 5 megapixels. It can capture 30 frames per second in video mode at resolutions up o

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1080p.

FIGURE-1.3

UltraSonic distance Sensor

Ultrasonic Distance Sensor: As was previously said, ultrasonic sensors contain a transmitter (Trigger) that can broadcast infrared sound waves and a receiver (ECHO pin) that can catch reflected sound waves. It also includes power pins, VCC and GND. As stated, it aids in determining the borewell's height.

FIGURE-1.4

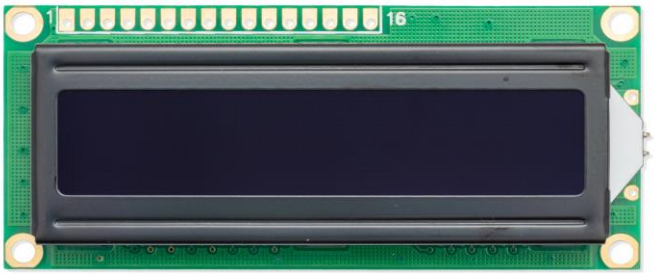
Raspberry Pi 4 Model-B

The most recent model of the well-known Raspberry Pi series is the Raspberry Pi 4 Model B. It offers revolutionary advances in terms of CPU speed, multimedia performance, memory, connection, and backward compatibility over the Raspberry Pi 3 Model B+ of the previous iteration. It uses the same amount of electricity as well.

VI. LCD (LIQUID CRYSTAL DISPLAY) :

A liquid crystal display is a leveled-paneled display or screen which is stimulated with the help of electricity. LCDs work on the condition of obstruction light instead of radiating a light. Compared with gas and light emitting diode displays ,the LCDs consume less amount of energy. With the help of the black light, Liquid Crystals are able to produce a picture in an LCD where the light from the LED is removed.

FIGURE-1.4



Liquid Crystal Display

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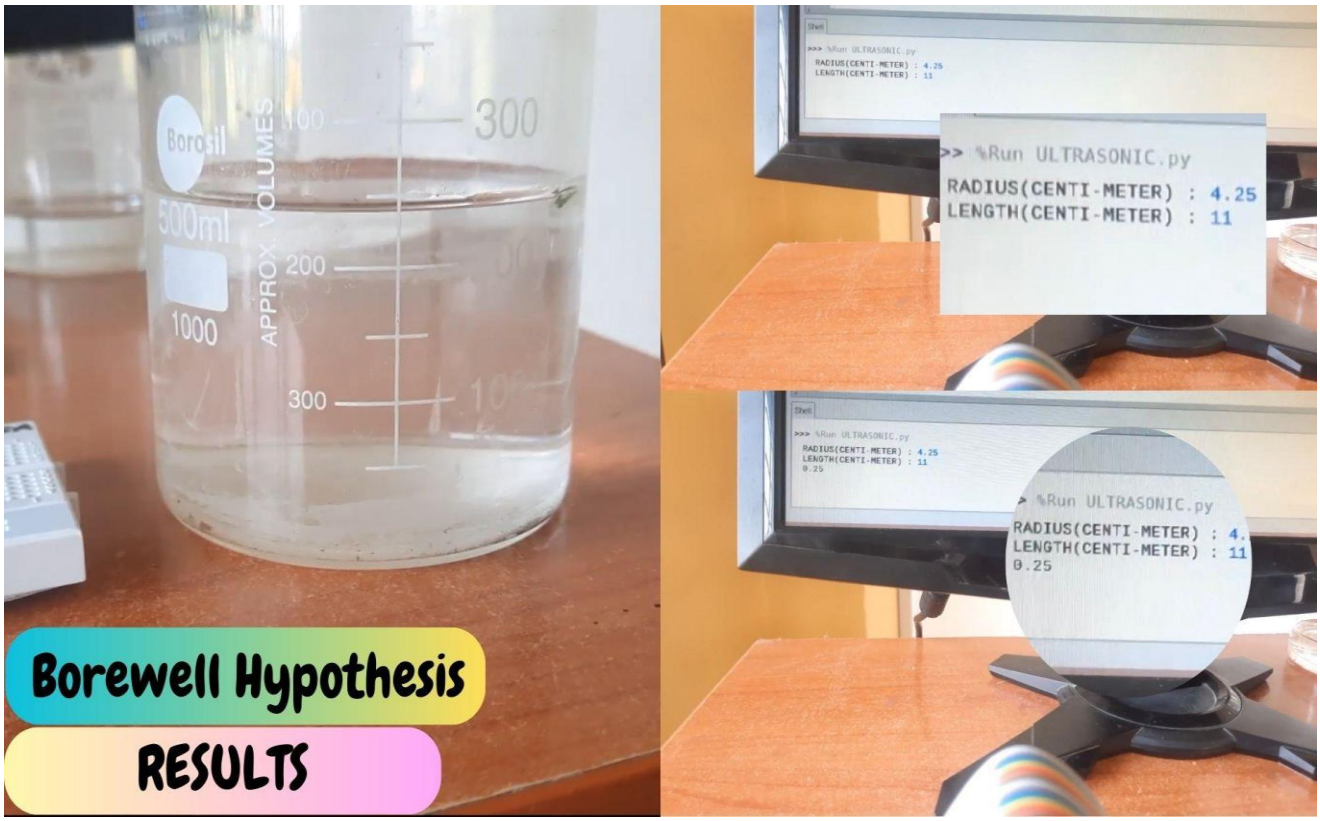
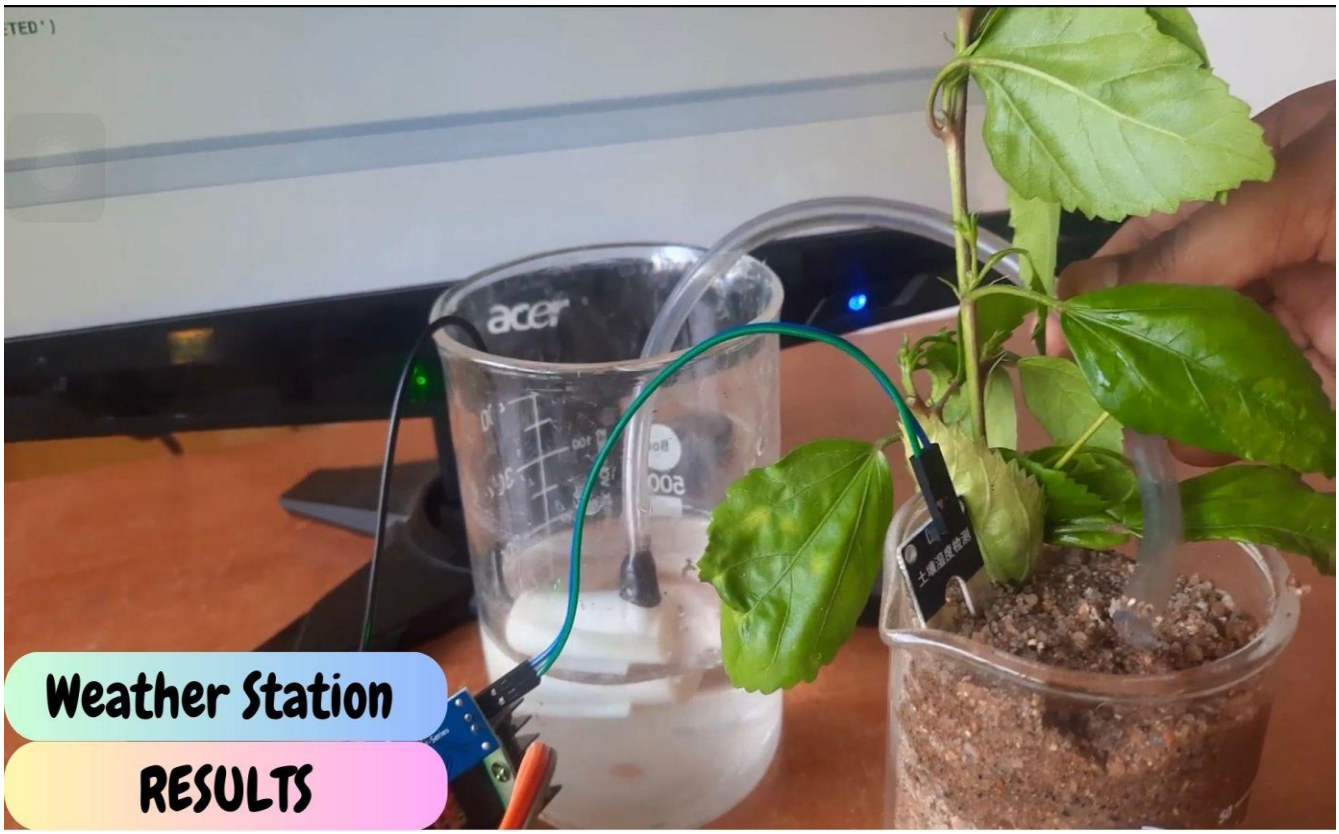
VI. RESULTS





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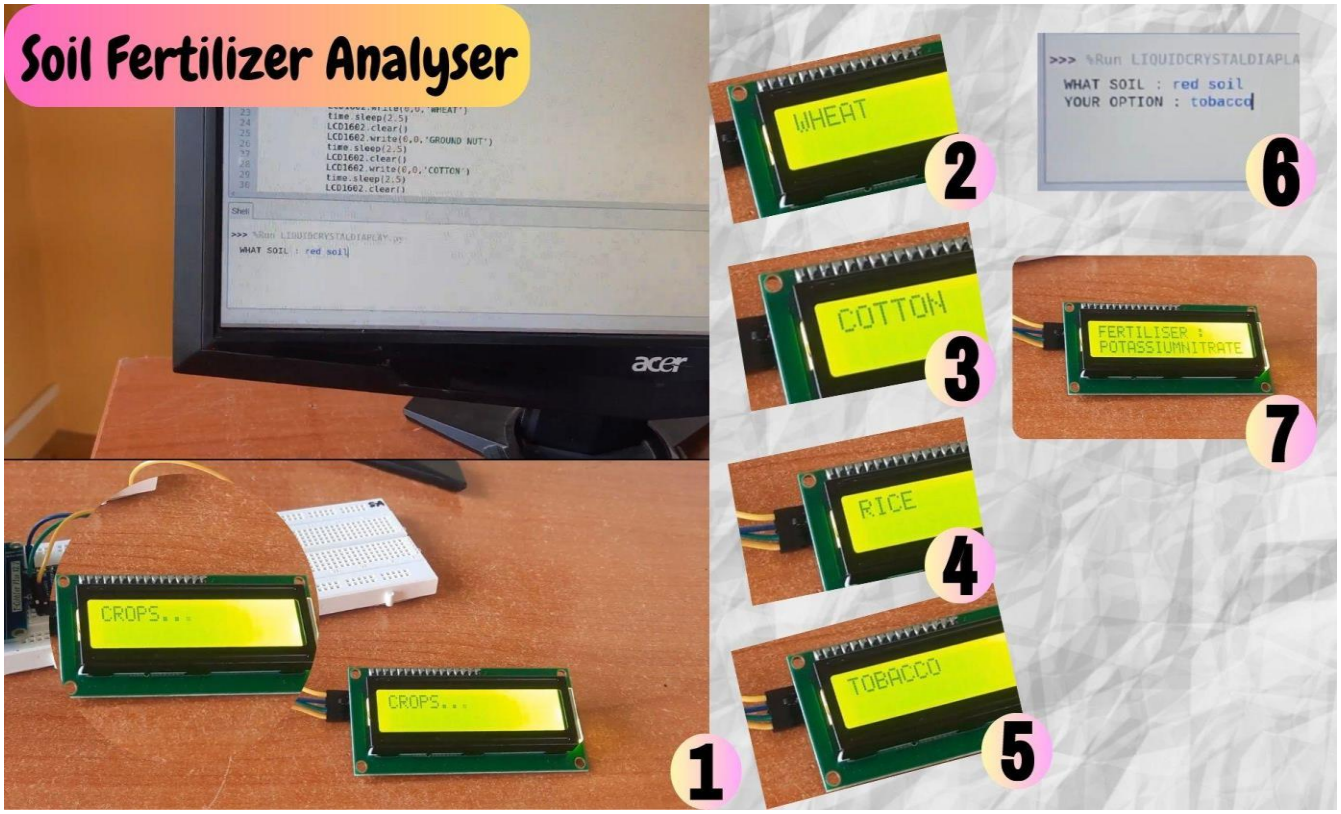

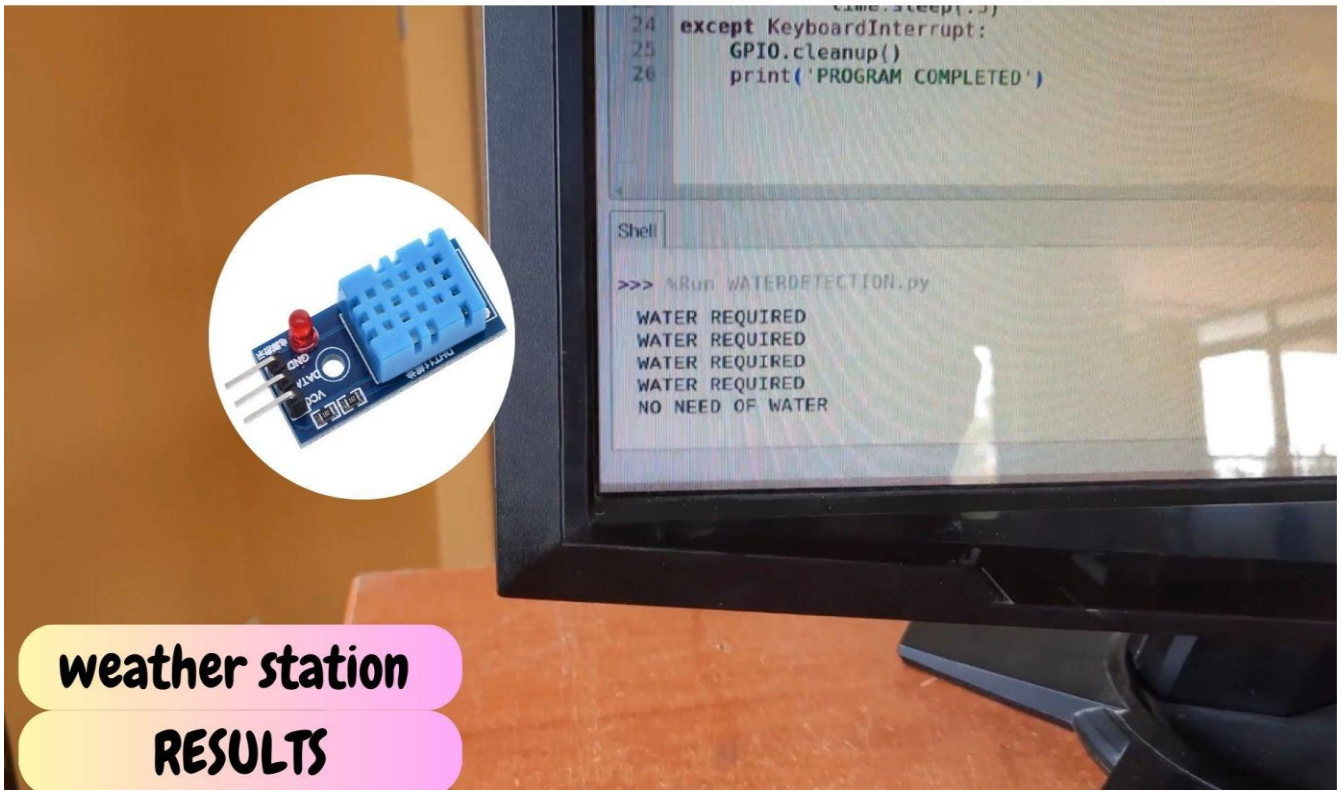

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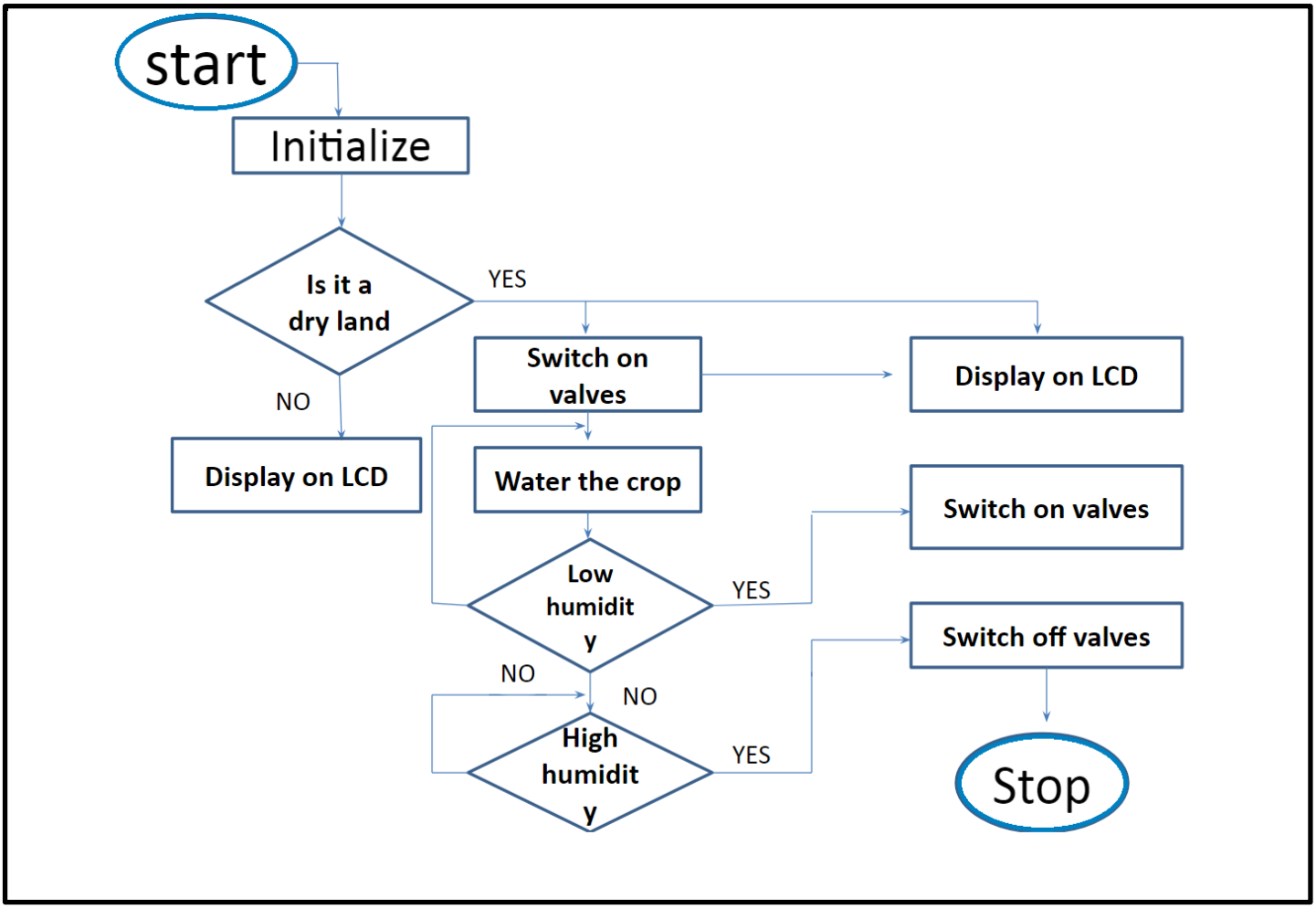
ALGORITHM :



ALGORITHM- 2.1

SOIL HUMIDITY

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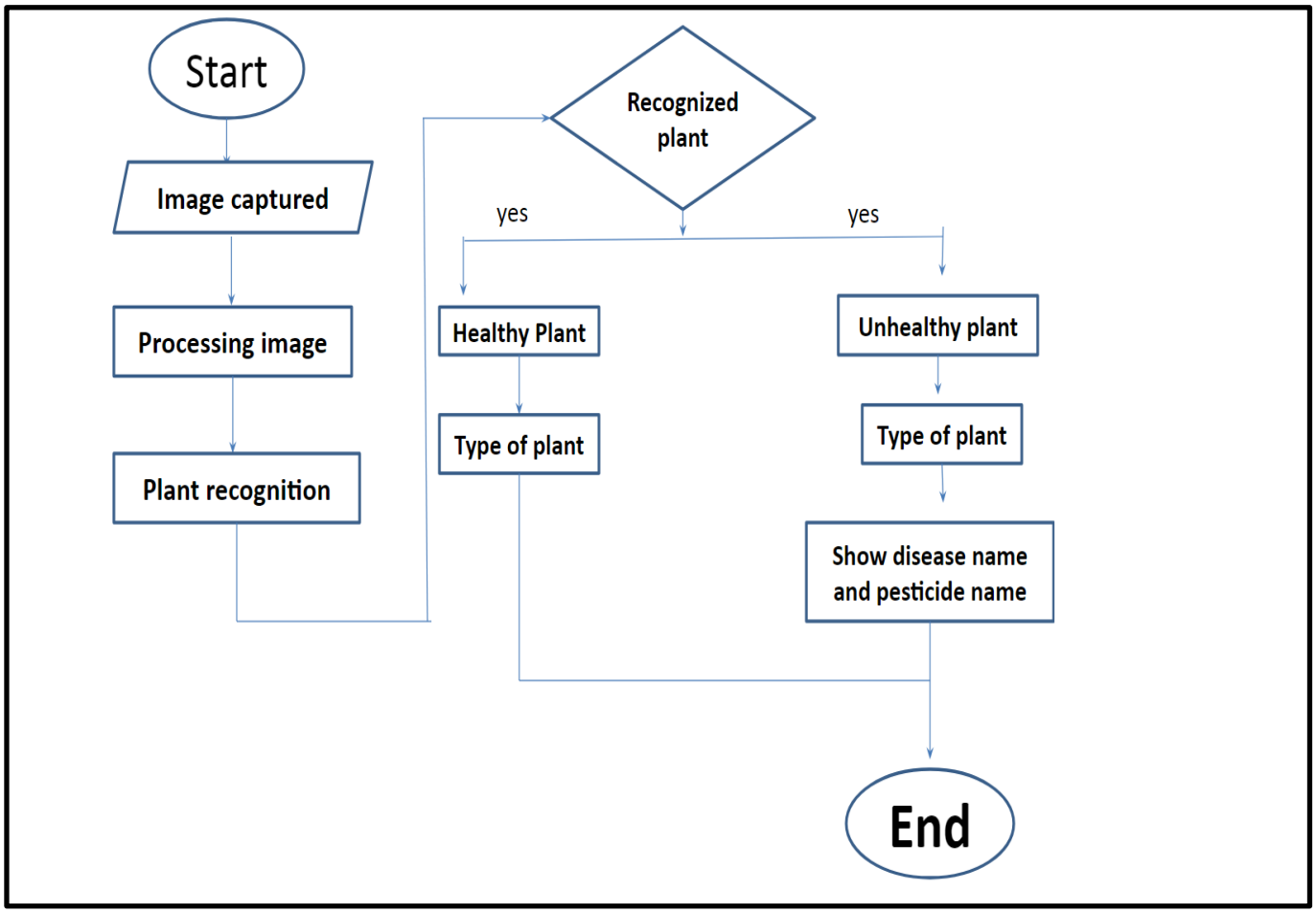

ALGORITHM- 2.2

DETECTION OF HEALTHY PLANTS AND UNHEALTHY PLANTS

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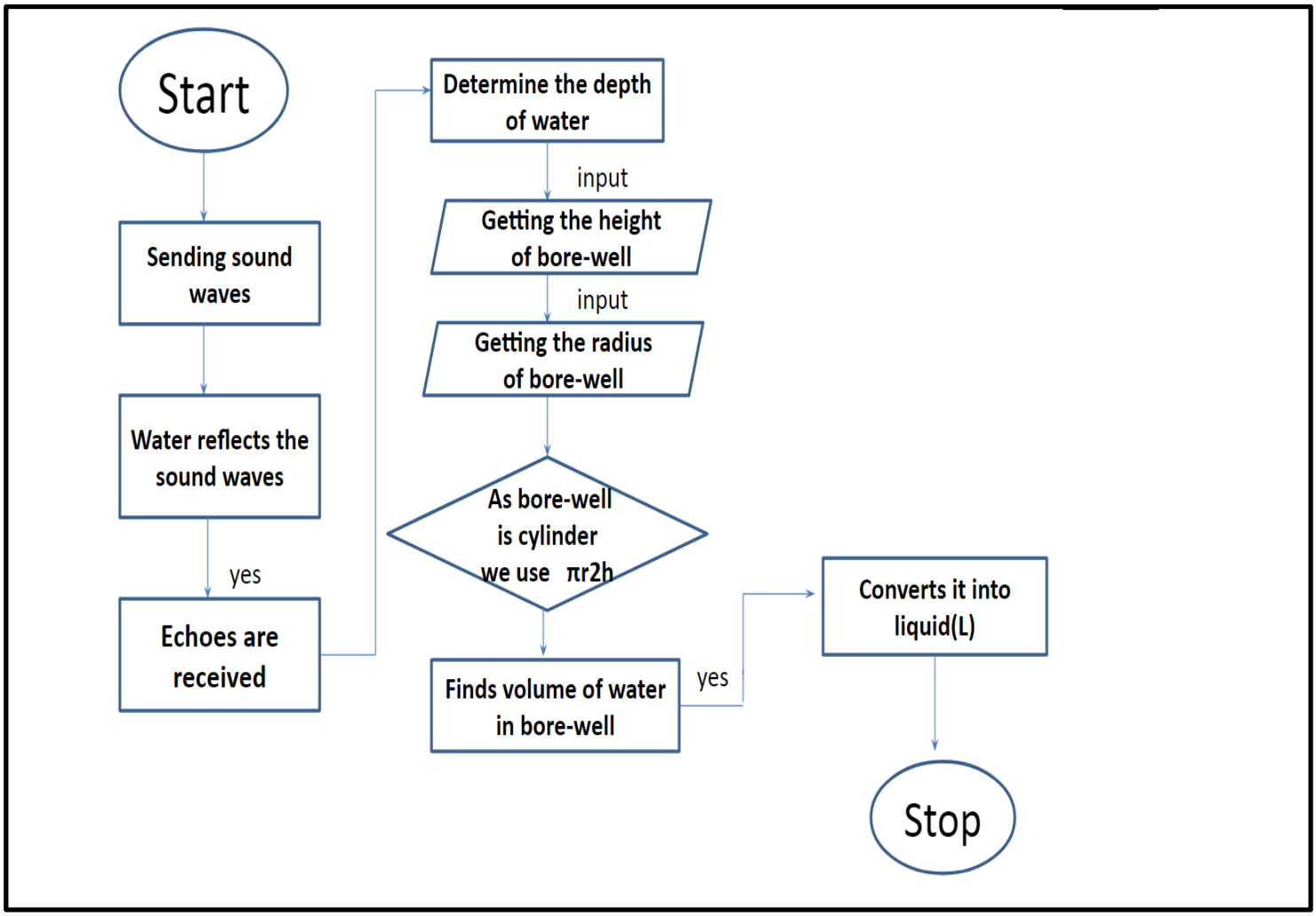

ALGORITHM-2.3

THE CONCEPT OF BOREWELL

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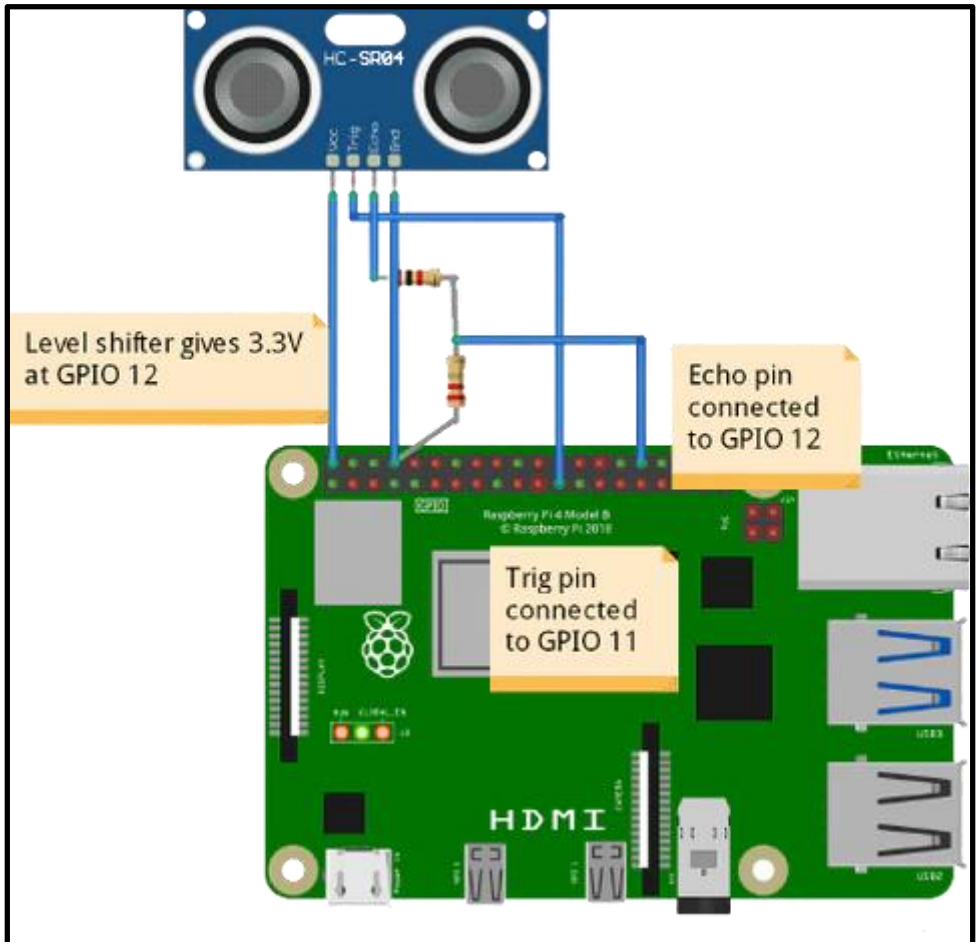

FIG 2.4 - CIRCUIT DIAGRAM

SOURCE- https://robocraze.com/blogs/post/interfacing-ultrasonic-sensor-with-raspberry-pi-4-gpio

VI. CONCLUSION

Agriculture is the basic source of the earth's prosperity. It can never be quantified. The major political problem faced by agriculture is its necessity to keep pace with population growth. This provokes and encourages the effort of the farmer for his development for a better way of life. This is proposed to modernize as well as to improve the productivity of the crop in the field. The advancement of agriculture field networking technology is required very much for agricultural development, but also a crucial sign of the far level of agricultural development. It'll be the longer-term plan of agricultural development. Applying the principles of this model to agricultural production has a great impact on making the efficient use of water resources that are available and also ensuring the efficiency as well as accuracy with stability of agricultural production which makes a better world.

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