| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 9, Issue 6, June 2020 ||

IoT Based Smart Agriculture System for Grapes

Apurva A. Londhe[1], Saurabh R. Patil[2], Imran A. Mulla[3], Dadaso S. Sargar[4], Prashant R. Deshmane[5]

Assistant professor, Dept. of EE, Sharad Institute of Technology College Engineering, Yadrav, Maharashtra, India[1]

Final Year UG Student, Dept. of EE, Sharad Institute of Tech. College Engineering, Yadrav, Maharashtra, India[2345]

ABSTRACT: IoT Based Agriculture System for Grapes is the solution for future demand for solving the issue of on-site monitoring and control of Grapes plant through sensor monitoring to have actual observation of parameters of Grapes that will give a better solution to farmer. This paper is about the implementation of IoT in Agriculture. IoT helps in better crop management, better resource management, cost efficient agriculture, improved quality and quantity, crop monitoring and field monitoring etc. can be done.

Arduino Uno based system that automatically measures weather parameters using sensors to find out disease on the grapes. This gives all weather condition information on our mobile also system uploads all parameter data on the internet. Smart agriculture is farming management concept using modern technology increase the quantity and quality of agriculture product. By precisely measuring variations within a field and adapting the strategy accordingly, farmers can greatly increase the effectiveness of pesticides and fertilizers, and use them more selectively. Smart Farming is also known as precision farming.

KEYWORDS: Smart Agriculture, IoT based Agriculture, Farm Sensing and Monitoring, Precision Farming.

I.INTRODUCTION

Traditional Farming & Precision Farming are very different from each other in every way. Traditional Farming uses the old and traditional methods of agriculture. The present traditional farming is based on on-site monitoring which needs farmer to visit the farm frequently also after visiting farmer can’t predict the accurate parameter and predication of diseases. So now a day’s population is migrating from rural to urban areas for different reasons, so they can’t visit the farm regularly. So it needs to develop a solution for distant farming. Also the prediction of the diseases can be made from the available researched data by local farms. Smart agriculture is farming management concept using modern technology increase the quantity and quality of agriculture product. By precisely measuring variations within a field and adapting the strategy accordingly, farmers can greatly increase the effectiveness of pesticides and fertilizers, and use them more selectively. Information about the presence of different soil properties and productivity within a particular plot of land can be electronically retrieved from so-called field record files, enabling farmers to respond in real time. The implementation of technology gave farmers the opportunity to drastically increase yield sizes by maximizing output and automating input via the capabilities of Agriculture Tech.

Inspecting the health state of farming has been a growing interest from last years for which various autonomous techniques are under use. One such technique is Iot Based System, IoT and Cloud computing technologies, can help in a real-time data extraction, evaluation and solutions to the agricultural farming. This paper aims to introduction of an Iot to the smart agriculture with Aurdino UNO and on field sensors. To face nature challenges, we need to involve the emerging technologies like Internet of Things (IoT) into agricultural sector along with various machinery or devices. IoT will be beneficial to connect the devices, collect and distribute the data on Internet thereby provide new approaches to farmers and the producers to make smarter decisions, reduce costs, provide efficiency and boost the production. The data acquired from sensors gives the condition at field like temperature, moisture in soil, leaf wetness and humidity. Smart agriculture employs a technique called precision farming where all the environmental aspects required by the crop to grow are constantly monitored. Monitoring alone cannot help the health of the crops. Besides, all this data is preserved and can be used for further prediction of disease on crop in that particular environment. So in this concept this all is integrated to develop a single module to use at field f grapes to pre indentify the disease, so that farmer can take necessary prevention action so that to save the crop from the diseases. This also can be developed for other crops than grapes by proper data and changing program.

II.SYSTEM MODEL DEVELOPMENT

This project involved the implementing of different sensors at the field to measure different parameter. The objective of the proposed research work is to provide real time measurement of farm parameter to the farmer through internet. The Smart Agriculture Management System consists of two modules, Data Monitoring and disease prediction.

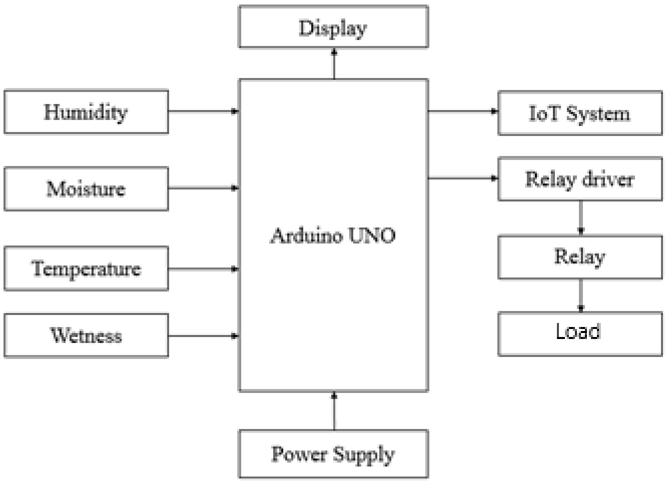

Figure.1 Functional Block Diagram

A. Internet of Things

Basically the internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The Internet of Things is actually a pretty simple concept; it means taking all the things in the world and connecting them to the internet. Internet of Things (IoT), a popular term now-a-days, de- scribes a system where the world is connected to Internet with the help different kinds of sensors. IOT is vision where “things”, especially everyday objects, such as all home appliances, furniture, clothes, vehicles, roads and smart materials, etc. are readable, recognizable, locatable, addressable and/or controllable via the Internet. Internet of Things will connect world’s objects in both a sensory and intelligent manner through combining technological developments in item identification, sensors and wireless sensor network.

B. Data Upload to Sensor Cloud

Two methods of data upload to the sensor cloud (Thing Speak) were carried out in this work. As the Arduino microcontroller allows shields to be connected to it to give it different capabilities, two different shields were tested. One was Ethernet Shield and the other being the GSM Shield. For the application presented in this paper, most suited shield was found to be GSM shield as it allows SMS capability which Ethernet shield does not and also it is more suited in remote areas where provisions for cable may not be available. ThingSpeak™ is an IoT analytics platform service that allows you to aggregate, visualize and analyse live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. Thing Speak is a free sensor cloud available for IoT enthusiasts. For Arduino to send data to ThingSpeak via the network connectivity with GSM shield, the official library for ThingSpeak is used. For setup of ThingSpeak, a user account and a channel is required.

C. Data Visualization

Data visualization is the graphical representation of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data. This feature is added for farmers to get idea about parameter so easily.

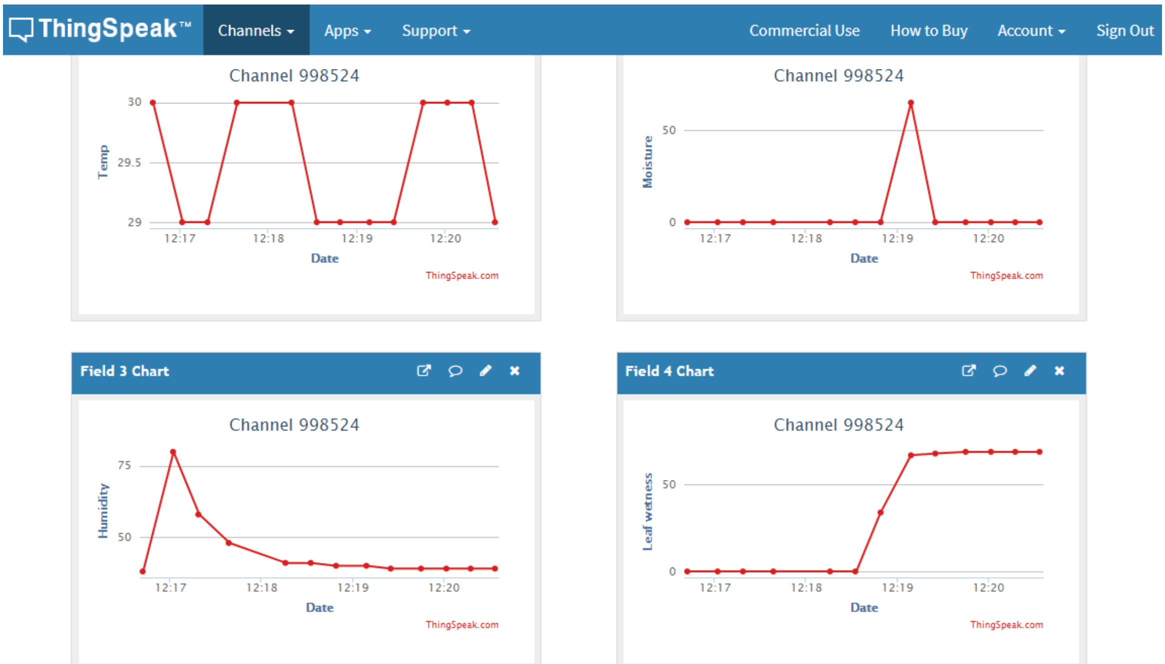

Figure.2 Things speak website data upload

D. Arduino UNO (ATMega-328)

It is a microcontroller development board made using ATmega328. ATmega328 has 14 digital input/output pins 6 analog inputs. It works on 16 MHz crystal oscillator, a power Jack and a reset button. It provides everything needed to support the microcontroller development board; it can be directly connected to computer with a cable and USB jack.

Features of Arduino Uno:

• Microcontroller: ATmega328. • Operating Voltage: 5V. • Input Voltage: 7-12V. • Digital I/O Pins: 14 (of which 6 provide PWM output). • Analog Input Pins: 6. • DC Current: 40mA. • Flash Memory: 32 KB. • SRAM: 2 KB. • EEPROM: 1 KB. • Clock Speed: 16 MHz

Configuration of AT Mega 328:

• The high-performance Atmel Pico Power 8-bit AVR
• RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities 1024B EEPROM, 2KB SRAM
• 23 general purpose I/O lines, 32 general purpose working registers
• Three flexible timer/counters with compare modes
• Internal and external interrupts, serial programmable USART
• A byte-oriented 2-wire serial interface, SPI serial port
• A 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages)
• Programmable watchdog timer with internal oscillator
• The device operates between 1.8-5.5 volts
• Advanced RISC Architecture
• High Endurance Non-volatile Memory Segments

E. LCD

LCD indicates different mode settings & set point adjustment. Also 16 char are divided to indicate speed output. The LCD Display used here is 16 characters by 2 line display. The 16 characters in both lines are equally divided to indicate commands and speed important pin EN (LCD enable) is directly connected to pin 14 of the controller. On the other hand pin R/W of LCD is connected to ground. The LCD interfacing is done here for indicating various display messages for the user. The interfacing is given in detail which is as follows: In this equipment the LCD which is used is 16X2 type i.e. 16 characters per rows and two rows. The function of LCD is to display the status of events performed by the respective circuit or to display those resulting parameters which have to be displayed on the screen as per user requirement. 16x2LCD It can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCDLCD is interfaced. In sub routines 'Enter Speed' and 'Current Speed' message, set Speed value is indicated on screen. In our project with the port-0 (D0-D7) i.e. from pin number 32 to pin number 39. In other words the data-bus D0-D7 is connected to port-0 of IC 89s52. Pin RS is directly connected to Pin11 of controller and one more another

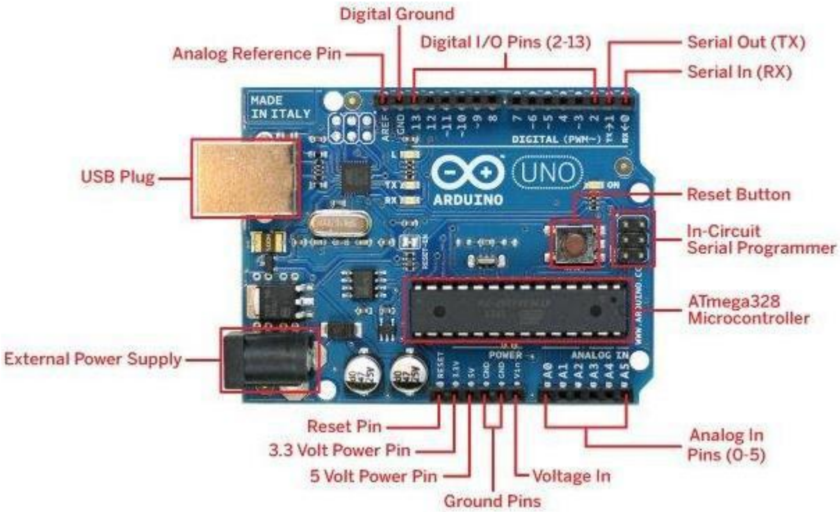

Figure.3 Pin out of Arduino Uno

F. GSM SIM300

SIM300 Module Features:

• Designed for global market, sim 300 is a tri-band GSM / GPRS engine works on frequencies EGSM 900.
• SIM300 features GPRS multi-slot class 10 / class 8 (optional) and supports the GPRS coding schemes.
• SIM300 can fit almost all the space requirements in your applications, such as smart phone, pad phone and other mobile devices.

GSM Modem Features:

• RS232 Interface with Hardware Flow Control Support (5 wire Serial interface with TX, RX, RTS, CTS & GND signals).
• Supports features like voice, data / fax, SMS, GPRS and integrated TCP / IP stack.
• Control via AT commands (GSM 07.07, 07.05 and enhanced AT commands).
• AC/DC 9-12 V /1.5 A Power Input.
• Pin 0.1" connector for Speaker & Microphone connectivity.
• Average Current consumption in normal operation 250 mA can rise up to 500-700 mA during Voice and GPRS connections. Current pulse can be high as 1.5-2 A.

Interfaces:

• RS-232 Interface with Hardware Flow Control support (5 signals - TX, RX, RTS, CTS and GND through D-type 9 connector).
• Serial port baud rate adjustable 1200 to115200 BPS.
• Pin 0.1" connector for Speaker &Mic connection.
• 8-pin flip type reliable SIM card holder.
• DC socket for Power Adapter.
• Rubber Duck GSM antenna or Magnetic Mount Antenna with approx. 3 mtr. cable.
• LED status for Power, Signal and Incoming Call.

G. LM35 Temperature sensor:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in °

Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

Features:
• Calibrated directly in ° Celsius (Centigrade)
• Linear + 10.0 mV/°C scale factor
• 0.5°C accuracy (at +25°C)
• Rated for full −55° to +150°C range
• Suitable for remote applications
• Low cost due to wafer-level trimming
• Operates from 4 to 30 volts
• Less than 60 µA current drain
• Low self-heating, 0.08°C in still air
• Nonlinearity only ±1⁄4°C typical
• Low impedance output, 0.1 W for 1 mA load 3

H. Humidity Sensor (DHT11)

Humidity sensors detect the relative humidity of the immediate environments in which they are placed. They measure both the moisture and temperature in the air and express relative humidity as a percentage of the ratio of moisture in the air to the maximum amount that can be held in the air at the current temperature. Humidity sensors detect the relative humidity of the immediate environments in which they are placed. They measure both the moisture and temperature in the air and express relative humidity as a percentage of the ratio of moisture in the air to the maximum amount that can be held in the air at the current temperature. As air becomes hotter, it holds more moisture, so the relative humidity changes with the temperature. Most humidity sensors use capacitive measurement to determine the amount of moisture in the air. This type of measurement relies on two electrical conductors with a non-conductive polymer film laying between them to create an electrical field between them. Moisture from the air collects on the film and causes changes in the voltage levels between the two plates.

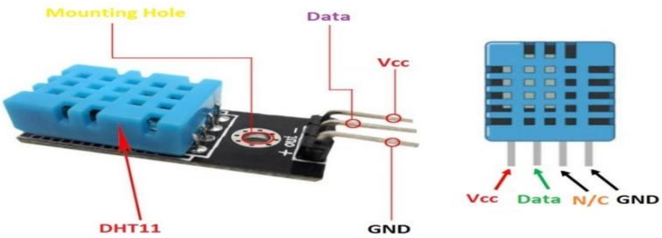

Figure.4 Humidity Sensor DHT11

I. Leaf Sensor

Basically, the resistance of the collector board varies accordingly to the amount of water on its surface.
Wet: the resistance increases, and the output voltage decreases
Dry: the resistance is lower, and the output voltage is higher
The LWS, manufactured by METER Environment, can detect small amounts of water or ice on the sensor surface for leaf wetness applications. Because the LWS measures the dielectric constant of the sensor's upper surface, it can detect the presence of water or ice anywhere on the sensor's surface. The LWS is designed to be deployed either in the canopy or on a weather station mast. Two holes in the non-sensing portion of the sensor body are provided for attaching the sensor to a pole or branch via twist ties or with 4-40 bolts.
Leaf wetness is a meteorological parameter that describes the amount of dew and precipitation left on surfaces. It is used for monitoring leaf moisture for agricultural purposes, such as fungus and disease control, for control of irrigation systems, and for detection of fog and dew conditions, and early detection of rainfall.
Leaf wetness may be measured by various means:

- By change in electrical resistance between two metal conductors in an alternate finger or double spiral configuration on a flat surface, either flat or cylindrical. The conductors are usually gold plated for corrosion resistance. An issue with this method is that measurements depend on droplets being large enough to bridge the gap between the conductors. A surface coating of for instance hygroscopic latex paint may be applied for more consistent results. Resistance measurement is often by alternating current excitation.

- By measuring the change in the dielectric constant of the surface of a sensor, thus detecting the presence of water or ice on the sensor's surface.

J. Moisture Sensor

The sensor measures the dielectric constant of the soil in order to find its volumetric water content (VWC). It obtains volumetric water content by measuring the dielectric constant of the media through the utilization of frequency domain technology. Since the dielectric constant of water is much higher than that of air or soil minerals, the dielectric constant of the soil is a sensitive measure of volumetric water content. The sensor has a low power requirement and very high resolution. This gives the ability to make many measurements (i.e. hourly) over a long period of time with minimal battery usage. In addition, the sensors incorporate a high frequency oscillation, which allows the sensor to accurately measure soil moisture in any soil with minimal salinity and textural effects.

K. Wi-Fi Module (EPS8266):

The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Express if Systems in Shanghai, China. The chip first came to the attention of Western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. \

However, at first there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.

The Pin-out is as follows for the common ESP-01 module:

1. VCC, Voltage (+3.3 V; can handle up to 3.6 V)
2. GND, Ground (0 V)
3. RX, Receive data bit X
4. . TX, Transmit data bit X
5. CH_PD, Chip power-down
6. RST, Reset
7. GPIO 0, General-purpose input/output No. 0
8. GPIO 2, General-purpose input/output No. 2

L. Detailed Connection Diagram:

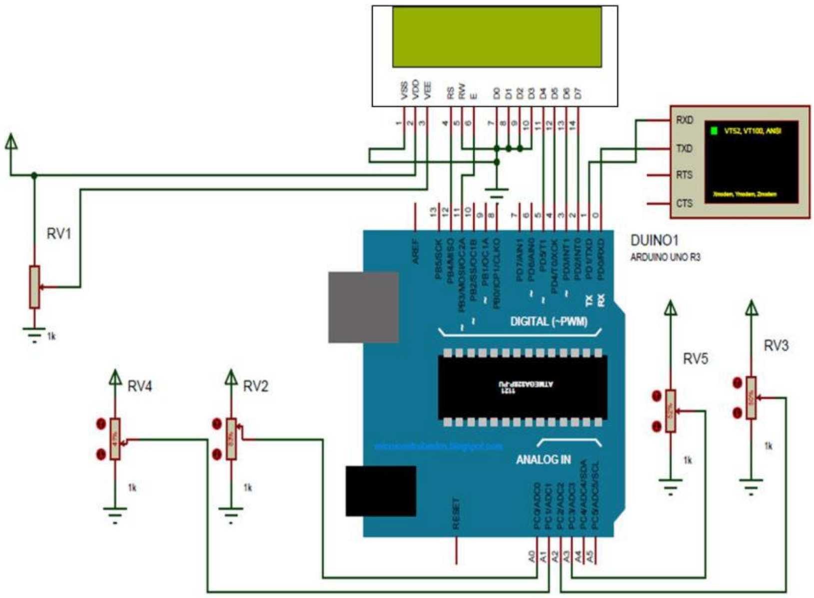

Figure.5 Connection diagram

1. RV1- LCD Brightness control POT 2. RV2 - Temperature sensor 3.RV3 - Moisture Sensor 4. RV4- Humidity Sensor 5.RV5 - Leaf Wetness Sensor

III. RESULT

Created at	Entry id	Field1	Field2	Field3	Field4
2020-02-23 12:16:42IST	1	30	0	38	0
2020-02-23 12:17:02IST	2	29	0	80	0
2020-02-23 12:17:19 IST	3	29	0	58	0
2020-02-23 12:17:39 IST	4	30	0	48	0
2020-02-23 12:18:16 IST	5	30	0	41	0
2020-02-23 12:18:33 IST	6	29	0	41	0
2020-02-23 12:18:49 IST	7	29	0	40	34
2020-02-23 12:19:09 IST	8	29	65	40	67
2020-02-23 12:19:25 IST	9	29	0	39	68
2020-02-23 12:19:45 IST	10	30	0	39	69
2020-02-23 12:20:02 IST	11	30	0	39	69
2020-02-23 12:20:18 IST	12	30	0	39	69
2020-02-23 12:20:34 IST	13	29	0	39	69
2020-02-27 12:06:09 IST	14	30	0	48	0
2020-02-27 12:06:44 IST	15	30	0	48	0
2020-02-27 12:07:10 IST	16	33	0	99	0
2020-02-27 12:07:35 IST	17	33	0	102	20
2020-02-27 12:08:00 IST	18	31	0	92	0
2020-02-27 12:08:23 IST	19	31	0	81	0
2020-02-27 12:08:38 IST	20	31	0	73	0

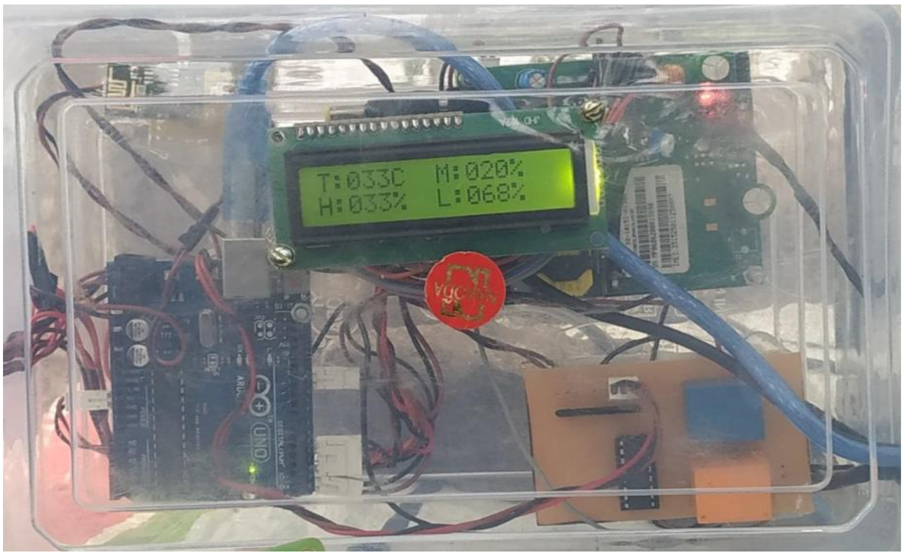

Figure 6: Hardware Result

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 9, Issue 6, June 2020 ||

IV. CONCLUSION

The concept of merging agriculture with state of the art technology can be achieved by integrating technology into the heart of agriculture, its traditional and primitive techniques. The complete real-time and historical environment information is expected to help to achieve efficient management and utilization of resources. By using the proposed approach, received updated information allows the farmers to cope with and even benefit from these changes. Farming can be made more efficient & accurate with the implementation of IoT device. IoT can be used in different domains of agriculture. The system is designed to remotely monitor the field parameters such as Humidity, Soil moisture, Temperature and Leaf Wetness, this information can be collected by the farmers with the help of cloud account and internet connection. The application of the latest innovations in technology, sensing and communications will allow for substantial improvements in precision agriculture practices and management solutions. By using sensors the crop field that is connected to internet, an appropriate decision can be taken.

REFERENCES

1. Sushanth, G., & Sujatha, S. (2018). IOT Based Smart Agriculture System. 2018 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET).
2. Nagaraja, G. S., Soppimath, A. B., Soumya, T., & Abhinith, A. (2019). IoT Based Smart Agriculture Management System. 2019 4th International Conference on Computational Systems and Information Technology for Sustainable Solution (CSITSS).
3. Namani, S., & Gonen, B. (2020). Smart Agriculture Based on IoT and Cloud Computing. 2020 3rd International Conference on Information and Computer Technologies (ICICT)
4. Rahul Dagar, Subhranil Som, Sunil Kumar Khatri "Smart Farming – IoT in Agriculture" 2018 International Conference on Inventive Research in Computing Applications (ICIRCA)