IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.-6, Issue-7, July 2018 E-ISSN: 2347-2693

Agile Agricultural System Using Wireless Fidelity

[1*]Neha Dayaram Amrutkar, [2]S. S. Morade

[1]Department of Electronics and Telecommunication, K. K. Wagh Institute of Engineering Education & Research Nashik, India
Department of Electronics and Telecommunication, K. K. Wagh Institute of Engineering Education & Research, Nashik, India

[*]*Corresponding Author:* amrutkarneha0705@gmail.com

Available online at: www.ijcseonline.org

Accepted: 14/Jul/2018, Published: 31/July/2018

Abstract— the Internet of Things has the potential has to transform the globe we live in; more-competent industries, automatic cars, and revolution of cities all these application are design using internet of things. However, the application of technology like Internet of things in agriculture has the greatest impact. There are seventy percent of people depends on the farming in India and one third people depend on other work. Facing the problem in agriculture often cause hindrance in the development of the country. Solution of this problem can be solve by using recent technologies. In this system, it is proposed to develop a Smart Farming System possess the benefits of cutting edge technologies such as internet of things and Wireless Sensor Network to help farmers for improving their farm. Using sensors like temperature, humidity, moisture, pH level sensor, wind speed sensor one can get the information about the parameters of the farm and then received data is transferred via raspberry pi to the server. Then the data received on the server, can be accessed by user to take necessary action. Also, an android application is installed in user's mobile phone provides which an additional advantage of accessing data from any location.

Keywords— Agriculture, Internet of Things, Wireless Sensor Network, Wireless-Fidelity, Environment

I. INTRODUCTION

Farmers take the decision on the base of aliveness for the human kinds as it is the main source of food grains and other raw materials. It plays very important role in the growth of country's economy. It also provides more than enough employment opportunities to the people. Improvement in agricultural areas is necessary and sufficient condition for the development of developing countries like India. Woefully, most of the farmers use the conventional methods of farming which results in small yielding of crops and fruits. But whatever automation was implemented it can be replaces by agri tech or new technologies. Therefore there is need to implement new and emerging technologies in the agricultural areas for getting the larger yield. Majority of the papers be an evidence of the use of wireless sensor network which collect the data from different types of sensors and then send it to main server using wireless protocol. Gathered information provides the data about distinct environmental factors which are useful to monitor the system. Monitoring environmental features is not enough and entire solution to enlarge the yield of the crops. There are number of variant feature that impact on the capacity to great extent. The insect and pest on the crop can cure using appropriate insecticides and pesticides'. It will improve the nutrients of the crop.

This project suggests a technique which is helpful in detecting the agricultural data and take action according to the threshold value. The field operations supply the versatility. This project is design to make resourceful agriculture using mechanization and IoT technologies. The salient features of this project involve smart sensing system, variable types of sensors such as temperature, humidity, moisture, pH level sensor, wind speed sensor, float sensor are used to get information about the field and assist farmers to take precise decisions on insights and recommendations based on the collected data. When soil moisture beyond threshold value sprinkler motor turn off, when level of water is beyond threshold value pumping motor turn off, When speed of wind is more the system will send the mail to user "don't spray fertilizers/pesticide". All this condition can be take place under controlling purpose.

II.LITERATURE REVIEW

Water is the most of important part for farming. So water management is necessary. In this paper Water management can be done using wireless sensor network. Established the communication of wireless sensor network for gathered environmental data and send the control signal

for turn on/off irrigation system. This system is useful for preventing the loss of water. [1]

This paper reduces the manpower and it can monitor the farm without visiting. This system uses soil moisture sensor, temperature sensor to get the information about field. Using GSM they will send the text as well as voice message to farmer. This method reduces the efforts of the farm and he feels comfortable to work on the farm. [2]

In this paper soil moisture sensor, CCTV and GPS are used. Soil moisture sensor gave the information about soil, CCTV took the information through image and GPS told the location of the farm. Whole collected information is converted into database. Save this database to monitor the system. This system also uses solar panel for solving the problem of power supply. [3]

In this experimentation, wireless sensor network is used for collecting the environmental data of farm with Internet Protocol camera. This system will stored the historical data for monitoring the farm and facilitate the client to get the information about field. [4]

In this paper they used camera to take photo manually and send the image to server, save records for viewing any other user. The system also sends the GPS co-ordinate. [6]

III. DESIGN

The things that are needed for this project are divided into two parts that is, functional and non functional. In functional part includes detail information of sensing and technical actions, and non functional part includes monitoring and controlling action.

3.1 Hardware Details

1. Raspberry Pi

Different types of raspberry pi are present such as R pi A, A+, R pi 2, R pi 3. In proposed system raspberry pi model B (version 3) is used. This version having more powerful processor, 10x faster than the first version. It is having wireless LAN and Bluetooth connectivity.

This model offers 40 GPIO pins which include GND, +3.3V, +5.5V supply voltage and all the pins are digital. It also provides camera connector, display connector, memory card slot, audio output and video output. It has 4 USB slot.

Out of these facilities I used 10 GPIO pin, GND, +3.3V, +5.5V supply, secure digital slot for inserting memory card, wireless connectivity for establishing the wireless connection between Raspberry Pi and server.

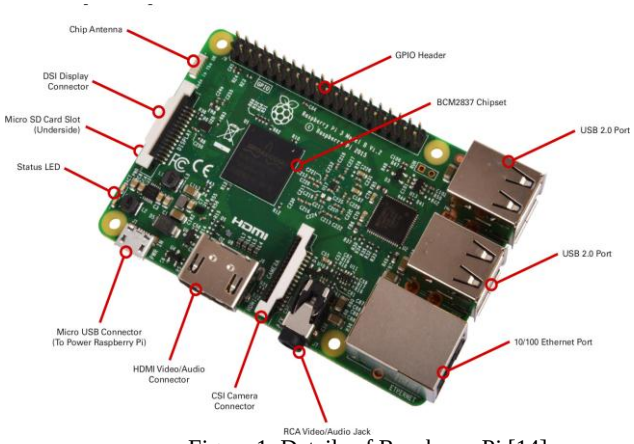

Figure 1: Details of Raspberry Pi [14]

2. DHT11 Sensor

DHT11 measures both temperature and humidity. This is the digital sensor. It will give input to raspberry Pi GPIO port in the form of 0 and 1. Raspberry Pi gives the data to server in the form of temperature in degree Celsius or Fahrenheit and humidity in percentage. In our system temperature is measured in terms of Fahrenheit and degree Celsius. DHT11 measures temperature using thermistor, which is also known as negative temperature coefficient (NTC).

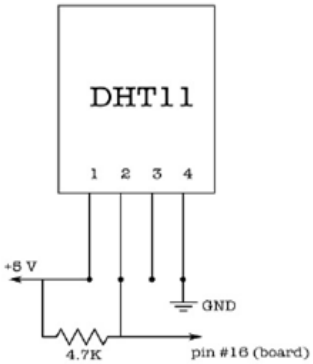

Figure 2: Circuit diagram of DHT11 sensor

In this temperature is depends on variable resistance. As the temperature increases resistance decreases. DHT11 measures the humidity with the help of capacity humidity sensor. Humidity level changes resistance between both the electrodes also change. This sensor is very useful to the farmer for collecting the information about temperature and humidity.

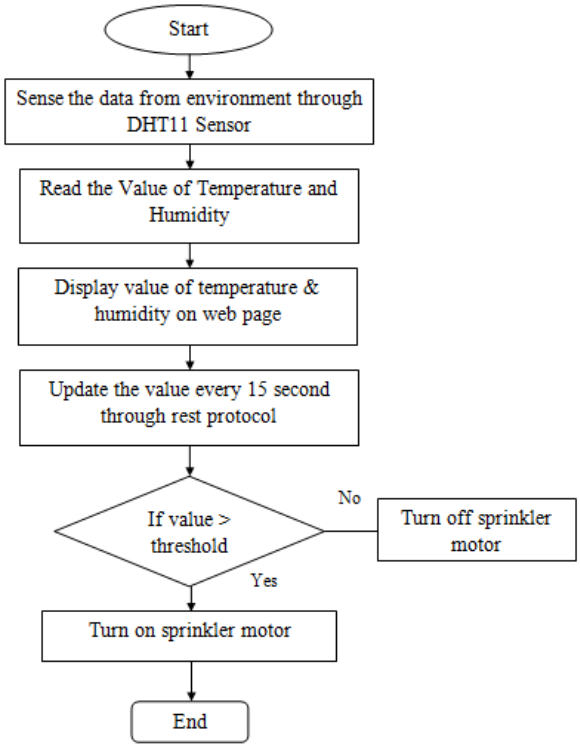

Figure 3: Flowchart for temperature sensing using DHT11

3. Float Sensor

Float sensor is analog sensor so input of this sensor is in continuous form. Data of this sensor cannot gives directly to Raspberry Pi. It requires analog to digital converter (MPC3008).This sensor perceive the level of water which is present in the tank. If level of water is beyond the threshold value turns off the pumping motor. And if level of water is less than the threshold value turns on pumping motor. So level of water is controlled by using relay and pumping motor.

Figure 4: Pictorial view of magnetic float sensor [4]

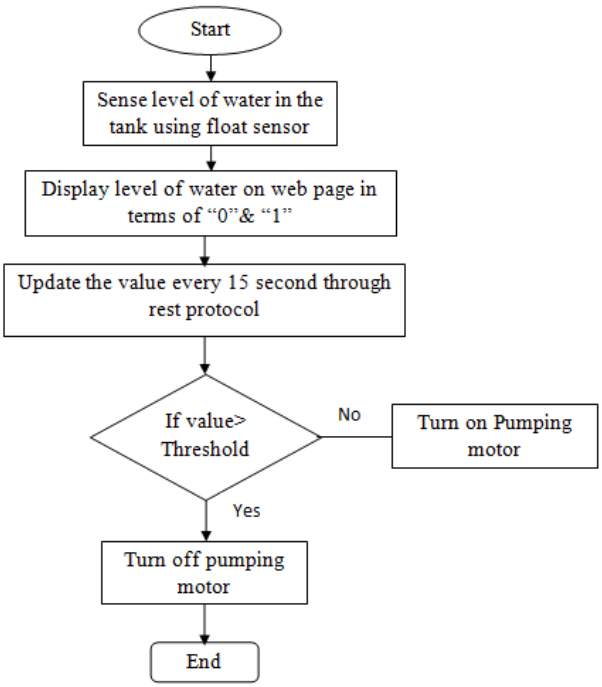

Figure 5: Flowchart for sensing the level of water

4. Acidity Sensor

The pH value is the negative logarithm of the molar concentration of protons (or hydronium-ions) in a solution:

$$pH = -\log(a_H^+)(mol.L^{-1}) \quad (1)$$

As a measure of soil acidity or alkalinity, soil pH constitutes one of the most pivotal chemical soil parameters. Normally, soil pH values outside the range of 5.5 to 6.5 are considered as non optimum because they can have negative impacts on nutrient availability, soil structure, soil organisms, and can make plants more sensitive to diseases. Due to uptake by plants and natural leaching of alkaline soil compounds, acidification is common among soils in temperate climates. Fewer soils, like soils on limestone or on glacial till, have high pH values. The controllation of soil pH by applying alkaline or acid fertilizers can limit effects of extreme acidic or alkaline soil conditions, which in turn improves crop production and resource efficiency.

This is analog sensor. It gives data in continuous form, but Raspberry pi only receives digital input. So this sensor requires analog to digital converter (ADC - MPC3008). Output of this ADC is send to the server through WI-FI connectivity of Raspberry Pi.

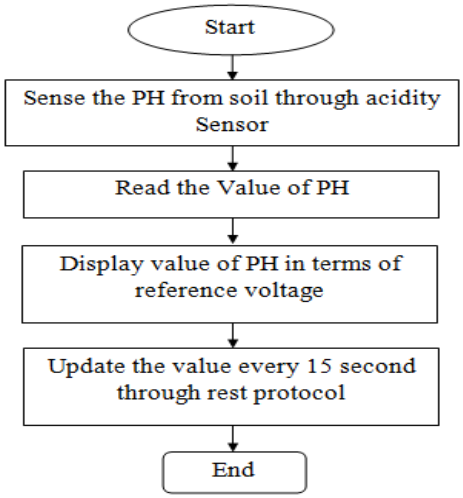

Figure 6: Flowchart for sensing pH of soil

5. Soil Moisture Sensor

Soil Moisture sensor is utilized to perceive the moisture which is present in the soil of farm. There are the two probes which is present in the soil moisture sensor is utilized to estimate volumetric content of water. More water is present in soil means conducts more electricity and less resistance. Therefore moisture level will be higher. Dry soil contents less water means conducts less electricity and more resistance. Therefore moisture level will be less. This sensor is very important for to know the condition of Soil.

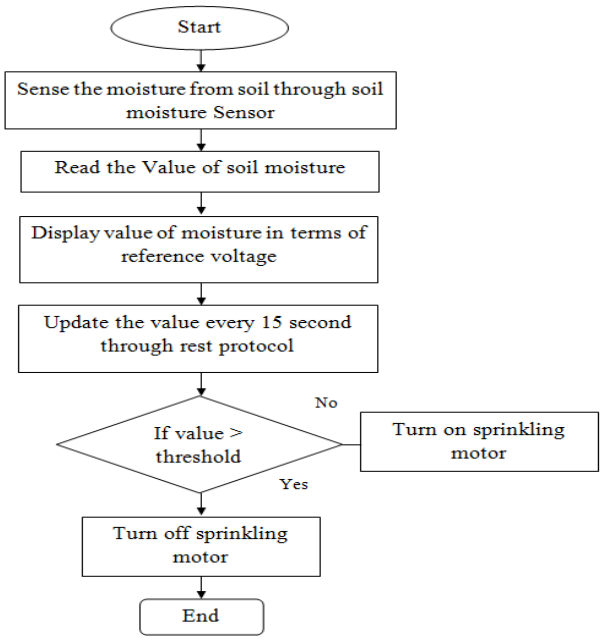

Figure 7: Flowchart for soil sensing using Soil Moisture Sensor

This sensor has both analog as well as digital pin. I used analog pin. It also required ADC (MPC3008) to convert analog to digital form. This digital data receives server though Raspberry Pi.

6. Wind Speed Sensor (anemometer)

Anemometer is used measure the wind speed or wind direction. It is important to know because to determine a suitable spot for growing plot and also determine the condition of are suitable for spraying or dusting crops with fertilizers or pesticides. It also helps to determine good time to take sample from your crop.

This sensor is analog sensor, so it requires ADC (MPC3008) to convert analog to digital form. This data is providing to sever using WI-FI module which is present on Raspberry Pi Board.

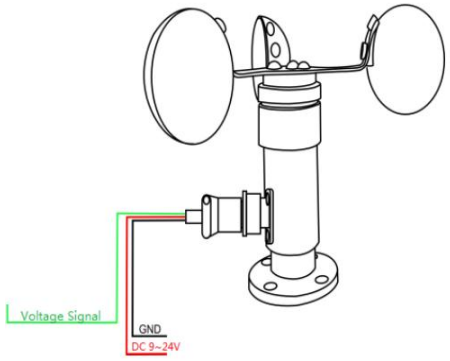

Figure 8: Circuit diagram of anemometer

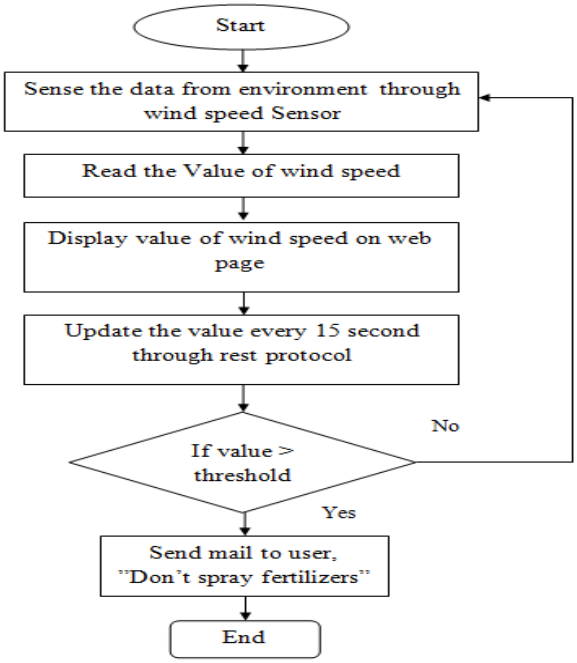

Figure 9: Flowchart for anemometer

IV. BLOCK DIAGRAM OF SMART RASPBERRY PI MODEL BASED AGRICULTURAL SYSTEM

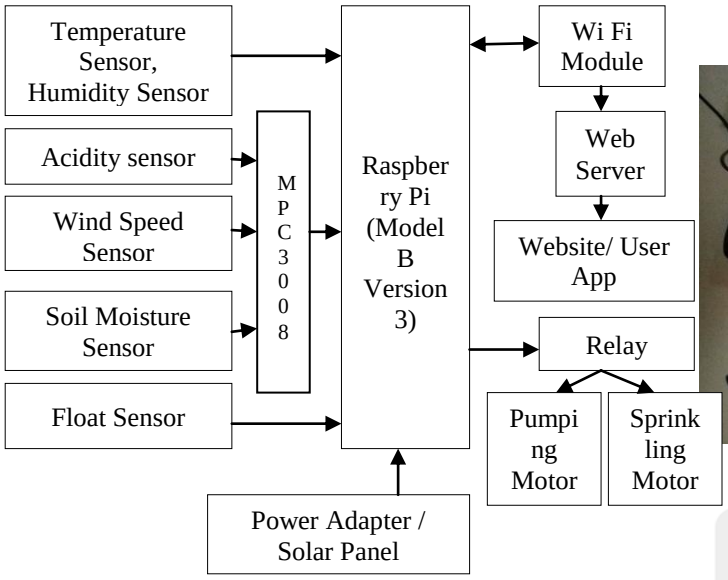

Figure 10: Block Diagram of Proposed system

This project is helpful for monitoring environmental parameter of the farm. In this project different sensors such as temperature and humidity, acidity, wind speed, soil moisture, and float sensors are used for collecting the information about the farm. So all this information upload on server through WI-FI module using Raspberry Pi

When the value of soil moisture senor is beyond threshold value sprinkling motor turn off, W hen value of float sensor goes beyond threshold value pumping motor turn off, When wind flow is more it will send the message ”Don’t spray pesticides / fertilizers”. All these actions are taking place for controlling purpose

4.1 Software details

Python is programming language used for raspberry Pi which is simple and object oriented language. NOOBS operating system is required for raspberry pi. All environmental data collected through different sensors such as DHT11 Sensor, Soil Moisture sensor, acidity Sensor, Float sensor, and wind speed sensor and send to the cloud. Update data every 15 second using REST protocol. Data is uploaded on things speak web page which is freely available for accessing purpose. Things speak website provides app called things view to get information about environmental parameter of the related farm. In this app we feed the channel id and access the information. This app shows information in terms of bar graph. When the condition goes beyond threshold value send the mail to user for controlling purpose.

V. RESULT

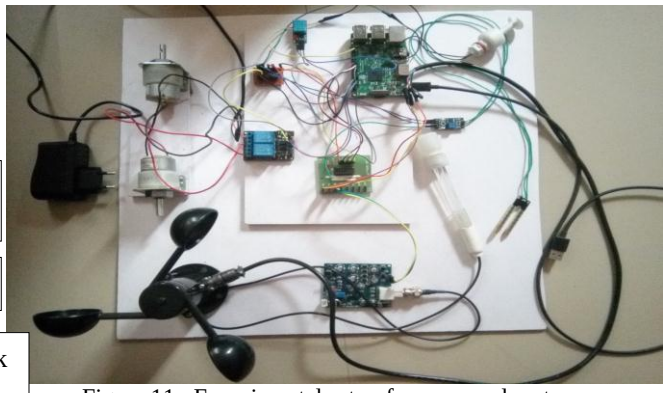

Figure 11: Experimental setup for proposed system

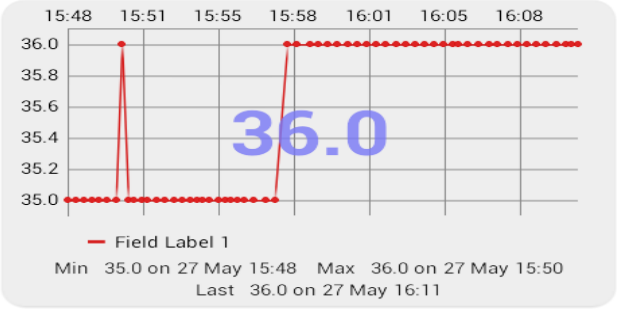

Figure 12: Temperature in Degree Celsius

Figure 12, shows the graph of temperature with respect to time. Temperature is shown in the form of degree Celsius using the formula is,

$$(°F - 32) \times \frac{5}{9} = ℃ \qquad (2)$$

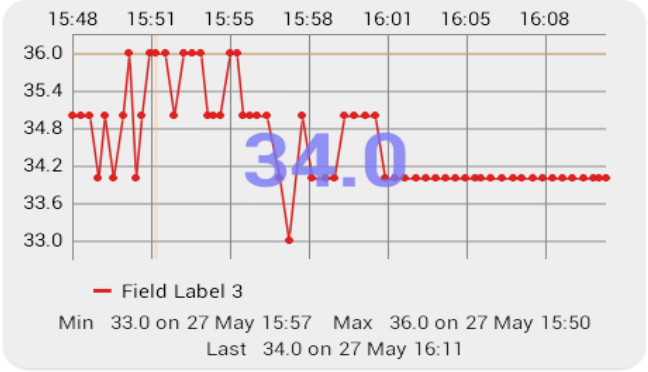

Figure 13: Humidity in percentage

Figure 13, shows the graph of relative humidity with respect to time. Relative humidity is shown in the form of percentage using the formula is,

$$RH = \frac{Pw}{Pws} \times 100 \quad (3)$$

Where, Pws = Saturation vapor pressure, Pw= Total pressure RH= Relative Humidity

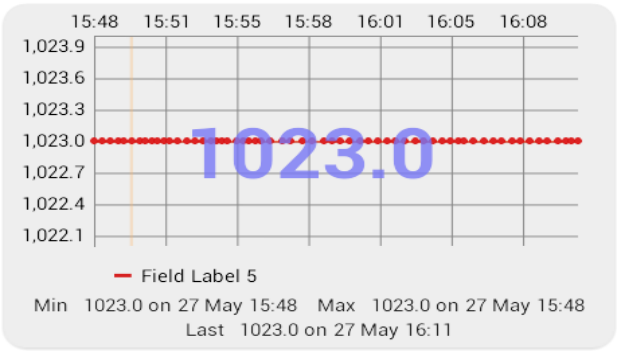

Figure 14: Level of Water

Figure 14, shows graph of level of water with respect to time. '0' represents tank is empty and '1' means tank is full.

Figure 15: Speed of wind

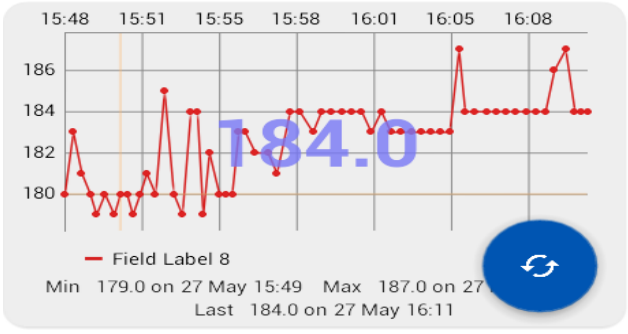

Figure 16: pH level of soil

Figure 16, shows graph of pH with respect to time. A value between 0 (for 0 volts) and 1023 (for 3.3 volts), producing 1,024 possible values.

Table I: Measured parameter of sensors W.R.T. time

Date	Temp in degree	Humidity in percentage	Level of water	Speed of wind (m/s)	PH level of soil
2018-05-24 08:02:49 UTC	33	42	0	2.5	2.5
2018-05-24 08:11:26 UTC	33	43	1	3.07	2
2018-05-27 14:49:09 UTC	36	53	0	12.55	4.5

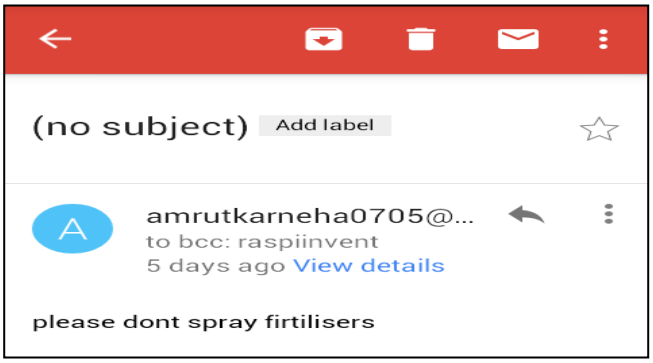

Figure 17: Sent mail to user according to wind speed sensor

This fig.17 shows notification to user whether the pesticides/fertilizers spray on field or not. This mail is send to user when wind flow is maximum.

VI. CONCLUSION AND FUTURE SCOPE

This experimental work is based on IoT which is helpful for farmer. It gives information about environmental parameters such as soil moisture, temperature, acidity of soil, speed of wind, humidity, and level of water. According to this information farmer will take appropriate decision about their farm. In this system automation of the farm is done with reduce cost for the benefit of farmer.

IoT based smart farming controlled irrigation use-full for farming, so that excess of the water to the crop can be saved. Threshold values for climatic conditions like humidity, temperature, moisture can be fixed based on the environmental conditions of that particular region. This system generates irrigation schedule based on the sensed real time data from field and data from the weather repository. This system can recommend farmer whether or not, is there a need for irrigation.

In this project using pH sensor value use of unnecessary fertilizers can be reduce. This system

automation reduces man power as well as work can be done easily.

The future work is trying to improve the topology structure to make all nodes communicate with each other, also to improve the stability of wireless sensors in communication,
by using better software and hardware design. Experimentation done for the one farm but can be develop with different crop pattern. Moreover, design and implementation of software can improve for interface more parameters.

ACKNOWLEDGMENT

This project is itself is an acknowledgement to the effort of many individual who have contributed to it we got a lot of guidance from various people at various stages of this system. Our guide Dr. S. S. Morade provides us excellent guidance throughout the project development period they suggested the necessary changes. I besides like to thank our HoD (Electronics and Telecommunication). Prof. Dr. D. M. Chandwadkar.

REFERENCES

[1] Jin-Shyan Lee, Yu-Wei Su, and Chung-Chou Shen "A Comparative Study of Wireless Protocols: Bluetooth, UWB, ZigBee, and Wi-Fi", *The 33rd Annual Conference of the IEEE Industrial Electronics Society (IECON)* Nov. 5-8, 2007.

[2] Jeonghwan Hwang, Changsun Shin and Hyun Yoe " Study on an Agricultural environment Monitoring Server System using Wireless Sensor Networks" ISSN 1424-8220 www.mdpi.com/journal/sensors, 2010.

[3] Hui Changl, Nan Zhou1, Xiaoguang Zhaol," A New Agriculture Monitoring System Based on WSNs" *Journal of Anhui Agricultural Sciences*, vol. 38, pp. 4370-4372, 2010.

[4] Nattapol Kaewmard, Saiyan Saiyod" Sensor Data Collection and Irrigation Control on vegetable Crop Using Smart Phone and Wireless Sensor Networks for Smart Farm" *2014 IEEE Conference on Wireless Sensors* (ICWiSE), October, 26-28 2014.

[5] Marcello A. Gómez Maureira, Daan Oldenhof, "ThingSpeak – an API and Web Servicefor the Internet of Things", https://thingspeak.com/channels/2567. 2014-06-08.

[6] M.K.Gayatri, J.Jayasakthi, Dr.G.S.Anandha Mala, " Providing Smart Agricultural Solutions to Farmers for better yielding using IoT", *IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development*, vol 45, 2015.

[7] Soundhar Ganesh,Venkatash,Vidhyasagar,Maragatharaj, "Raspberry Pi Based Interactive Home Automation System through Internet of Things", *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*, Volume 3 Issue III, March 2015.

[8] S. Shanthi, Abinaya. R, Akshaya. V, Gowri. S " Agriculture Crop Monitoring using GSM in WSN" *International Journal of Advanced Research in Computer and Communication Engineering* Vol. 5, Issue 3, March 2016.

[9] Abdullah Na, William Isaac, "Developing a Human-Centric Agricultural Model in the IoT Environment", *International Conference on Internet of Things and Applications (IOTA) Maharashtra Institute of Technology*, Pune, India 22 Jan - 24 Jan, 2016.

[10] Arindam Giri, Subrata Dutta, Sarmistha Neogy, "Enabling Agricultural Automation to Optimize Utilization of Water, Fertilizer and Insecticides by implementing Internet of Things (IoT)", *International conference on information technology*,2016.

[11] The Internet of Things, http://www.gartner.com/it-glossary/internet-of-things, on February 20, 2016.

[12] IOT Devices, http://blog.atollic.com/one-trillion-iot-evices-expected-by-2025-what-development-tools-to-use-for-development-of-internet-connected-iot-products, on February 18, 2016.

[13] Research papers on IOT, http://www.engpaper.net/free-research-papers-iot-internet-of-thing.htm, on February 20, 2016.

[14] The official RaspberryPi website, www.raspberrypi.org, on January 31, 2016.

[15] James Brown and Utz Roedig, Carlo Alberto Boano and Kay Romer, Nicolas Tsiftes, "Demo Abstract: How Temperature Affects IoT Communication", February 19, 2016.

