# "DESIGN & IMPLEMENTATION OF REAL-TIME CROP MANAGEMENT SYSTEM BY USING ARDUINO & IOT"

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**ABSTRACT:** *Now days it's a challenge to enhance development of plant in respect of its growth and to cut back costs which ends up in an innovative idea of utilizing that crop monitoring with IOTs system which is able to further help in better management of water and human resources. This an crop monitoring with IOTs system using GSM are developed using sensors technology with Arduino UNO and GSM module to efficiently utilize water for irrigation purpose. That system has soil moisture sensor inserted into the soil of the plants and a water level sensor placed in an exceedingly water container from where water are going to be pumped to plants for irrigation. Certainly this algorithm is designed with the help of threshold values from the soil moisturing sensor to control water quantity in soil and to measure the water level in tank. This project requires Arduino UNO board having inbuilt ATMega328 microcontroller. Now, it is time to convert the manual irrigation into automatic irrigation with the help of soil moisture sensor and it will detect dankness content of soil and user or owner make asking call resulting in turn ON/OFF of pumping motor. Human efforts are reduced using this system and increase saving of water by efficiently irrigating the plants. The look has been made with better resource management and low power consumption. This project consists of micro-controller ATmega328 family which collects the input signals within the soil through soil moisturing sensor. GSM module receives the request call and sends the all current status of sensor riding through SMS. An LCD screen is additionally linked to the micro- controller to indicate moisture conditions of the soil and water pump. The water level sensor is deployed to detect the extent of tank so tank contains efficient water to transfer into crops.*
**Keywords:** Arduino, wireless sensor network, sensors, IoT, Agriculture**.**

## 1. INTRODUCTION

As the world is growing into new technologies, ideas and their implementations it is a necessary goal to trend up in agriculture also. Our project is significant on the use of wireless sensor network which collects data from different sensors deployed at various nodes and send it through the wireless protocol. The collected data provides the information about the various environmental factors. Real time crop management model is a real time monitoring system. This model monitors the soil properties like temperature, humidity, soil moisture, PH, etc. It is feasible to control many operations of the field remotely from anywhere, anytime by IOT. It offers a futuristic way of life in which the farmer gets the control his field using a smartphone, it also offers an efficient use of energy. The use of wireless sensor network and IoT is applied in all areas of industry, including smart agriculture, smart parking, smart building environmental monitoring, healthcare transportation and many more.

## 2. LITERATURE SURVEY

G. Naveen Balaji, V. Nandhini, S. Mithra, N. Priya , R. Naveena figure out that experiments on bases of IOT Based Smart Crop Monitoring in Farm Land. And hence, this system module performs data acquisition, processing, transmission and reception functions. The main goal of this group is to collect all the required information regarding the soil using the sensors and then send this information to the Arduino ATmega 328, the GSM module is also connected to the arduino microcontroller which is generating the alert message which is useful for the farmer to know the status of the farm. They have used Arduino ATMega 328 microcontroller, soil moisturing sensor YL-69, temperature and humidity sensor DHT11, GSM module (SIM800), Wi-Fi module ESP 8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) capability produced by Shanghai-based Chinese manufacturer, GMAX 232 which is an integrated circuit that converts signals from a TIA-232 (RS-232) serial port to signals proper for use in TTL-compatible digital logic circuits The MAX232 is a dual transmitter as well as dual receiver that is generally used to convert the TX, CTS, RTS signals.

G. Sushanth and S. Sujatha from Department of ECE, Christ University, Bangalore, Performed experiments on IOT Based Smart Agriculture System. This researches created a IoT based

smart agriculture system in which they had also done something similar to the IOT Based Smart Crop Monitoring in Farm Land by the G. Naveen Balaji, V. Nandhini, S. Mithra, N. Priya , R. Naveena. In this system they have implemented a LCD display with the arduino board/microcontroller which is displaying the value of various environmental aspects like the temperature, humidity, motion. They had been developed an android application for same purpose to display information. They had been using the cloud to store value from crop monitoring system and to retrieves the values. The components they had used are as: Arduino Mega microcontroller, Max232, wifi module, relay for water pump, moisture sensor, humidity sensor, temperature sensor, motion sensor, LCD display, cloud storage, power supply & the mobile phone.

## 2. PROBLEM STATEMENT

The proposed paper aims to detect the various crop related diseases and to provide the real time status of the crop to reduce the crop expenses. It must provide the real time environmental information related crops, crop diseases. The system should also provide the essential data about the soil moisture, humidity, temperature, and so on.

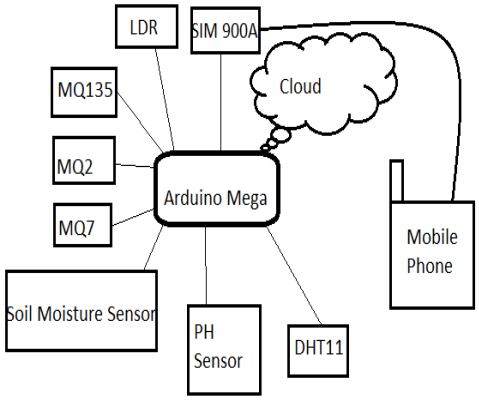


**Figure 1:** Proposed system of the real time crop management system

**Arduino:** Arduino is a hardware component used for building electronics projects. Arduino is made up of both a physical programmable circuit and a bunch of software, or IDE (Integrated Development Environment) that runs on your computer. It is having input, output pins & AC connector as shown in below figure

**Figure 2:** Arduino Mega

**Soil Moisturing Sensor:** The Soil Moisture Sensor is used to detect water content of soil. This sensor can be used in various fields of soil science, agricultural science, environmental science, horticulture, botany, and biology. As shown in the figure 2.2, two metal pins are deep inserted into the soil and the moisture present in the soil is shown in the form of percent of the screen.

**LDR (Light Dependent Resistor):** A Light Dependent Resistor (LDR) is a register which totally depends upon the light. The best example of LDR is the street light system which automatically turns ON or OFF.

**MQ2:** MQ2 sensor is also known as gas sensor, this gas sensor senses the different kind of gases such as hydrogen, carbon monoxide, alcohol, methane, propane, carbon dioxide, etc. Its main application is to detect the unwanted gas leakage from an industry or home. It is cheaper, durable & it senses the unwanted gas quite fast.

**MQ7:** MQ7 is a gas sensor which used to detect to carbon monoxide where CO is found in fumes fabricate through burn fuel in car, truck, small engines, stoves, lanterns, grills, fireplaces, gas ranges and furnaces.
In this project the MQ7 will detect the carbon monoxide (CO) present in the atmosphere.

**MQ135:** MQ135 is air quality sensor and also knows as pollution sensor. It detects a broad range of gases, such as NH3, NOx, alcohol, benzene, smoke and CO2. It is highly sensitive to Ammonia, Sulfide and Benze steam, smoke and other harmful gases. It having only four pins :Digital output, Analog output ,Ground, Supply (5V).

**DHT11:** DHT11 stand for Digital Humidity and Temperature. It gives the value of temperature and humidity in digital format this sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. This sensor is also factory calibrated. hence easy to interface with other microcontrollers.

**pH Sensor:** pH sensor is a sensor which commonly used for water measurements. This sensor measure of acidity and alkalinity, or the caustic and base present in a given solution. This sensor generally expressed with a numeric scale ranging from 0-14. The value 7 represents neutrality.

**SIM900A:** SIM900A is a GSM (Global System for mobile communication) is used for communication in mobile devices. It allows to users send or receives SMS, data, voice call. It plays an important role for the transmission of the messages between the sender and the receiver.

**Operation:** As shown in the proposed system figure all the required sensors like MQ135, MQ2, MQ7, DHT11, SIM900A, LDR, Soil moisture sensor, ph sensor are connected to the arduino system. This sensors are an input to the arduino microcontroller. The input signals given by all sensors are then stored in the cloud. SIM900A is a GSM (Global System for mobile communication) is used for communication in mobile devices. It allows the users to send or receive SMS, data, voice call.

## 3. SYSTEM OVERVIEW

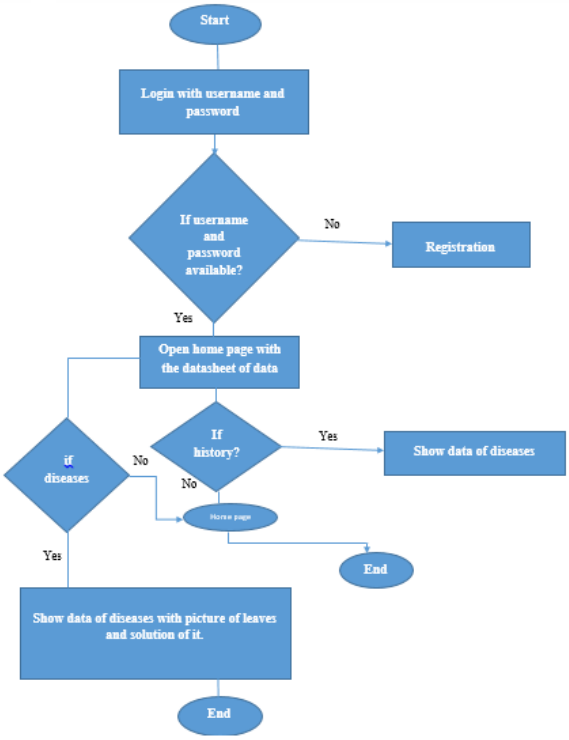


**Figure 3:** Frontend Flowchart

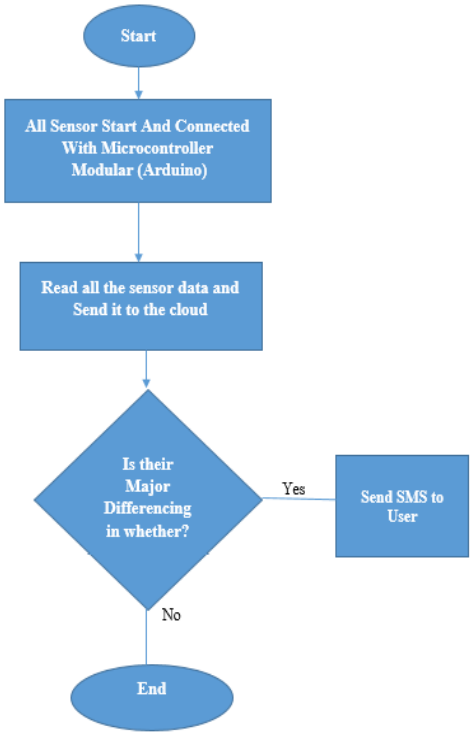


**Figure 4:** Backend Flowchart

## 5. HARDWARE SETUP

In this project, we are evaluating the physical values of various environmental aspects like temperature, humidity, soil moisture, and various smokes like carbon monoxide, carbon dioxide, methane, ph value, and so on. The following diagram shows the hardware setup.

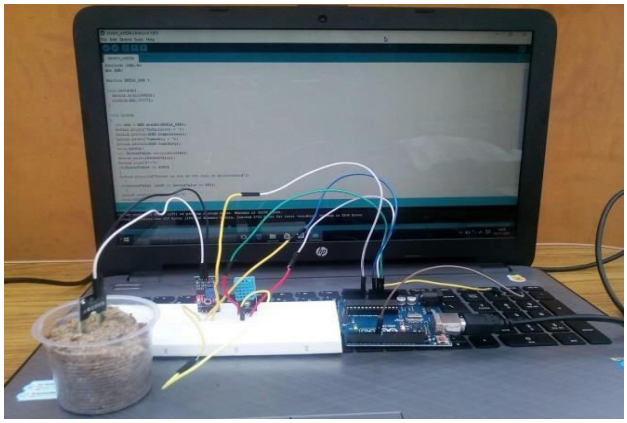

**Figure 5:** Hardware Setup

## 6. EXPERIMENTAL RESULT

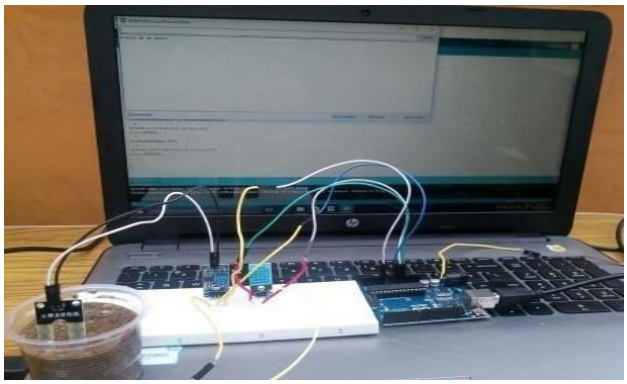

**Figure 6:** oil moisture sensor output for Wet soil sample

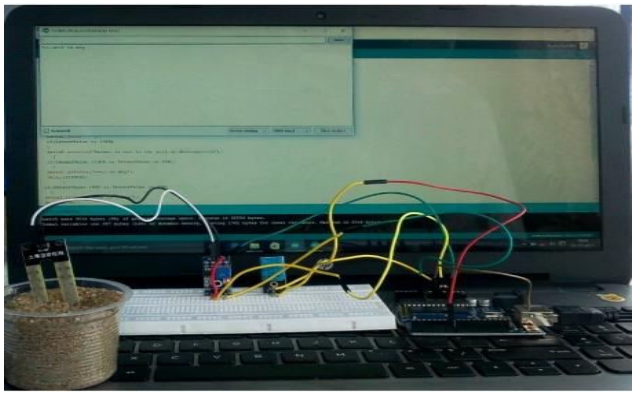

**Figure 7:** Soil moisture sensor output for dry soil sample

## 7. CONCLUSIONS

Agriculture are gradually being replaced and enhanced by more sophisticated and accurate digital and electronic device. In this paper, we have implemented an idea for efficient crop monitoring for agricultural field. With the application of IOT the data can be stored and retrieved from anywhere. In this project, the sensor part is limited only for monitoring of crops and a software portal is established for giving the actual values retrieved from the sensors.

## 8. REFERNECES

[1] G. Naveen Balaji, V. Nandhini, S. Mithra, N. Priya , R. Naveena " IOT Based Smart Crop Monitoring in Farm Land " in Imperial Journal of Interdisciplinary Research (IJIR) Peer Reviewed – International Journal Vol-4,Issue-1,2018(IJIR).

[2]. Ms. G. Rekha M.E1, S. Muthu Selvi " Android Arduino Interface with Smart Farming System" in 2017 International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 6 Issue 3 March 2017.

[3]. G. Sushanth and S. Sujatha "IOT Based Smart Agriculture System" in 2018 in IEEE.

[4]. K. Jyostsna Vanaja, Aala Suresh, S. Srilatha, K. Vijay Kumar, M. Bharath in " IOT based Agriculture System Using NodeMCU" in International Research Journal of Engineering and Technology (IRJET) Volume 05 Issued 03 March 2020.

[5]. Dharesh Vadalia1, Minal Vaity2, Krutika Tawate3 , Dynaneshwar Kapse4 " Real Time soil fertility analyzer and crop prediction" in International Research Journal of Engineering and Technology (IRJET) Volume 04 Issue: 03 | Mar -2017

[6]. P. Rajalakshmi and S.D. Mahalakshmi, "IOT Based Crop-Field Monitoring and Irrigation Automation",10th Int'l Conf. Intelligent Systems and Control (ISCO) , pp. 1–5, 2016

[7]. Balaji Bhanu, Raghava Rao, J.V.N. Ramesh and Mohammed Ali hussain, "Agriculture Field Monitoring and Analysis using Wireless Sensor Networks for improving Crop Production", Eleventh International Conference on Wireless and Optical Communications Networks (WOCN).2014.

[8]. Ms. G. Rekha M.E, S. Muthu Selvi ,"Android Arduino Interface with Smart Farming System " in International Journal Of Engineering And Computer Science ISSN:2319-7242

[9]. Yogesh G. Gawali, Devendra S. Chaudhari," Wireless Sensor Network based Monitoring for Agricultural System" International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 8, August 2016

[10]. K. Krishna Kishore, M. H. Sai Kumar, M. B. S. Murthy, "Automatic Plant Monitoring System" in International Conference on Trends in Electronics and Informatics ICEI 2017

[11]. G.Shruthi, B. SelvaKumari, R. PushpaRani, R. Preyadharan, "A-Real Time Smart Sprinkler Irrigation Control System" 2017 International Conference on Electrical, Instrumentation and Communication Engineering (ICEICE2017)

[12]. Sanket Salvi, Pramod Jain S.A, Sanjay H.A, Harshita T.K, M. Farhana, Naveen Jain, Suhas M V," Cloud Based Data Analysis and Monitoring of Smart Multi-level Irrigation System Using IoT" in International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC 2017)