

# SMART e-AGRICULTURE MONITORING BASED ON ARDUINO USING IOT

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**Abstract:** Agriculture sector in India is diminishing day by day which affects the production capacity of ecosystem. There is an exigent need to solve the problem in the domain to restore vibrancy and put it back on higher growth. The Concepts of Internet of Things (IOT) are applied to a number of applications ranging from home automation to IOT, where connecting physical things, from anywhere critical parameters is enhanced with email and short messaging system for alert system. Whereas, Greenhouse are controlled area controlled area environment to grow plants. The main aim of this project is to design a simple, low cost, Arduino based system to monitor the values of environmental parameters and that are continuously uploaded and controlled in order to achieve optimum plant growth and yield. A GSM (Global System for Mobile communication) modem is used to send SMS which displays the present status of the environmental parameter. We also use prediction for automatically direction and resolution of any problem in the devices. . Various sensor nodes are deployed at different locations in the farm. Controlling these parameters are through any remote device or internet services and the operations are performed by interfacing sensors, Wi-Fi, camera with microcontroller. IOT is a shared Network of objects where these objects interact through Internet. Fluctuations in rainfall or market prices can cause profits to quickly rise or plummet. Obtaining accurate, ongoing data on operations has historically also been a challenge. Unlike cars or microprocessors, you can't mass produce identical tomatoes. Companies like Clean Grow and Slum have begun to bring Big Data to the field with tools that can dynamically calibrate moisture and other metrics. Between efforts to eat more food grown locally, a younger generation of farmers and cheaper component-farming is getting an infusion of data and technology. As the concept of the Internet of Things becomes increasingly prevalent, many systems are being devised to allow all manner of data to be gathered analyzed and devices controlled via wireless data networks.

**Keywords:** IoT, Smart Agriculture, Humidity, Temperature, Soil Moisture, Arduino.

## I. INTRODUCTION

The Internet of things (IOT) is the greatest efficient and important techniques for development of answer the question. IOT evolve from different components which includes lots of sensors, software's, network components and other electronic devices. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity. Hence, automation must be implemented in agriculture to overcome these problems. In order to provide solution to such problems, it is necessary to develop an integrated system which will improve productivity in every stage. But, complete automation in agriculture is not achieved due to various issues. IoT are applicable in various methodologies of agriculture. Applications of IoT are Smart Cities, Smart Environment, Smart Water, Smart Metering, Security and Emergency, Industrial Control, Smart Agriculture, Home Automation, e-Health etc. 'Internet of Things' is based on device which is capable of analysing the sensed information and then transmitting it to the user. From survey of United Nations - Food and Agriculture Organisations, the world wide food production should be increased by 70% in 2050 for evolving population. Agriculture is the basis for the human species as it is the main source of food and it plays important role in the growth of country's economy. There are many other factors that affect the productivity to great extent. Factors include attack of insects and pests which can be controlled by spraying the proper insecticide and pesticides and also attack of wild animals and birds when the crop grows up. The crop yield is declining because of unpredictable monsoon rainfalls, water scarcity and improper water usage. Though it is implemented the research level, it is not given to the farmers as a product to get benefitted from the resources. The IOT technology is more efficient due to following reasons:

- Minimum human efforts
- Faster Access
- Time Efficiency
- Efficient communication

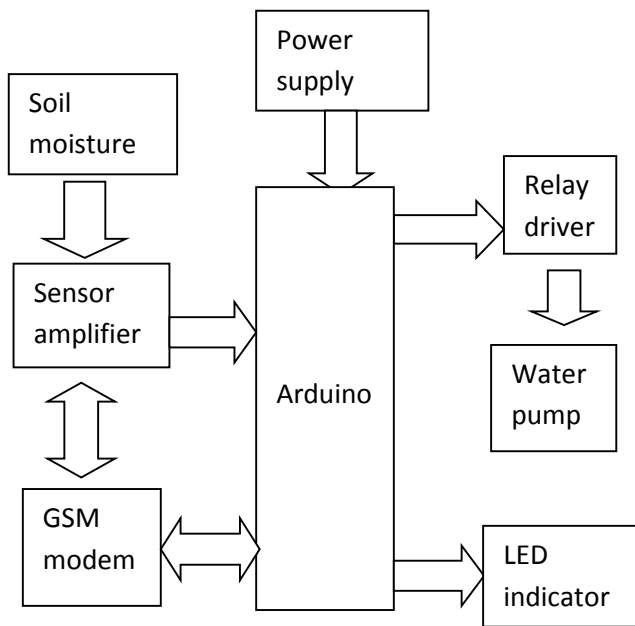


Fig 1. Block Diagram of System

## II. CRITICAL EVALUATION ON AGRICULTEURE MONITORNG PLATFORM

Indian Agriculture is diverse in culture. The production varies from place to place so for each crop there are certain condition for its production. So Lack of information about the crop, leads to failure in production. This system will help to overcome this problem and gather all the information needed to increase its production. The following system provides monitoring platform for agricultural ecosystem based on IOT. As per systems, the crops are being monitored with the help of Arduino boards and GSM technology where in Arduino boards behaves as a microcontroller. The System purpose is to supply water when farm is dry during absence of human, it will also monitor the humidity, salinity of the soil, soil moisture and temperature also. It includes Arduino Nano, Node MCU sensors like soil moisture and Dht11, Solenoid valves, relays. Through the help of internet, the control of the system is handled and the sensors used in the project stores the parameters in timely manner. This will help the user to analyse various conditions in the place anytime. Then control the conditions or parameter of the place properly.

The paper tells about soil less agricultural technique where plants are grown and provided nutrients solution in a water solvent. This technique applied is known as hydroponics which is further integrated with IOT technology the result of which is increased productivity and therefore by automating the collection of data of required factors for proper nurturing of crop. There is a controlled environment agriculture (CEA) that is designed with the hardware specification and multiple sensors. The device is designed to analyse the environment condition and alert the farmer uses WIFI connectivity integrated into it. Additional to that the reading is plotted according to all the four season and the data is sent to the user with its advantage of controlling over anywhere and anytime all over the world. The functional requirement of the proposed system is to measure temperature, gauge humidity, quantify the water level, measure light intensity, measure air toxicity where as non functional requirement are availability, reliability, maintainability, ease of use. The sensor involved in the system measures the specific factors and notify the user. The factors like temperature, moisture, light intensity, air toxicity, ph. value. There is a Arduino mega development kit which contains a microcontroller in built and integrate all the sensor and the result is displayed in the LCD screen moreover the system has a WIFI module which sends the further reading from the sensor to the user. This wireless control system for agriculture motor where the farmer will get notification or SMS in his mobile whenever the motor is on and whenever it is off. The project has been successful in India and helped during non deterministic weather conditions.

## III. EXISTING SYSTEM

Smart farming system using sensors for agricultural task automation Smart faming is the most appreciable concept which is used nowadays to increase the productivity of the crops or fields. The features of this paper includes monitoring temperature and humidity of the field through sensors using CC3200 single chip. The main idea of this system is to automate the activities of farming using the principle of mechanics, communication and electronics. There are two modules namely a smart farm sensing system and a movable crane. This system consist of two main sensors and a small irrigator through which crop growth can be analysed. The research goal of this system to provide a sustainable solution for automation of the system. The sensors collect the environment data and allow one to get control over the field from their cell phones. There is a microcontroller unit (MCU) which collect data from each sensors and when the environment changed the collected data is converted to correctly transmission pattern. after the information is completed the MCU will prepare Xbee module and a serial communication to send the information.

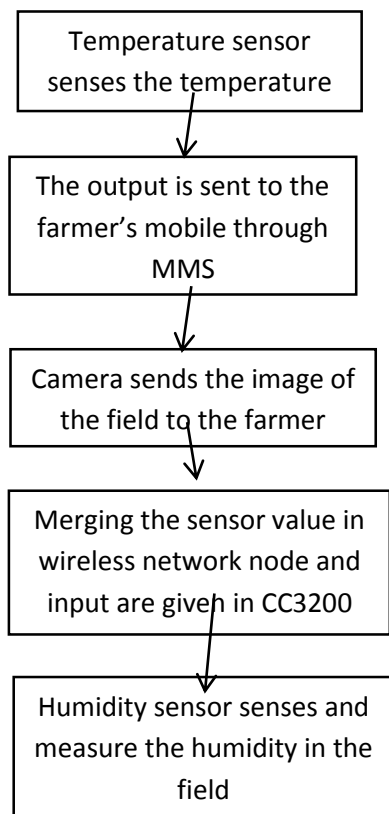


Fig.2

#### IV. PROPOSED SYSTEM

Proposed System deals with better production and cancelling out all factors leading to crop failure. The proposed system will give results based on the necessity of the crops, which will help to deal with the requirement and crisis faced during crop productivity. Measure temperature to deal with crops which cannot bear high or low temperature. Some crops fail due to humidity, so gauging humidity is a necessity. Estimate water level so to check if the crops don't get submerged in water and get damaged. To display the reading in the system for user to find optimal solution for the better production. The System to have longer lifespan and show accurate measurement. The System should be easy for upgradation so as to simplify integrating components with enhanced features. The proposed system should have the following aspects:

- Reliability: The system has longer lifespan and the measurements are accurate.
- Maintenance: The proposed system upgraded at ease by simple integrating components with enhanced features.
- Ease to use: The proposed system is easy to comprehend and grasp. The usage of the system doesn't require any prior knowledge

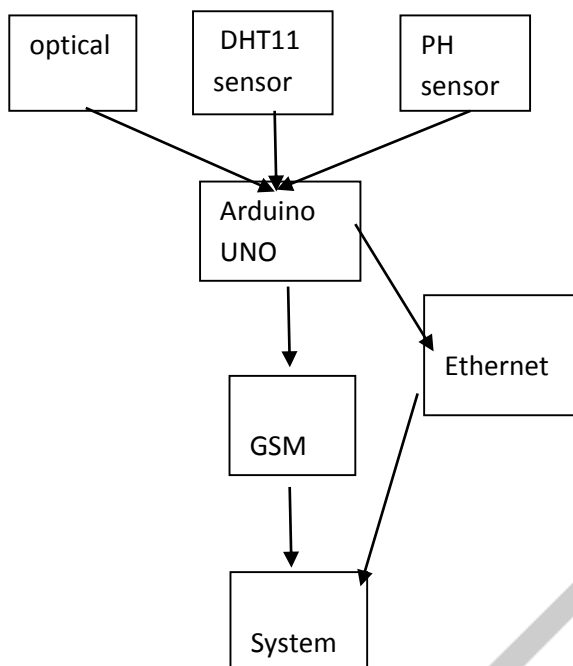


Fig.3

## HARDWARE COMPONENTS

### DHT11 sensor

DHT11 used in the paper is a basic, ultra low-cost digital temperature and humidity sensor. Which has a capacitive humidity sensor and thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires very careful timing to grab data. The only real downside of this sensor can get new data from it once every 2 seconds. This hub will continue to expand to capture these points of Arduino, and provide depth on the impact of these issues. Arduino represents an important technology that will drive innovative margins, from entrepreneurs and hobbyists. The Arduino Starter Kits uses the Arduino Uno as a main board, with the board. GSM, together with other technologies, is part of the evolution of wireless mobile telecommunications that includes High-Speed Circuit-Switched Data, General Packet Radio System, Enhanced Data GSM Environment, and Universal Mobile Telecommunications Service.

### Ethernet

Ethernet is the most widely installed local area network (LAN) technology. Systems communicating over Ethernet divides a stream of data into shorter pieces called [frames](#), higher-layer protocols triggered [re transmission](#) of lost frames. As the [OSI model](#), it provides services including the [data link layer](#). Ethernet is how a networked devices can format data for transmission to other network devices on the same network segment, and how to put that data out on the network connection. It touches both Layer 1 (the physical layer) and [Layer 2](#) (the data link layer) on the OSI network protocol model. Ethernet defines two units of transmission, packet and frame. The frame includes not just the "payload" of data being transmitted but also addressing information identifying the physical "Media Access Control" (MAC) addresses of both sender and receiver, VLAN tagging and service information, and error-correction information to detect problems in transmission. Each frame is wrapped in a packet, which affixes several bytes of information used in establishing the connection and marking where the frame starts. Ethernet initially assumed a shared medium: multiple devices on each segment of the network, connected daisy chain at first but later in star topology via Ethernet hubs (which replicated all traffic received on any port to every other port). It therefore defines a means of sharing the medium: Carrier Sense Multiple Access with Collision Detection (CSMA/CD). Ethernet devices will check to see if anyone else is transmitting at the moment (carrier sense of multiple access) and if so (collision detection) will wait a short time before retrying the transmission. Over time, though, hubs were replaced by switches, which send to each port only the traffic directed to the device on that port. That, combined with the migration from coaxial to twisted pair cabling (with dedicated pairs for sending and receiving data) and optical fiber, made shared-medium problems a thing of the past.

### PH SENSOR

PreSensfiber optic pH sensors have a measurement range from 5.5 to 8.5 pH, which is perfectly suited for culture monitoring and physiological applications. Optical pH sensor foils for 2-dimensional visualization of pH distributions are available for low pH (2.5 – 4.5) and medium pH (5.5 – 7.5) range. All our optical pH sensors are pre-calibrated and can additionally be delivered either beta-irradiated or untreated, according to your requirements. optical pH sensors are optimized for culture media and physiological solutions and can be applied from microliter to production scale. You can choose from various pH sensor designs - or disposables with integrated sensors – to get a fiber optic pH probe that really fits your requirements. If you cannot find an optical pH sensor

suitable for your application in our product range, just contact us! Sensor designs can be adjusted for certain applications and we offer sensor integration in customized housings. From monitoring pH levels inside engineered tissue, implantation in small animals, measurements in micro-volumes of liquids, to automated profiling in sediments or biofilms, our optical pH micro sensors can be applied in most different research fields. A further option for optical pH measurements is our pH imaging system. An optical pH sensor foil is placed on the sample surface or a cross section and pH distributions and changes over time can be assessed 2-dimensionally. pH imaging can give whole new insights, as thousands of measurement points can be recorded in just one image

## V. RESULT

Here all the component is used for the supply of the required current for +5V. There are four sensors used which are: DHT11 sensor, LDR sensor, Sol moisture sensor and PH sensor. A fan, exhaust fan, water pump, artificial light and motor pumps are attached to the Arduino for cooling purpose. So that the user can easily monitor and control the parameters through android mobile application. For which android application is developed. And the user can also log on the application by providing username and password for verification. The following data of the use is stored in database. A GSM modem is also used to send text messages which immediately displays the current status of the environmental parameters. DHT11 sensor is used to analyse the excess of temperature and humidity in the environment. Where high temperature effects the ability of crops, to produce fruits. Hence the whole system sends SMS alert to the various mobile users.

## VI. CONCLUSION

Thus, this system avoids over irrigation, under irrigation, top soil erosion and reduce the wastage of water. The main advantage is that the system's action can be changed according to the situation (crops, weather conditions, soil etc.). By implementing this system, agricultural, horticultural lands, parks, gardens, golf courses can be irrigated. Thus, this system is cheaper and efficient when compared to other type of automation system. In large scale applications, high sensitivity sensors can be implemented for large areas of agricultural land. Monitoring efforts should be broadly conceptualized so that they incorporate not only farm production and productivity, but also natural resource

## FUTURE ENHANCEMENT OF THE SYSTEM

An information system is usually created in modern organizations to cater to the information needs of management. A monitoring system is a subsystem of a management information system and has several distinguishable components. The technological rationale for precision suggests farms should continue to consolidate, though in an industry in which sentiment and family continuity have always played a big part that purely economic analysis might suggest is irrational, this may not happen as fast as it otherwise would. Still, regardless of the speed at which they arrive, these large holdings will come more and more to resemble manufacturing operations, wringing every last ounce of efficiency out of land and machinery. Such large-scale farms will probably continue to be served by large-scale corporations that provide seeds, stock, machines and management plans. But, in the case of the management plans, there is an opening for new firms with better ideas to nip in and steal at least part of the market.

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