International Journal of Scientific Research & Engineering Trends
Volume 7, Issue 4, July-Aug-2021, ISSN (Online): 2395-566X

Iot Based Smart Farming System

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Abstract- **In India over 60% population is relied on agriculture as the basic source of their income. As a result, it contributes to 1/3rd of Indian economy. That is the reason agriculture is integral part of Indian economy. Also, it plays crucial role in development of country. And traditional farming degrading the development in agriculture, there is necessity of technological intervention in agricultural practices to increase overall grade of farming. There are various methods in farming that demands automation and reduced human efforts. Hence, agriculture can be made smart using IoT and other smart automation tools & technologies. Smart agriculture increases crop yield, quality, decreases water wastage etc. Internet of Things (IoT), Machine Learning (ML), and automation technology has brought revolution in every field, making everything smart and intelligent. The main objective of this project is to propose IoT based Smart Farming System supporting farmers in getting Livestock Data, Temperature, Soil Moisture, Humidity, PH measures and fire detection for efficient monitoring of environment which will empower them to increase their overall grade of service and their product quality. This will increase mainly the income of farmers and reduce the unnecessary expenses. The IoT based Smart Farming System being recommended is assimilated with Arduino, Sensors and a Wi-Fi module producing live data feed.**

Keywords- **Internet of things, Soil moisture, Temperature measurement, pH measurement, Smart farming.**

I.INTRODUCTION

Agriculture anchors and supports life on Earth, has an primitive history of thousands of years. Promising farmers began to plant them around 11,000 years ago. In Addition, its innovation has been pushed by executing the several new procedures, techniques, technologies, and methodologies by the time.

It engages over one-third of the global personnel. Besides, it pushes the process of economic wealth in developed countries. Several studies determined that overall world farming uses approximately seventy percent available fresh water per year to irrigate only seventeen percent of the soil.

Another side, the total available irrigated land is slowly decreasing due to the fast increasing of food requirements and eff ects of global warming. In other words, agriculture is dealing with new main significant challenges. As the world population now has reached nearly 8 billion, FAO (Food and Agriculture Organization) suggested that world food production in the world must be increased by 70-75% to feed the rapidly rising population in the world.

According to many studies, the population will rise above nine billion people by mid- century, since many reports cited rapid growth in the global population. In 1800, there were a billion-group living on earth, it expanded to 8 billion of every 2021.

Notwithstanding, examines report expected that toward the finish of this century there would be eleven billion individuals, so there would be a lot more mouths to take care of very soon. The fast increment of populace, the reduction in farming area, the expanding power of worldwide environment changes, and the decrease in workforces and energy deficiencies are presenting tremendous difficulties to the agribusiness area.

A main source of water lack and water shortage will be fast urbanization and industrialization in the creating and created world. Additionally, the erratic environment changes incorporate outrageous climate conditions, extreme tempests, heat waves, and floods will antagonistically affect world farming area. We need more creation from horticultural frameworks to fulfill the developing food needs.

Else, we will suff er from food instability issues which will be the greatest danger. In addition, Scientist uncovered that the advancement of the farming creation isn't just significant for to delivering food to take care of the populace; however it is additionally fundamental for the mechanical area. Additionally, the farming is the primary source to create the crude material for some modern areas. Consequently, it should be perceived that mechanical and agrarian advancements are not other options.

Notwithstanding, the two areas are corresponding to one another on the way to accomplishing the food security issues. As the advancement of mankind from trackers and finders to agrarian social orders, the efforts have mostly centered around improving the plant yield and efficiency by either hereditary changes, social or farming, the executives rehearse, or by creating and presenting plant assurance measures.

As needs be, in the last and present century, people groups have begun investigating the potential outcomes by embracing different current methods in farming. The selection of the savvy cultivating strategies in agribusiness is one of the astounding models.

Fig 1. Smart farming using IOT.

II. MOTIVATION

Distinctive sort of issues looked by the ranchers spurred us for the suggested framework that are :-

- Indian cultivating is on the hitch in view of the restricted specialized information in farming practices.
- The issues shortage of assets additionally accumulates in their concern causing obstruction or preventing designers from developing.
- To forestall unintentional consuming of harvests.
- To forestall unreasonable utilization of water which bring about bringing down of water table?

So through this structure we are introducing answer for this issue by presenting a mechanized and methodical cultivating methodologies that empower farmers to develop in a useful manner likewise with restricted assets and more prominent yield which is guaranteed and experienced.

III. LITERATURE SURVEY

S. Sivachandran, K. Balakrishnan, K. Navin, "Continuous Embedded Based Soil Analyser", International Research Journal of Engineering and Technology (IRJET). Volume: 3 Issue 3 | March 2014 [1]

In this paper, creators propose an implanted soil analyser with measures the pH worth of the dirt and dependent on this worth gives proportion of different soil supplements. The framework proposed here utilizes signal molding, show, microcontroller unit, sensors, power supply and warm printer.

This model aide in forecast of the dirt arrangement dependent on the accessibility of supplements. Numerous methods screens different soil boundaries and this paper focuses at soil richness. The primary point of this model is to supplant the traditional strategy for soil testing via computerized soil testing. It consequently gauges the significant soil supplements like potassium, phosphorus and nitrogen by ascertaining the pH esteem.

Anand Nayyar, Er. Vikram Puri, "IoT Based Smart Sensors Agriculture Stick for Live Temperature and Moisture Monitoring utilizing Arduino, Cloud Computing and Solar Technology" May 2015. [2]

This paper presents an IoT based brilliant stick that empowers live observing of the diverse horticultural boundaries. This stick assists rancher with securing live information of temperature, soil dampness. The rural IoT stick gives attachment and measures in which ranchers can right away sanction shrewd checking situation by situating the stick in the field and getting live information benefits from various brilliant devices like keen tablets, telephones and so forth and the data which is delivered through sensors could be just investigated and prepared by agrarian specialists even in distant regions by means of distributed computing advancements.

Apurva C. Pusatkar, Vijay S. Gulhane, "Execution of Wireless Sensor Network for Real Time Monitoring of Agriculture", International Research Journal of Engineering and Technology (IRJET). Volume: 03 issue: 05 | May-2016 [3]

In this paper, creators center on utilizing WSN that is Wireless Sensor Network. Utilization of WSN helps continuously observing of the horticultural field. The paper weights on the way that the yield rate in agribusiness has gotten stale and consequently they have incorporated extra agrarian boundaries that must be checked.

Notwithstanding the traditional boundaries like mugginess, temperature and soil dampness, this paper centers around water level, flood, wind bearing, wind speed, climate and so forth Horticultural ventures normally utilize wired correspondence which has different issues and consequently this paper focuses on the utilization of remote organization.

The author likewise proposes a caution framework that sends an alarm to the rancher. The proposed model likewise incorporates the utilization of Global framework for Mobile (GSM), ZigBee, General Packet Radio assistance (GPRS), Global Positioning system (GPS) for secure transmission of information. It likewise recommends the utilization of mechanized water system framework that comprises of inserted framework prompting lesser utilization of rancher energy and cash. This paper additionally helps in expanding the yield of the ranch by streamlining water utilization. The proposed water system framework improves water the executives and manageability.

Laxmi C. Gavade, A.D Bhoi, "N, P, K Detection and Control for Agriculture Applications utilizing PIC Controller", International Research Journal of Engineering and Technology (IRJET). Volume: 6 Issue: 4 | April 2017 [4]
This paper recommends a model to identify mugginess of the dirt, temperature, daylight, N, P and K substance utilizing sensors in the farming field. By estimating these boundaries rancher can build the efficiency of the dirt as it identifies the supplements lacking in the dirt.

The normal efficiency in India is not exactly the world normal and this paper presents an approach to attain ‘evergreen transformation' in horticulture. Manures assume an essential part in great yield yet imbalanced utilization of P, K, and N causes decline in crop creation.

In ordinary strategy soil inspecting is done physically yet this paper presents synthetic examination that comprises of three strategies: optical technique, conductivity estimation and electrochemical strategies. These techniques help in estimating the essential supplements.

IV. METHODOLOGY

The basic building blocks of an IoT based smart farming System is shown below. It includes different Sensors and processor. The sensors are interfaced with Microcontroller; data from the sensor is send to farmer using cloud. Mobile app continuously receives data from sensors and accordingly the farmer can take the decision.

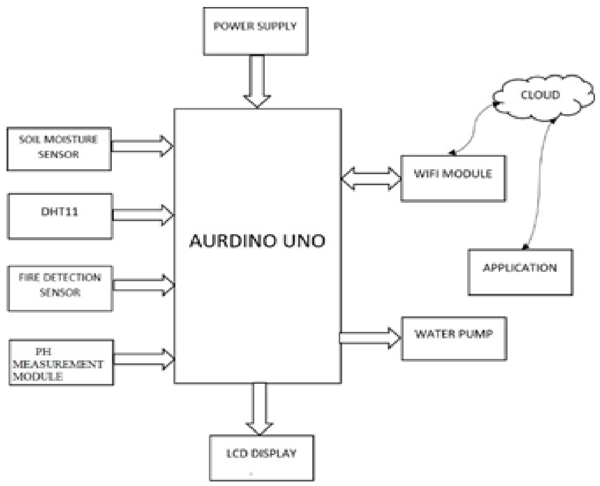

Fig 2. Block diagram of system.

When the data from different sensors that are humidity, temperature, soil moisture, ph value is acquired it is sent to the mobile app of the user and if the water content in the soil is less than the cut off value then an alert message is received on the app of the user and motor gets switched on automatically using relay.

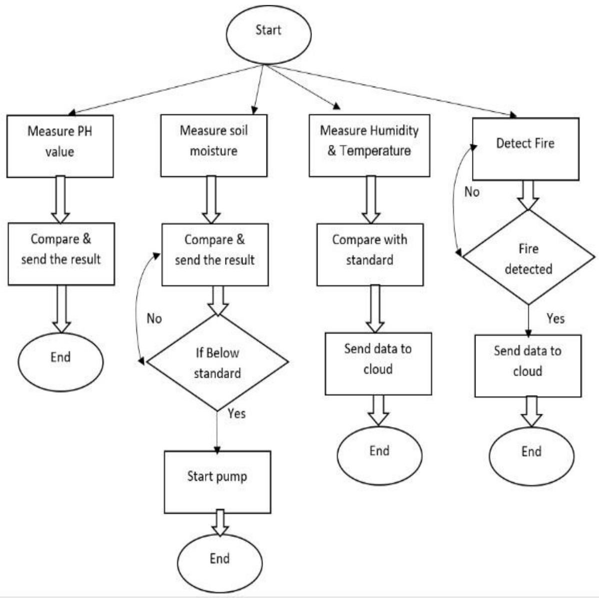

Fig 3. Flow Chart.

V. COMPONENT REQUIRED

1. Arduino UNO:
Arduino Uno is an open-source microcontroller board which contain Microchip ATmega328P microcontroller. The board is consisting of analog and digital input/output (I/O) pins which can be interfaced to various boards and circuits. The board consists of 14 digital I/O pins & 6 analog I/O pins, which can be programed with the Arduino IDE.

The specification is:
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory:32 KB (ATmega328) of which KB used by bootloader
- SRAM:2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz)

2. Blynk:
It is used for building apps. This app has capacity to remotely control hardware and also shows sensor information. This app also helps to visualize and store data.

This platform contains 3 main elements:
2.1 Blynk app: With the help of various widgets amazing interfaces for the projects can be created.

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2.2 Blynk Server: Establishes a communication network between smartphone and hardware.
2.3 Blynk Libraries: All incoming and outgoing commands are processed and also

3. DHT11 Sensor:
It measures humidity & temperature. This sensor does not required ADC because it supplies digital output and therefore can be directly connected to microcontroller. Microcontroller is of eight and provides values of temperature & humidity in serial form. It has 4 pins they are VCC, GND, DATA and NC.

The specification is:
- Resolution 1%RH 8 Bit
- Repeatability ±1%RH Accuracy 25℃ ±4%RH

4. Soil Moisture Sensors:
It measures the volumetric water content in soil. This sensor uses two probes to pass current through the soil, and then it reads the moisture level through resistance. More water means less resistance makes the soil conduct electricity more easily, while dry soil more resistance conducts electricity poorly.

The specification is:
- Power supply: 3.3v or 5v
- Output voltage signal: 0~4.2v
- Current: 35mA.

5. Fire Detection Sensor:
A flame detector is designed to detect and respond to the presence of a flame or fire. Responses can be detected by sounding an alarm.

The specification is:
- On-board LM393 voltage comparator chip and infrared sensing probe.
- Support 5V/3.3V voltage input.
- On-board signal output indication, output effective signal is high level, and the same time the indicator light up, output signal can directly connect with microcontroller IO.
- Signal detection sensitivity can be adjusted

PH Measurement sensor:
PH sensor is used to measure acidity and alkalinity. It is expressed with a numeric scale ranging from 0-14. The value 7 represents neutrality. The numbers goes on increase with increasing alkalinity, while the numbers goes on decrease with increasing acidity.

The specification is:
- Module Power: 5.00V
- Measuring Range: 0-14PH Measuring Temperature: 0-60 ℃ Accuracy: ± 0.1pH (25 ℃)
- Response Time: ≤ 1min

VI. EXPERIMENTAL RESULT

We have measured the moisture of soil at different times of the day and figures below show the results of all the sensor readings at different platforms.

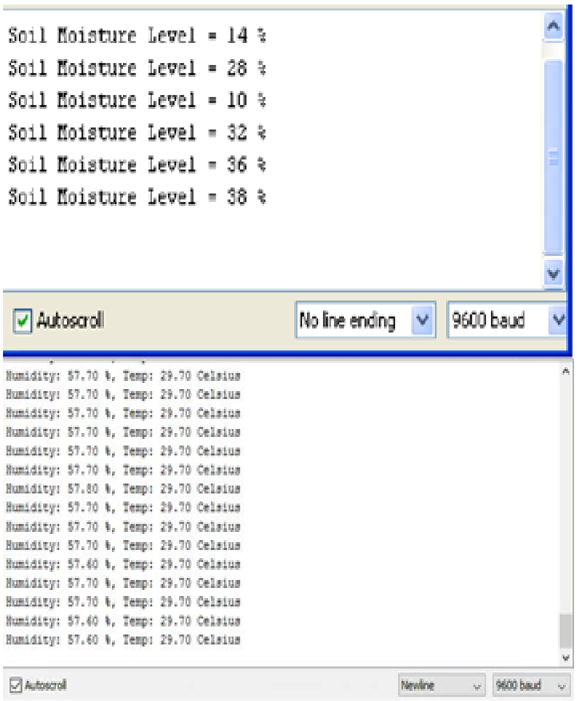

Fig 4. measured valued of soil moisture, temperature and humidity.

Fig 5. UI of app on blynk software which shows Values of humidity and temperature.

Fig 6. UI of app on blynk software which shows Values of PH level.

Fig 7. UI of app on blynk software which shows Values of soil moisture.

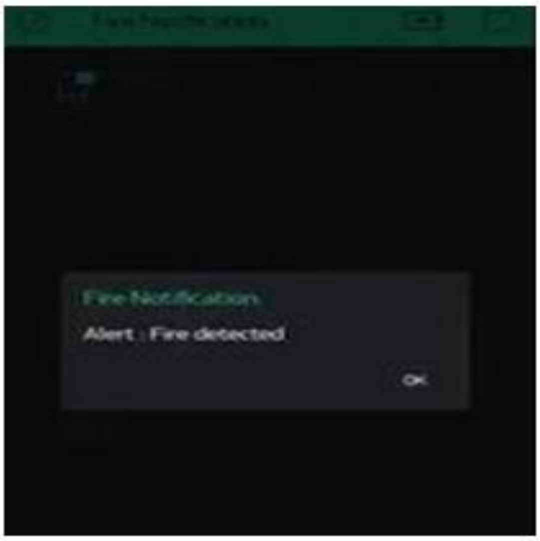

Fig 8. UI of app on blynk software which shows Fire alert message.

VII. ADVANTAGES

1. Real Time Monitoring:
IoT based smart farming allows farmers to get data of temperature, soil moisture, humidity, PH value in real-time. They get data quickly and accelerate the process of decision making.

2. Water Conservation:
soil moisture sensor helps us to measure the amount of water in the soil hence it prevent the wastage of water thus eliminating risk of drought and lowering of water table.

3. Pest Management:
As we are getting real time data about plant health we can effectively control the pest growth by improving pesticides strategy. Lowered Operation Costs: Due to automation labour required is less so operation cost get reduced which increases farmer income.

4. Remote Monitoring:
Decisions can be made in real-time from anywhere and anytime via internet connection so farmer can monitor many fields at different location.

5. Increase Nutritional Value:
Due to real time data of PH value, there will be correct use of fertilizers which will result in increased nutritional value of agriculture product. Improved crop pattern: Soil control measures such as pH level and humidity content can be help the farmer to identified which crop to be harvested according to the soil level.

6. Green Process:
Precision farming help reduce water wastage and energy and, thus, make farming greener, but also significantly scale down the use of fertilizer. This allows getting a cleaner and organic product compared to traditional agricultural methods.

7. Response to Climate Change:
One of the benefits of using sensor in agriculture is to make farmers respond quickly to any significant change in temperature, humidity, thanks to real-time monitoring and prediction systems.

8. Reduction of Risks:
When farmers get real time information, they can understand what situation will be in the future, and they can predict some problems that may arise.

VIII. FUTURE SCOPE

The future scope of this project could include drones for spraying pesticides and insecticides. The drone can use image processing to pluck the ripe fruit or vegetable, also image processing can be used to analysis plant growth and development.

Using technique like big data and data mining, data can be collected to help the farmer to predicte proper crop sequence suited for particular place.

Future works should be focused on increasing sensors like rain sensor which would make predicting and analysing more accurate especially with regard to fungus Control and pest control. We can also use Artificial intelligence for improving decision making in agriculture.

IX. CONCLUSION

The following model provides us the required information of how to use Internet of things (IOT) in the agriculture sector. The technology tools use here provides opportunity for the farmer to control and monitor parameters like temperature, soil moisture, humidity and PH of soil remotely. As compared to traditional agriculture practices, it had simplified monitoring and controlling process.

It also provides the solutions to optimize the use of water resources which will fight issues like water scarcity and helps in preventing degradation of soil will help in sustainable development. The technology used here provides incredible opportunities to increase productivity and also to increase the capability, reliability, of the farmers and growers.

ACKNOWLEDGMENT

We would like to thank our guide, Professor Mrunalini Bhandarkar for providing us valuable inputs and suggestions to us and encouraging us to create and implement this project.

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