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Cloud Based Monitored System For Smart Agriculture With IOT

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ABSTRACT :

Agriculture has now emerged as the most vibrant growing sector worldwide as the population is increasing in a fast and boundless way. The key challenge of the agricultural industry is the improvement of farming efficiency and quality without constant physical monitoring of operations to meet the fast-increasing speed of demand for food. The second huge challenge that the agricultural industry faces, along with the mounting population, is the climate circumstance. Therefore, this paper is aimed to present a smart farming model based on the Internet of Things using the clustering in order to handle the adverse condition. We use different types of sensors like soil moisture, air pressure, rain detection, and humidity sensors for various purposes in this model. The data will collect on the cloud, and the calculated amount is automatically done. This smart agriculture can be adopted automatically from the crop control, collection of useful data, and analysis. That is why this paper explains how to implement the IoT in monitoring humidity, soil condition, temperature, and supplying water to the field level of water, climate condition. This report aims to design the IoT-based Smart Farming System, which is integrated with different types of Sensors and a Wi-Fi module for producing live data feed that can be found online.

Keywords - Smart Farming, IOT, Clustering, Sensors, Cloud

INTRODUCTION:

The primary benefit of IoT is that it will join the real world and virtual world by using the Internet as the intermediate of communication and exchange data and information with each other. IoT is the amalgamation of interrelated computing devices, mechanical machines, digital machines, objects, internet, animals, or people that are provided by a unique identification and the capability to move the data over networks without asking any human-to-human or human-to-machine or human-to-computer interaction.

The execution of different technologies & devices like the internet, cloud, and sensors devices makes smart agriculture. In today's time, the population of the world is growing daily and supposed to be around 9.8 billion in the year 2060. To produce the foodstuff of these billions of people, it is compulsory to uplift the productivity of the crop. The population of this world is increasing day by day, and the land for agricultural purposes is decreasing from various reasons such as industrialization, housing buildings and commercial markets are building up on the parkland of agriculture. To feed all these billions of human beings, we have to enhance the productivity of the crop.

This can be done through the implementation of the Internet of Things (IoT) in the agriculture industry. Smart Farming is also called precision farming.

Fig 1. Sensor deployed in field for data capturing

Smart farming and traditional farming are quite dissimilar with each other in every aspect. Traditional farming makes use of the oldest and conventional methods of agriculture and using old machinery for agricultural occupation, and producing crops without knowing any reevaluation of demand of the market and weather forcing reports but smart farming uses very innovative technologies like smart devices, IoT sensor nodes, Internet, and cloud storage for data collection. Farmers chatting community, time to time measurement of different factors like the best environment for the growth of the plantation, how much nutrients, soil quality, water quality, air pressure are required. Farming has become very easy, economical, and cost effective by using smart technology. Farmers can reduce the employment cost and improve crop yielding by using smart technology; it also provides better crop production.

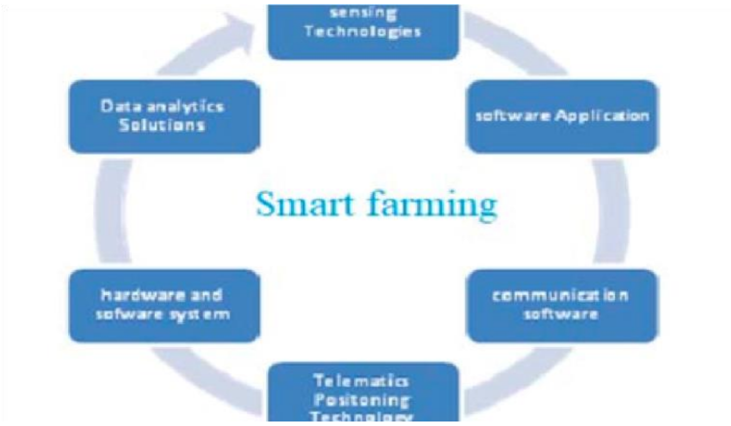

fig 2 Basic structure of IOT based on Hardware /Software

Now a day, the agricultural industry is bent on using IoT technology for smart farming to achieve crop performance in the global market and other factors such as minimal human disruption, time and cost, etc. Advances in technology ensure that sensors collect data from a wide variety of nodes. Networks are also readily available worldwide .and that smart farming can be achieved with full promise. Smart farming is a particular solution to the problems the agricultural industry is currently facing. Its focus is toward improving agriculture in agriculture. The reasons which promote smart farming are the Internet, smartphones, Sensors devices, and IoT devices.

The smart agricultural market is expected to earn $18.55 Billion by 2022, at a CAGR of 13.9%. BI estimates that 76 million IoT devices will be shipped for agricultural use by 2020. In the CAGR of 20%. IoT devices can be very easy to improve production and harvesting in the agricultural industry as these IoT devices can be used to monitor soil acidity, temperature, humidity, air pressure, etc. In addition, smart agriculture will be useful in monitoring livestock production & health as well. IoT sensors can inform farmers of data such as rainfall, crop yields, and any insect infections; soil nutrients are very useful in production and provide specific information which can help to find improved farming methods. The In

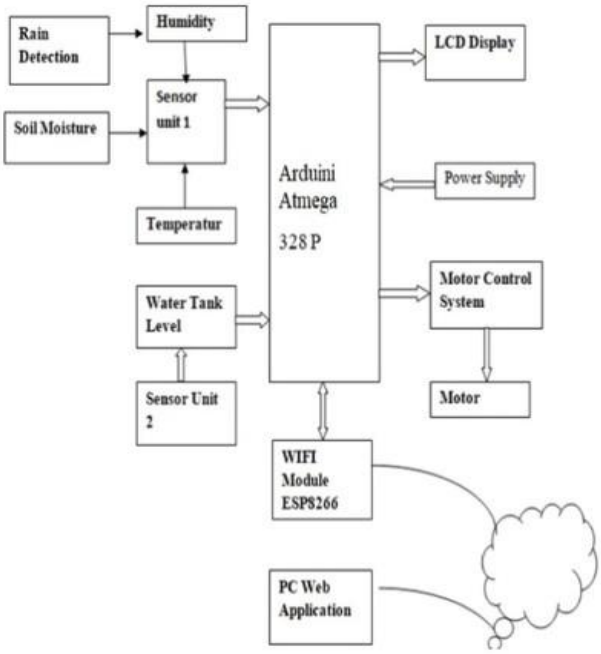

Fig 3. System Block Diagram

ternet of Things, having features which seem real-time and direct with integral aspects will majorly change the system of procuring agriculture and provide the appropriate technology to establish a uniform flow of agricultural goods.

II. PURPOSED MODEL :

The objective of such models is to expand the centralized monitoring system & organize agricultural land. This can be managed from any place wirelessly by using the mobile phone. The elementary operations of collecting data pertaining to the following, namely irrigation data, environmental data, soil moisture, and fertilization data, can be performed by application users themselves without human intervention. Such collected data further can be used for the perception of assessing crop performance & calculate crop forecasts and personalized harvest recommendation for any farm using the application. The information from the sensor network will be fetched according to the climatic conditions prevailing in the farmland like temperature, soil moisture, humidity, and light. By the aid of this model, we will measure the activities undertaken in the farm field. We can carry over crops over one field, divided into different fields. The data acquired through all these nodes is gathered & forwarded to cloud storage. In this system, we are using the cloud service as a storage database of the collected data. Data can be sent to the cloud to store in the cloud database. Farmers can log in to their particular accounts to view their history & the present data of each node.

III. WORKING OF MODEL :

Wireless data communication: The collected data from the various sensors nodes are forwarded to the server through wireless transmission (WIFI module).
Sensor data attainment: The sensors boundary with Arduino Uno board such as DHT11, temperature sensors, rain detection sensor, humidity, and soil moisture is used.
Data Analysis & Decision making: Data analysis refers to the process of interpreting data collected from different sensors from the agriculture field. The water motor will automatically be turned ON if the soil moisture falls below the threshold and vice versa. A farmer can even operate the motor by using mobiles through mobile apps.
Automated Irrigation System: Once the control is established from the mobile application or web application in the automated irrigation system. Data processing will be there to pass an access form the web application toward the electrical switches during the Arduino microcontroller.
Mobile Application: Mobile apps will be developed in android OS. The mobile phone application provides help for monitoring and controlling the agriculture field from anywhere.
Internet application: The internet application will be designed to see the ground and crops from anywhere using an internet connection. The webpage can also be communicated using the processing IDE.

IV. DEVICED USED

A. The Soil Moisture Sensor

A soil moisture sensor will be able to detect if the soil is wet or dry. The output of this soil moisture sensor will also consist of analog & digital signals. When the soil becomes utterly dried up then it will not allow the current moving through it. So that the output is called to be the highest.

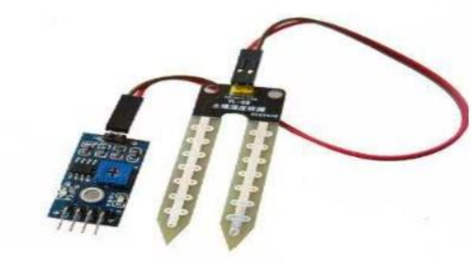

Fig 4. The Soil Moisture Sensor

B. Temperature Sensor

The LM35 sensor is used for the temperature measurement purpose, because its output voltage is linear with the Celsius scale of temperature. It has a large operating range. The highest output is 5V. The output will increase by 10 mV for every 1 degree rise in temperature.

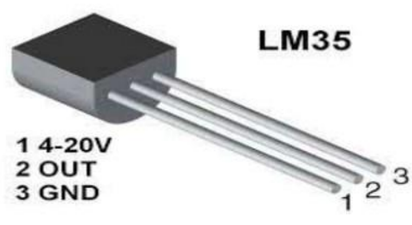

Fig 5. Temperature Sensor

C. Humidity Sensor

They are low in size up-to-20 meter indicator transmission with low power consumptions, make it the best option for different applications. This DHT11 Humidity sensor possesses the features: humidity sensor difficult through calibrated digital signal output.

D. Rain Detection Sensor

Rain sensor module is the rain detecting device. This can be applied to be a switch at the drop of rain on a rainy day when it measures the intensity of rainfall. The rain board and control board separate for additional use, LED power indicator, and flexible sensitivity with potentiometer. In this case, analog output is used to detect rainfall..

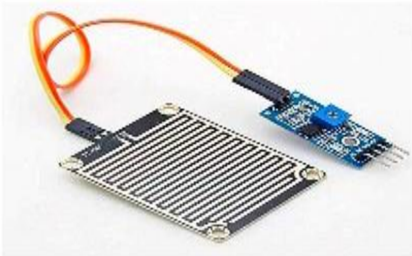

Fig 6. Humidity Sensor

E. Communication Module

Board ESP8266 is a fine cheap Wi-Fi mode that fits enhancing the effectiveness of Wi-Fi with UART serial connecting. Features 802.11 b/g/n protocols, Wi-Fi Direct (P2P) soft-AP, Integrated TCP/IP protocol stack.

Fig 7 . Wifi Module

V. EXPERIMENTAL RESULT :

The assessment of Rabi & autumn (Kharif) crops is accepted with the data like humidity, temperature, and rainfall. We can analyze and predict the best crop for the field based on the collected data which is collected from diverse sensors node. The collected data from numerous sensors node are as follows which is established with the values obtain throughout the experiment in Tables 1, 2 & 3. Figure. 10, 11 & 12 deals with the Rainfall trends, temperature trends, and Soil moisture trends throughout Kharif and Rabi seasons respectively. The table 1, 2 & 3 depicts the average temperature data, rainfall trends, and average surface soil moisture trends respectively for different seasons over past years starting from the year 2017.

The respective table data values are plotted in graphs for use in predictions over the next coming years.

TABLE 1 - DATA OF TEMPERATURE TRENDS DURING RABI AND KHARIF SEASON

Year	Kharif Session (°C)	Rabi Session (°C)
2017	27.1	22.5
2018	26.5	21.5
2019	27.9	23.1
2020	25.3	21.7

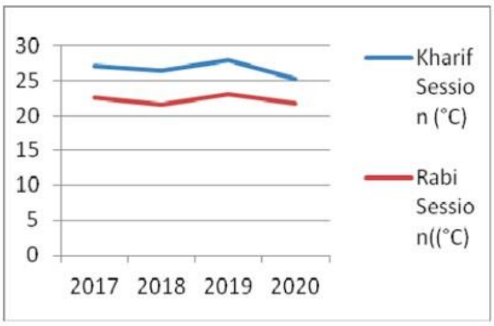

Fig. 8. Temperature trends all through Rabi and Kharif seasons

TABLE 2 SURFACE SOIL MOISTURE TRENDS DATA THROUGHOUT KHARIF AND RABI SEASON

Year	Kharif Season (mm)	Rabi Season (mm)
2017	8.4	10.4
2018	8.5	10.6
2019	9.8	10.3
2020	7.9	11.2

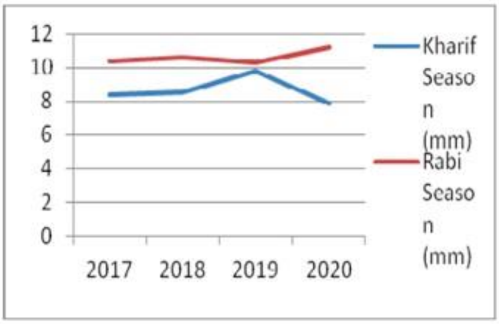

Fig. 9. Surface soil moisture trends throughout Rabi and Kharif seasons

TABLE 3 RAINFALL TRENDS DATA THROUGHOUT RABI AND KHARIF SEASONS

Year	Kharif Season (mm)	Rabi Season (mm)
2017	775	108
2018	640	190
2019	849	85
2020	585	174

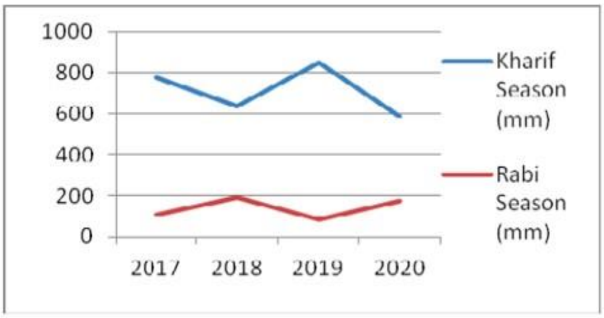

Fig. 10. Rainfall trends throughout Rabi and Kharif seasons.

VI. CONCLUSION :

IOT-enabled agricultural system has helped us achieve modern scientific solutions. This paper has filled the gap between quality, production, and quantity. Data entered by collecting and importing data from multiple real-time use or cloud storage sensors in the database to ensure quick action. With seamless endto-end performance and advanced business process, the manufacturer speeds up the process and reaches supermarkets on time and makes the proposed system fully operational.

It also reduces the efforts of human, simplifies the techniques of farming, and is also helpful to gain smart farming. Along with these features, smart farming can develop the market for farmers by a single touch and minimum hard work.

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