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IOT In Agriculture: Internet of Things- Solution For Smart Farming Monitoring System

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Abstract :

In India, the farming plays a vital role in the economy and growth of the nation as about 60% of the residents is indulged in farming. Agriculture is one of the fields where water is required in tremendous quantity. The water level required by each soil type varies vastly. The inappropriate preservation of water in cultivation leads to water shortage. The farmers working in the farm lands are solely dependent on the rain, river and bore wells for irrigation of the land. Along with those scorching summers threatens our planet every year, our farmers are unable to cultivate our traditional crops at their suitable seasons. Temperature dependence of crop depends on whether that crop belong to "wet harvesting crops" or "dry harvesting crops". Hence with change in temperature, their water requirement changes Soil water level can be manipulated and accordingly irrigation can be done which can save a huge water that applied in the field in surplus amount. In this type of environment, optimal temperature, humidity, and light intensity were provided to crops using IoT.

This research focuses on the design of a prototype using WSN to provide complete automation for the irrigation process. In this modern era of agriculture the farm lands have

water-pumps, drip irrigation system, but also manual controlling by farmers is required to turn the pump on/off whenever needed. The process can be turned to so simple if the whole irrigation process can be controlled automatically. Irrigation depends on a large number of factors. But here few of them have been considered. Therefore, from a farmer's perspective, it is highly desirable to monitor and control the environmental factors to avoid bolting. Keywords: Internet of Thing (IoT); GSM module; ARDUINO UNO, Farming, Agriculture.

***IndexTerms* – IOT, Agriculture, Cloud.**

I. INTRODUCTION

The rapid use of the Internet-of-Things (IoT) based technologies redesigned almost every industry including "smart agriculture" In the field of health and wellness, automatic control of home appliances, logistics, Industries and smart cities. IoT and automation can be applied in the field of agriculture enormously to improve every aspect of it. Agriculture in India is the means of livelihood of almost two thirds of the work force in the country. India's most important economic sector has always been agriculture. Bringing more land under cultivation, expanding irrigation facilities, using better seeds, techniques, water management, and plant protection have all contributed to an increase in post-independence agricultural production. A farmer's job entails

more than just ploughing and harvesting crops. To achieve good results, the farmer must remember to water the fields at regular intervals. To keep the field from drying out due to a lack of water and to keep the field owner informed about the weather conditions. In the field, to measure various weather parameters as well as soil moisture levels. It provides a simple and effective method for watering the fields when the soil moisture level drops. This system is completely automated. The setup includes an ARDUINO UNO microcontroller, as well as sensors, which are critical for controlling irrigation on the field. The ATMEGA 328P is a more advanced microcontroller that serves as the system's brain. We use various sensors, such as temperature and humidity sensors, to measure various climate parameters. As well as moisture sensor and pH sensor for checking soil condition. All of the measured sensor parameters are sent to the registered GSM module. And if any of the sensor activates, then the corresponding alert message will also send to the concerned person via SMS using the GSM module.

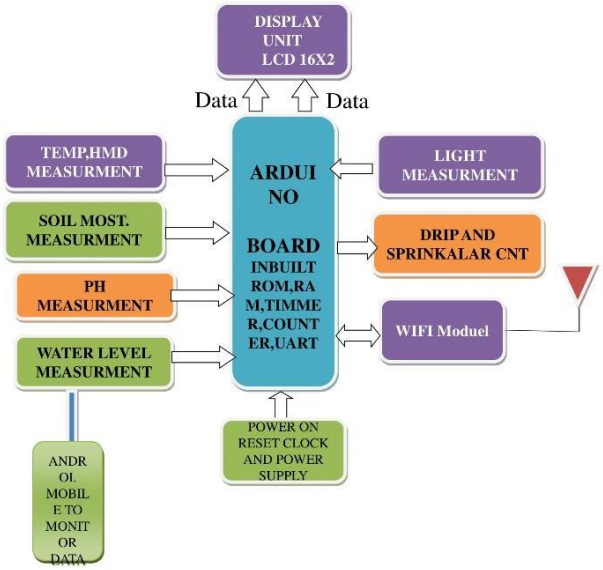

Figure 1. :- Block Diagram

Agriculture is done in every country from ages. Agriculture is the science and art of cultivating plants. Agriculture was the key development in the rise of sedentary human civilization. Agriculture is done manually from ages. As the world is trending into new technologies and implementations it is a necessary goal to trend up with agriculture also. IOT plays a very important role in smart agriculture. IOT sensors are capable of providing information about agriculture fields. we have proposed an IOT and smart agriculture system using automation. This IOT based Agriculture monitoring system makes use of wireless sensor networks that collects data from different sensors deployed at various nodes and sends it through the wireless protocol. This smart agriculture using IOT system is powered by Arduino, it consists of Temperature sensor, Moisture sensor, water level sensor, DC motor and GPRS module. For example When the IOT based agriculture monitoring system starts it checks the water level, humidity and moisture level. It sends SMS alert on the phone about the levels. Sensors sense the level of water if it goes down, it automatically starts the water pump. If the temperature goes above the level, fan starts. This all is displayed on the LCD display module. This all is also seen in IOT where it shows information of Humidity, Moisture and water level with date and time, based on per minute. Temperature can be set on a particular level, it is based on the type crops cultivated. If we want to close the water forcefully on IOT there is button given from where water pump can be forcefully stopped.

II. LITERATURE SURVEY

Smart Agriculture: IOT based smart sensors agriculture by Anand Nayyar and Er. Vikram Puri, November 2016 This paper focuses on how Internet of Things (IOT) technology has brought changes to each and every aspect of common man's life by making everything smart. IOT is a platform in which devices are connected to the internet, so that information can be collected and exchanged. The improvement of Intelligent Smart Farming IOT devices is gradually revolutionizing the agricultural production by not only strengthening it but also making it more cost effective which reduces wastage. The objective of this research is to propose a New Smart IOT based Agriculture helping farmers in obtaining Live Data regarding temperature and soil, for intensifying environment monitoring which will help them to involve in smart agricultural practices and increase their overall yield and quality of products. This paper provides insights to construct a methodology for efficient working on fields which makes agriculturists easy.

R. Nageswara Rao et al. (2018) Agriculture plays vital role in the development of agricultural country like India. Issues concerning agriculture have been always hindering the development of the country. The only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture. Hence the proposed method aims at making agriculture smart using automation and IoT technologies. Internet of Things (IoT) enables various applications crop growth monitoring and selection, irrigation decision support, etc. A Raspberry Pi based automatic irrigation IOT system is proposed to modernization and improves productivity of the crop. Main aim of this work to crop development at low quantity water consumption, In order to focus on water available to the plants at the required time, for that purpose most of the farmers waste lot time in the fields. An efficient management of water should be developed and the system circuit complexity to be reduced. The proposed system developed on the information sent from the sensors and estimate the quantity of water needed. A two sensors are used to get the data to the base station the humidity and the temperature of the soil, the humidity, the temperature, and the duration of sunshine per day. The proposed systems based on these values and calculate the water quantity for irrigation is required. The major advantage the system is implementing of Precision Agriculture (PA) with cloud computing, that will optimize the usage of water fertilizers while maximizing the yield of the crops and also will help in analyzing the weather conditions of the field.

Divya J. et al. (2017) Agriculture plays the major role in economics and survival of people in India. The purpose of this project is to provide embedded based system for soil monitoring and irrigation to reduce the manual monitoring of the field and get the information via mobile application. The system is proposed to help the farmers to increase the agricultural production. The soil is tested using various sensors such as pH sensor, temperature sensor, and humidity sensor. Based on the result, the farmers can cultivate the appropriate crop that suits the soil. The obtained sensor values are sent to the field manager through the Wi-Fi router and the crop suggestion is made through the mobile application. Automatic irrigation system is carried out when the soil temperature is high. Crop image is captured and it is sent to the field manager to suggest pesticides. Wang Ke Qiang and Cai Ken (2010) -Through the Internet of Things technology embedded technology neural networks image processing and information management technology to integrate develop monitoring and warning system of field information collection. One of the features of the system is the use of Internet of

things to make intelligent individual monitoring sites， mainly in the monitoring sites on the implanted sensor network node, using wireless communication networks and Internet networks are connected with each other and use the information collected field data to establish agriculture hazard warning model， the corresponding decision support program.

Suhas Athani et al. (2017) Suitable soil water amount is an obligatory condition for ideal plant growth. Also, water being a crucial element for life nourishment, there is the prerequisite to circumvent its excessive use. Irrigation is a supreme consumer of water. This calls for the need to control water supply for irrigation purposes. Pasture should neither be over irrigated nor under-irrigated. Soil Monitoring is one tool to provide soil information. Over time, systems have been applied so as to approach register this aim of which computerized procedure are the most accepted as they permit data to be gathered at high persistence with less work demand. Size of the current structure engage micro-processor based systems. These systems provide several technological supremacy but are high-priced, large, hard to sustain and less welcomed by the technologically untrained operators in the pastoral scheme. The objective of this project is to outline a manageable, facile to install technique to detect and specify the level of soil moisture that is endlessly managed with a view to attain pinnacle plant growth and concomitantly augment the obtainable irrigation resources. In this project we use the information obtained from the input sensors which is handled using the neural networks algorithm and correction factors for monitoring. Soil monitoring, providing a series of assessments showing how soil conditions and/or properties change over time. The use of simple obtainable components decreases the manufacturing and maintenance costs. This makes this system more economical, appropriate and a low maintenance solution for applications, mainly in rural areas and for small scale agriculturists.

III. Ease of Use

By using different kinds of IoT sensors and IoT application in farming smart agricultural can be applied. Here are eight technologies for smart farming.

A. Keep Track of Climate Conditions

The most desired smart agriculture gadget is weather stations which combine various smart farming sensors. This is implemented by locating the sensors across the field which collects various data from the environment and sends it to the cloud . All the collected measurements can be used in mapping the climatic conditions and choosing the appropriate crops and collecting required measures to improvise their capacity. Here are few devices available for such agriculture using IOT: all Metro, Smart Elements and Pycno.

B. Greenhouse Automation

There are several IoT sensors available to obtain data on soil, lighting, humidity and temperature which is required in the field of agriculture. Green IQ, Farmapp, Growlink are some of the farming products that uses the knowledge of smart farming, provided that clever irrigation and other smart services for agricultural.

C. Crop Management

There are several crop management devices which are placed in the field to obtain information specific to farming of crops. The crop growing can be checked to avoid any viruses that can harm the yield of crops. Arable and Seminos are good examples of crop management devices.

D. Cattle Monitoring and Management

IOT sensors can be attached to the cattle on the farm to understand their health conditions so that the sick animals can be identified and isolated. There are several smart agriculture sensors like cowlar to provide nutrition insights for the cattle on the field.

E. Precision Farming

IOT sensors can collect data regarding lighting, temperature, soil condition, humidity and pest infections that helps the farmers to collect data about optimal amounts of water , fertilizers to raise good quality crops. Cropx Mothive provides services to farmers to reduce wastage and increase yields.

F. Agricultural Drones

Agricultural drones is one of the most effective developments in the farming field. Drones are of great use for planting crops, fighting infections and pests and monitoring crops. Drone Seed, builds drones for planting trees in the areas that are deforested.

G. Predictive Analytics for Smart Farming

Farmers can make use of data analytics which helps them to use the real-time data and make predictions on crop harvesting time, how much yield the farmers can get. It also helps in analysis of climate situations. Crop Performance technology helps farmers to manage the supply of water and nutrients to improve the quality of crops. Irrigation processes can be enabled by using farming solutions like soil scout.

H. End-to-End Farm Management Systems

Distant farming techniques can be accomplished using FarmLogs and Cropio. There are several IoT devices and sensors placed on the agricultural fields to practice smart farming.

In the smart agriculture domain, besides the main problems of sensing, collecting data, and controlling devices to respond to the real farming environment, data storage and processing are also important problems and face some challenges. In reality, the number of collected data is huge, and traditional data storage, organization, and processing solutions are not feasible. Therefore, big data processing solutions need to be researched and applied for smart agriculture

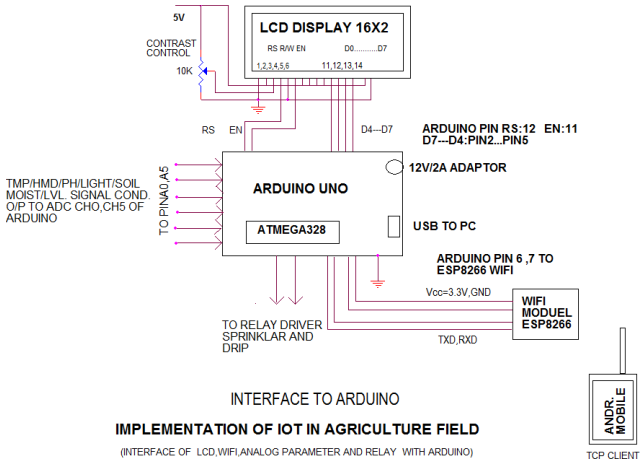

Figure 2:- Interface Circuit diagram

IV. RESULTS

After Signal conditioning data shown on LCD of Arduino :

Table 1:

SN	PARAMETER	Span	Actual Val.	Unit
1.	Temperature	0-100	25.00	Deg. C
2	Humidity	0-100	78.00	%
3.	Light	0-100%	32%	%(lux or candela)
4.	Level(Tank Height)	0-225	200	Inch
5	Ph	0-15	8.00	-
6	Soil Most.	0-100	90.00	%

1)Signal conditioning is done for 10bit inbuilt ADC for analog i/p 0-5V.
2)Calibration of each parameter is done in relation with span and unit.
3)All parameters are shown with their unit on LCD.
4)These parameters sent by Xbee from arduino:

The irrigation data for different sensors like moisture, temperature, humidity. Once it reaches the threshold level, the device provides appropriate action to the fieldwork robot. Figure 8 shows the irrigation of raw data details with moisture, temperature, humidity sensor output. This continuous graph shows well-performed device activities during feedback processing time. the overall performance response of the smart agriculture system. In the sensor fieldwork, the robot responds to the real-time scenario. The experimental setup of our IoT-based smart agriculture monitoring system consisting of many sensors with CPU. The microcontroller unit is connected with mobile for live stream data fetching from the raw field [36]. The raw data of temperature sensor details shows in figure 9. Based on this data, the IoT will provide proposed feedback with help of the fieldwork robots in the smart agriculture domain.

V. CONCLUSION

The model which consists of many analysis sections for an overall framework. Thus our integrated units having many advantages as discussed earlier in smart agriculture units with IoT modules. Few limitations are also incorporated in this constrained model for platforms and security. The number of challenges and limitations considers the most IoT-based devices for smart agriculture. The main focus is cost-effectiveness in the IoT devices in the reduction of hardware and software cost with compromising precision system output. The imported devices ignores the compromise with the component's expenses gets minimized. The standardization of the data format for the process will also provide improved device consistency and execution time. The initial process barrier providers for active farmers are regulated when improving the system's goods or services. Also, the proposed integrated system will provide complexity due to many devices interlinked through a web server. The heterogeneity property is a very complicated process in the IoT sector which provides better accuracy and excellent overall performance of the system. Finally, the deep learning analysis with a huge amount of features or data can increase the production from smart agriculture by IoT.

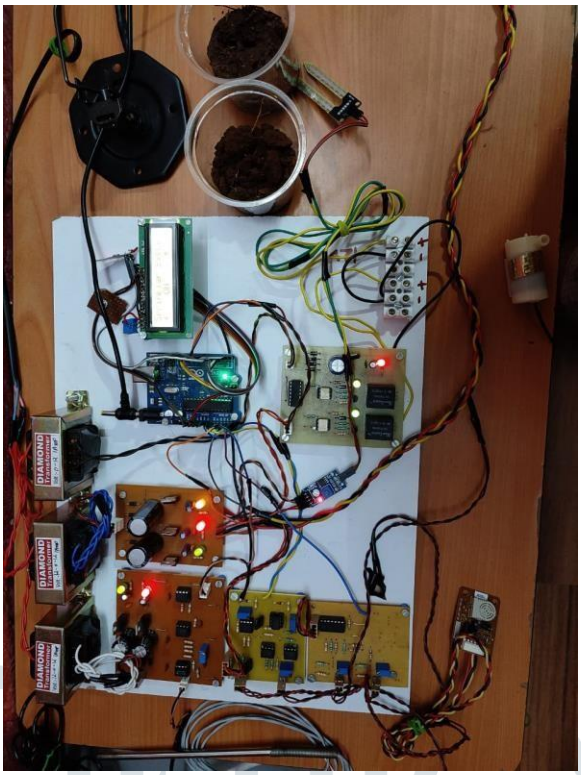

Figure 3: Actual image of project

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