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Iot: A Boon for Farming

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***Abstract*—** Agriculture plays a very important role in the development of any country. As in India, about 70% of the population depends upon the farming and 1/3rd of the capital comes from agriculture. Now the agriculture area in India is diminishing day by day, which is affecting the production capacity of the ecosystem, development of the country, capital of the country and mainly farmers of India. The main purposes of this article to overcome these problems which come directly, indirectly in farming by using the recent technology called IoT (Internet of Things) and provide a perfect solution. IoT has shared a network of an object embedded with electronics, software, sensor and many more with the internet for collecting and exchanging the data. One of the important application of IoT is Smart Farming. In Smart Farming, we discuss the implementation of IoT in Irrigation System, Large Farming Operation, Organic Farming, Family Farming, Production System, Monitoring System to analyze the Weather, Crop, Soil condition.

Keywords- *IoT, Internet, Software, Data, Technology, Bluetooth, WI-FI, GPS, RFID, AI, Farming, Crop, Production, Application, Android, Software, Hardware, Sensor, METO, Pycno, Hygrometer, Soil, Weather, Greenhouse, Transistor.*

I. INTRODUCTION

The World is becoming an advance through new technologies and their implementation in daily life. So it is necessary to look upon rural areas for implementing recent technologies like IoT not only in agriculture (called Smart Farming) but also in homes (called Smart Homes). As we know that Agriculture is the basis of life for whole Living Organisms because it provides food grains and other raw material and also provides opportunities for employment for most people. The growth of the Agriculture sector in the rural area is necessary for the development of rural people as well as to maintain the economic condition of the country. Today also in rural area farmers are using traditional methods which result in less productivity. So wherever automation has been implementing or had been implemented, it is found that productivity has increased, improved and manpower is reduced. Here there is a need to implement the recent automation based technology of IoT like monitoring system of the crop, weather, cattle, and soil etc., Smart Greenhouse, Cloud Computing for data collection, Smart Analysis. To do these all we deal with the sensor, hardware, software almost.

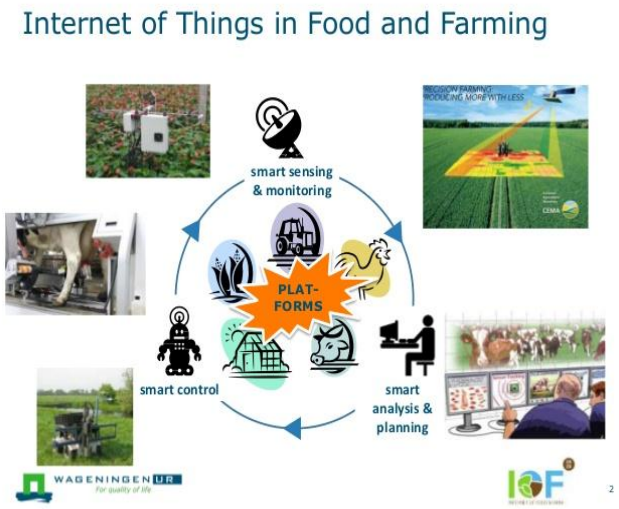

Fig 1-Smart Farming

II. IOT APPLICATION FOR FARMING: MONITORING OF CLIMATE CONDITION

The most popular gadgets used in agriculture are a weather station. The various sensors in farm field collect the various data from the environment and then send the data to the cloud. From the cloud, the data is analyzed by the weather forecasting expert and then this analyzes data will display with the result that which crop is suitable for cultivating. So

by choosing the appropriate crop and increase the yield. Some examples of such agriculture IoT devices are all METEO, Smart Elements, and Pycno.

III. IOT APPLICATION FOR SOIL USED IN FARMING

To analyze that soil had fertility or not, farmers do soil testing. To make for convenience to the farmer IoT introduced a different mechanism to check the soil fertility, soil requirements, soil moisture and many more soil related disease which affect the crops. This all the factor is analysed by the different sensor used in making equipment of IoT application and solved by agriculture expert and instruct to a farmer using a mobile application. As we know that different crop requires different soil factor. In this work, we used a device for remote monitoring of soil characteristics. This device is connecting with the mobile application through Bluetooth, WI-FI, Internet etc. through sensor node we send the data and this data is received in the mobile application.

It also tells the farmer that which crop should be cultivated first and then after which crop should be cultivated, what type of method is used for protecting soil as well as crop.

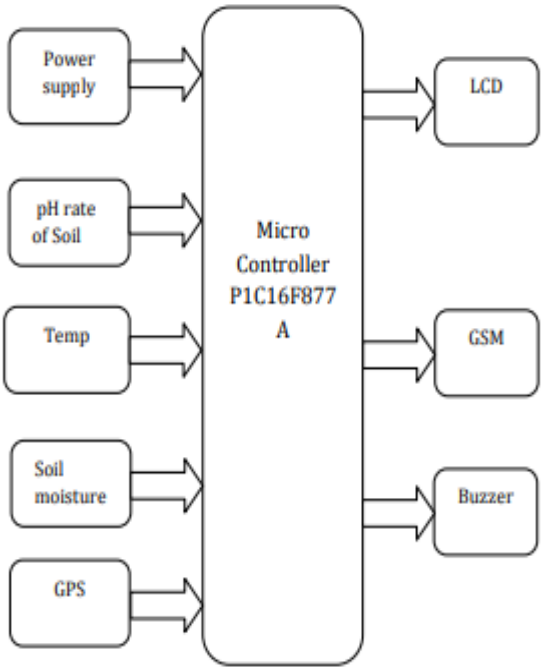

Fig -2: Block diagram of Smart Farm Monitoring System

A. Devices and raw material used:-

(I) Sensor: -

This sensor senses the soil moisture, soil measurement and tell us about soil fertility, temperature, organic compounds require for fertility, insects, disease. Some sensors are installed two-meter-deep (neon 5 plot). Some sensors are

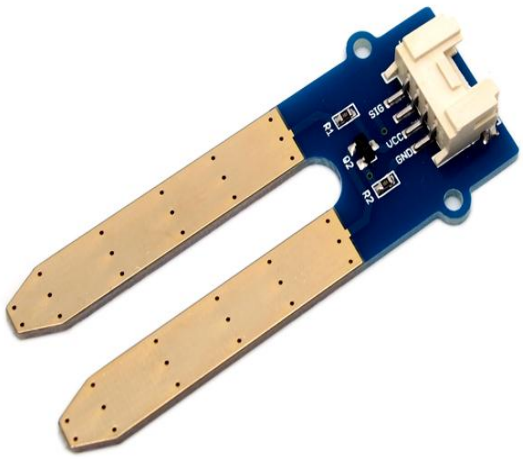

Fig-3 Sensor for getting information about Soil Moisture (Soil Hygrometer)

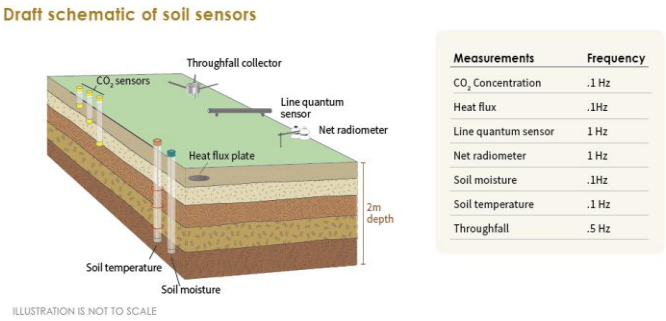

Fig-4 Systematic Diagram of using Sensor in Soil

Fig-5 Sensor for Soil Management

(II) Aurdino and Transistor: -

Aurdino basically used for programming and transistor is used for completing the circuit.

IV. IOT APPLICATION FOR PROTECTION OF CROP

After Successful testing of soil now it's time to cultivate the crop. For cultivating the crop, we used the new automation based machinery or traditional method and then we put the sensor which requires for soil, crop and to check the weather. There is the various method used for crop protection as well as cultivation to get better production. They are

A. The Assistance of Drones

The technology is changing day by day the most recent example of this is DRONES. Drones are used in agriculture to enhance Farming. The ground-based and aerial-based drones are used in agriculture. Drones are helping farmers by providing image and the areal maps. The advantages of using this innovative technique (Drones) are: -

- → Crop Health State
- → Irrigation System
- → Monitoring Process
- → Spraying
- → Planting
- → Soil and Field Analysis
- → GIS Mapping
- → Drainage Mapping

Drone technology will provide a high tech makeover in Agriculture Industries with good planning and strategy based on real-time data collection and processing.

Fig-6 Using Drone in Agricultural Field

From the drone data, we can draw insights regarding plant health indices, plant counting and yield prediction, plant height measurement, canopy cover mapping, field water poising mapping, scouting reports, stockpile measuring, chlorophyll measurement, nitrogen content in wheat, drainage mapping, weed pressure mapping, and so on. The drone collects multispectral, thermal, and visual imagery during the flight and then lands in the same location it took off. [1]

V. IOT APPLICATION FOR FARMING: SMART GREENHOUSES

Greenhouse farming is a technology which helps in enhancing the productivity of vegetables and fruits, crops etc. It controls the environment of surroundings through proportional control mechanism and manual intervention. With the help of IoT, we can design a smart greenhouse; this design controls the climate as well as monitoring intelligently, eliminating the need for manual intervention. To control the environmental parameter of smart greenhouses, different sensors are used to measure the environmental parameters according to a various plants requirement. For remote accessing, we have to create the cloud server for connecting IoT. [2]

Illuminum Greenhouses is a drip installation and Agri-Tech greenhouse organization and uses new modern technologies for providing services. It builds modern and affordable

greenhouses by using solar-powered IoT sensors. With these sensors, the greenhouse state and water consumption can be monitored via SMS alerts to the farmer with an online portal. Automatic Irrigation is carried out in these greenhouses [3].
The IoT Sensor is used in smart greenhouses not only provide the information but also controls they are: -

- Lights Level
- Pressure
- Temperature
- Humidity
- Actuators
- Control on Heater and Fan

This all data is taken by Wi-Fi or Bluetooth.

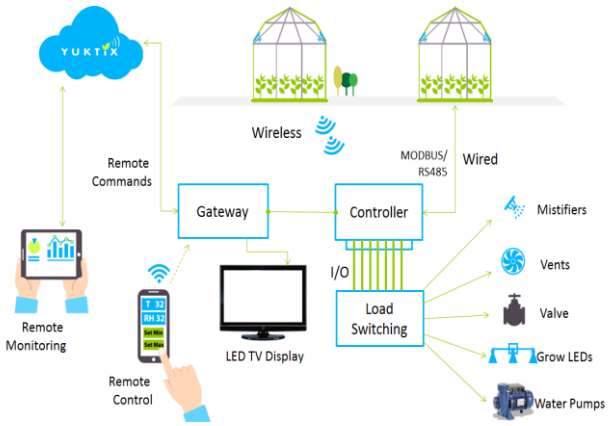

Fig-7 Mechanism of Smart Greenhouse

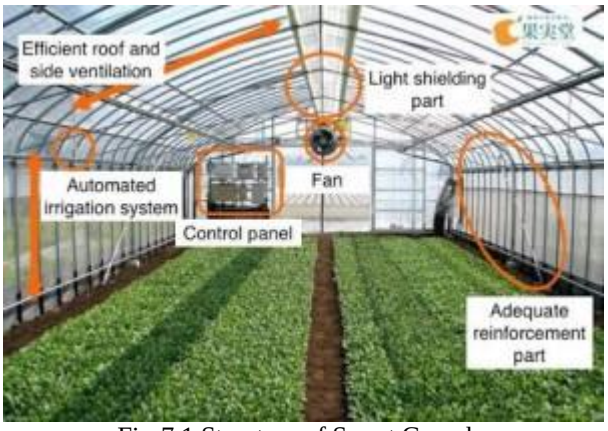

Fig-7.1 Structure of Smart Greenhouse

VI. IOT APPLICATION FOR FARMING: LIVE STOCK MANAGEMENT

The wireless IoT application which provides data of cattle like location, health, well-being etc. It helps the owner to provide an information like: -

- They are Sick or not.
- Monitoring at animals.
- The animal is pregnant or not.
- Water break.
- Productivity.

Fig-9 Live Stock Management

VII. IOT APPLICATION FOR FARMING: MOBILITY

A. Framapp:-
It is one of the IoT based apps used in smart farming. The framer can track Integrated Pest Management software with monitoring, sensors, and fumigation functions.

B. Growling:-
It is used for real-time monitoring of Smart Green Houses.

C. GreenIQ:-
It uses the smart agricultural Sensor. It is a smart sprinkler controller system.

D. Farm blog:-
It is an agriculture market software for facilitating grain marketing decisions.

E. Cropio:-
It is an agriculture field related software which provides an information related to the field, it accesses the real-time data and tell us for updation if required in the field

Fig-8 GreenIQ

Through Smartphone application we can find out various factors that are: -

a) **Disease Detection and Diagnosis:** Photos taken of suspect plants can be forwarded to experts for analysis.
b) **Fertilizer Calculator:** Soil sensors and leaf colour can determine what nutrients are needed.
c) **Soil Study:** Capturing soil images, as well as pH and chemical data from sensors, allows farmers to monitor and adjust to changing soil conditions.
d) **Water Study:** Determining Leaf Area Index from photos and brightness logging can help farmers determine water needs.
e) **Crop Harvest Readiness:** Camera photos with UV and white lights accurately predict ripeness. [5]

Fig-10 Framaap

VIII.IOT APPLICATION FOR FARMING: AGRICULTURE SENSOR

There is a lot of sensors are used in the IoT application.

- Location Sensos
- Optical Sensor
- Electro Chemical Sensor
- Dielectric Soil Moisture Sensors
- Airflow Sensors

Some software for designing/providing instruction to an application: -

- Python
- Hadoop
- Java
- Artificial Intelligence
- Machine learning

IX. IOT APPLICATION FOR FARMING: SMARTPHONE TOOLS

Smartphone Tool	Smart Farming Applications
Camera	Provides pictures of leaf health, lighting brightness, chlorophyll measurement, and ripeness level. Also used for measuring the Leaf Area Index (LAI) and measuring soil organic and carbon makeup.
GPS	Provides a location for crop mapping, disease/pest location alerts, solar radiation predictions, and fertilizing.
Microphone	Helps with predictive maintenance of machinery.
Accelerometer	Helps determine Leaf Angle Index. Also used as an equipment rollover alarm.
Gyroscope	Detects equipment rollover.

X. IOT APPLICATION FOR FARMING: MAINTENANCE OF THE SYSTEM

Maintenance of your hardware is a challenge that is of primary importance for IoT products in agriculture, as the sensors are typically used in the field and can be easily damaged. Thus, you need to make sure your hardware is durable and easy to maintain. Otherwise, you will need to replace your sensors more often than you would like.

XI. IOT APPLICATION FOR FARMING: SUPPLY CHAIN

For control, the transportation and storing of plant IoT enables us to use the Location Sensor which is GPS, RFID and another sensor etc. The effectiveness of the entire supply chain comes from transparency and customer's awareness.

XII. THE BENEFIT OF IOT BASED SMART FARMING

✓ *Better control over the internal processes and, as a result, lower production risks*
✓ *Enhanced product quality and volumes*
✓ *Increased business efficiency through process automation.*
✓ *Data, tons of data, collected by smart agriculture sensors***,** e.g. weather conditions, soil quality, crop's growth progress or cattle's health. This data can be used to track the state of your business in general as well as staff performance, equipment efficiency, etc.

Fig-10 Smart Farming Benefit

CONCLUSION

As technology is becoming advanced and automated in every field here also, we have to think about rural areas for implementing this all new or recent technologies for the better as well as a smarter future. Today not only agricultural is smart but the whole scenario which comes in our daily life is becoming smart by using recent technology like IoT, Machine Learning, AI etc. So in this, we can make use of recent technology to make or rural areas smarter and developed.

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Mohit Yadav is a student of Computer Science and Engineering Department at Kruti Institute of Technology and Engineering College, Raipur, Chhattisgarh. He is pursuing Bachelor of Engineering form Chhattisgarh Swami Vivekananda Technical University. Her recent publications in Artificial Intelligence and its Application: A marvellous Technique in International Journal IJARIT. His other research works are focused on Development through upcoming technologies like Artificial Intelligence, Machine Learning and IoT.

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