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IOT and Agriculture Data Analysis for Smart Farm

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Abstract—IOT plays a important role in agriculture. IOT uses sensors which are capable of providing information about agriculture field. Smart farming is managing farms using technologies like IOT to increase the quantity and quality of products by improving yields of crops. Wireless sensor network are being proposed for watering of crops to increase the productivity and gives the new direction for research in agriculture and farming through a mobile application in a smartphone. Wisekar is used to detect the disease in crops and report the type of crop disease to the farmer. As Farmer is the backbone of our country this work help the farmers handle various operation wirelessly through mobile applications and providing smart agriculture to farmers.

***Keywords*—**Smart farming;IOT(Internet Of Things); wireless sensor network; wisekar; Smartphone.

I. Introduction

Agriculture is the science of farming, including cultivation of the soil for the growing of crops.Agriculture plays a major role in India's economic growth. Agriculture is the main industry in this rural location.Advanced technologies can bring benefits to the majority of people [1].In the recent years, the Internet of Things (IoTs) has begun to play a major role in daily lives. Modern day farming demands increased production of food to accommodate.

The WSN-based farming solutions need to be of very low cost to be affordable by end users. Reports warns that the growth in food grain production is less than the growth in population to increase the role of ICT in agriculture, an agricultural advisory system to mitigate crop-diseases the agriculture-advisory implemented large global population [2]. New technologies are being applied in this domain to enhance the productivity.

Compared to the wiring method, wireless is cheaper, since it is free of cable maintenance, flexible in installation, and also reliable.Irrigation scheduling is predicted with WSNs by monitoring the soil moisture and weather conditions. We focus on data consisting of temperature, humidity, and soil moisture in the crop fields. In crop farming, WSN can be used to monitor and control factors that influence crop growing conditions and yields [4].Wisekaris a web-based repository for archival of sensor-derivedevents. IoTs repository for sensor networks, the structure of Wisekar is flexible enough to be useful for a variety of applications. The crop disease is detected from crop-images. Fuzzy Logic is used to find the percent-infection of disease [3].

II. Related Work

Applications and agriculture data analysis ofIOT, WSNs for agriculture, Wisekar used in agriculture support.

1. Application And Agriculture Data Analysis Of IoT

In the recent years, IoTs have been applied in many studies and applications. The applications of technology in the field of agriculture are used to improve crop yields and to reduce costs [1].Tracking and tracing the whole agricultural production process were done with distributed IoTs servers.IoT focused on irrigation system using WSN for collecting environment data and control irrigation system via smart phone.The sensors are used to measure humidity, soil moisture, temperature and are controlled with an electronic device (Arduino) and used smartphone application for flexibility and functionality [1].This system was supported by a WSN for gathering and analysing plant related sensor data to provide control of climate, fertilization, irrigation, and pests. [1]. It also focuses on the leaf spot disease assessing the crop-weather-environment-disease relations, based on wireless sensors. After accumulating data from agriculture IoT system, a relevant functional requirements was demonstrated to support large data analysis in agriculture.

2. Wisekar Used In Agriculture Support.

The ICTs was used to boost the agriculture production. Agriculture advisory systems were introduced to detect the crop-related problems. The framework as been developed around IOT. ACAS is implemented with wisekar to detect the crop disease [5]. Wisekar is an IoT repository designed to store data from multiple domains [2]. Wisekar acts as a bridge between advisory system and software for crop-disease [5].

3. Wireless Sensor Network

In agriculture, most of the WSN-based applications are used for various applications [2]. WSNs for environmental condition monitoring and applied for predicting crop health and production quality over time. Irrigation scheduling is predicted with WSNs by monitoring the soil moisture and weather conditions. WSNs uses Fault-tolerance,Scalability, and Tolerance against communication failures in harsh environmental conditions, Information security. The usage of pesticides andfertilizers helps increasing the crop quality as well as minimizing the farmingcost. However, forandfertilizers helps increasing the crop quality as well as minimizing the farmingcost. However, forcontrolling the usage of pesticides, monitor the occurrence of pests in crops. To predict the occurrence, the surrounding climate information such as temperature, humidity, and wind speed need to be determined [2].

A herd of cattle grazing a field can be monitored using WSN technology or Radio Frequency Identifier (RFID). Thus, real-time monitoring of any cattle is also achieved. The WSN used to monitor whether any cattle is moving near the vegetation fields or not.

III EXISTING SYSTEM

In the existing system of agriculture the farmers have to grow crops manually .The farmers are not aware of the technology that are being used in agriculture .Due to the disease in the crops the productivity is less and the farmers are not aware of the crop disease and pesticides that are used for the growth of the crops and increase their productivity.

Disadvantages of existing systems

- Deficient production information.
- Less knowledge about weather forecast.
- Poor ICT(Information and Communication Technology) infrastructure.
- Marketing research skills and research center.
- High cost machineries for work.
- More manual work.
- Keeping track of record manually.

IV. METHODOLOGY

This work aims at design and implementation systems with sensors in the crop field and data management by using a smartphone with web application.This system is implemented with three parts i.e. control box,web application, and mobile application as shown in the Fig. 1.

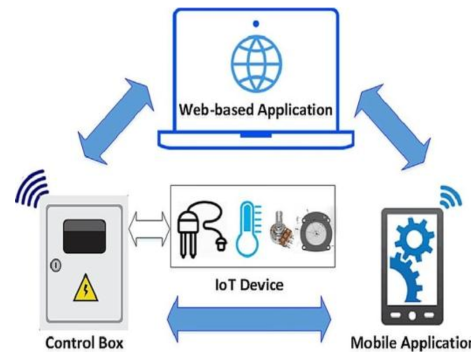

Fig. 1..An overview of the system.

A. Control Box

The control box is designed to control the IoTs devices and obtain data from the crops. The control box could be located anywhere in farm or near the farm, having the soil moisture sensors, solenoid valve, DHT22 sensor, and an ultra-sonic sensor connected to the control box.

B. Web-Based Application

The web-based application was implemented to manage agricultural plots and to manage watering of crop. The web-based application involves managing the real-time information from IoTs devices in each village. The web-based application allows an administrator to manipulate the conditions of water needed of each crop mobile application.

C. Mobile Application

The mobile application is used to control on-off switching of the electrical system by the farmer manually or automatically through LINE application.

The control box keeps the electronic devices in a water proof box and can be located anywhere in the farm where the soil moisture sensors are used to measure the humidity of crop soil and control the switching on and off water sprinklers automatically. The web based applications is used to get information of agriculture from NodeMCU and is used to manage the agricultural plots and watering of crops. The mobile application is used to switch on –off by the farmer. It can be controlled manually or automatically. The automatic system is activated based on the values defined by the field sensors. The farmer can also take control to switch on-off the water and notifications are obtained through LINE application.

[i] Wisekar-based Automated Crop-disease Advisory Service (ACAS) to detect crop disease.

When a crop is affected with the disease the farmer need to know about the disease, he uses his mobile phone to capture a few images of the crops and sends them to the RTBI call-centre. The call centre consists of experts and semi-experts to advise the farmer..The semi-trained experts at the call-centre use the information available at the dashboard. In ACAS the image is captured and sent to the wisekar using the corresponding library and the disease is recognized and sent back about the crop disease to the dashboard. During the process the call centre and advisory system are recorded.The software takes the input from the wisekar and corresponding software is chosen for detection and is passed to the crop monitor where the crop image is monitored and the type of the disease is chosen and sent the result back to the dashboard.

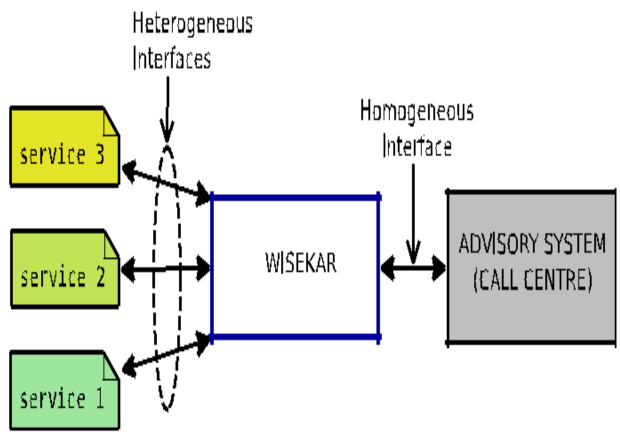

Fig 2: Interfacing heterogeneous services to the advisory system through the wisekar

[ii] Wireless sensor used in agriculture

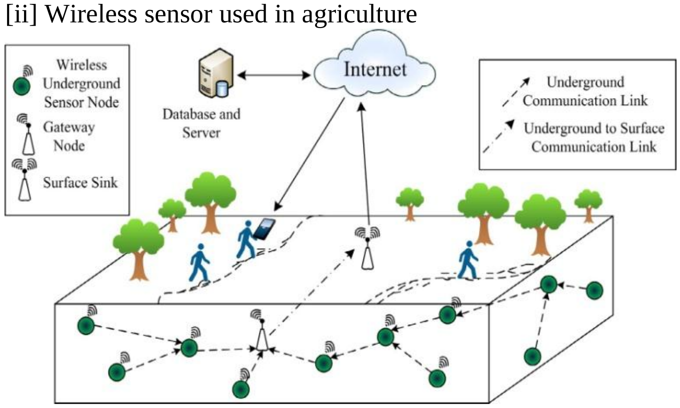

Fig. 3. A typical wireless sensor network deployed for agricultural applications.

The nodes in the on-field sensor network communicate among themselves using radio-frequency (RF) links. A gateway node is also deployed along with the sensor nodes to enable a connection between the sensor network and the outer world. The gateway node is powered with both RF and Global System for Mobile Communications (GSM) or GPRS.

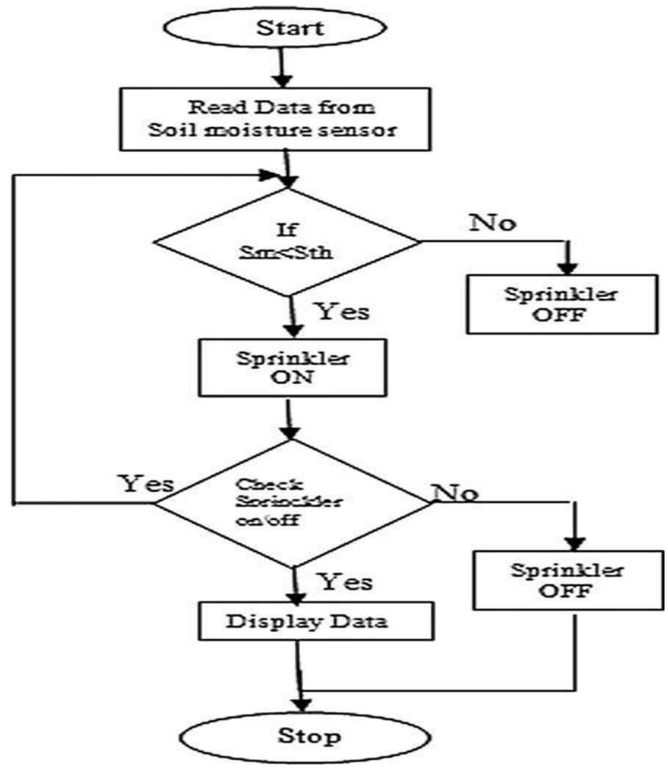

Fig 4: Flow chart of the smart farming

The flow chart is designed as the soil moisture is sensed by the sensor, depending on the soil moisture threshold value the sprinkler module works and making on and off sprinkler is to be achieved by the above programming flow chart.

V. RESULTS AND DISCUSSION

The system can use IoT devices to collect data on humidityderived from the DHT22 sensor, soil moisture derived from soil moisture sensor, and temperature derived from web service .The information can be displayed on a mobile device to the farmer, and is used by automatic on/off control of watering.

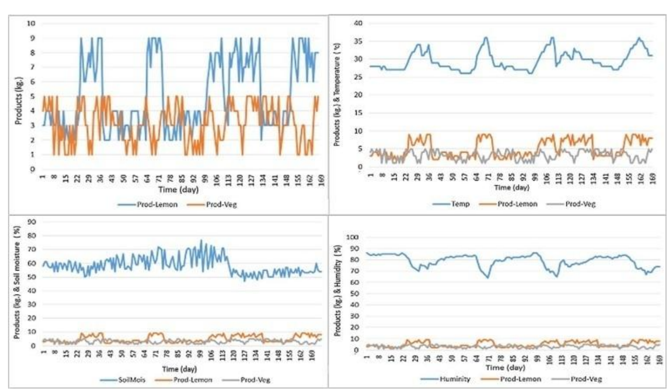

Fig 5: Comparison of IoT information with productivity

The farmer can manually turn on/off the watering. The status of on-off switching and time stamps can be notified via LINE Application. The humidity and temperature varies with the different cultivation. If lime cultivation is high the humidity will be in middle. If lime cultivation and homegrown vegetables are high then temperature will be in middle. From an economic perspective, this system was considered an investment because of its low cost.

VI. CONCLUSION AND FUTURE SCOPE

IoTs was applied in agriculture to improve crop yields, improve quality, and reduce costs. The survey state that lot of research is going on in IoT technology to increase the productivity in agriculture. There are still a number of issues that are faced by farmers and the issues need to be identified and solve the issues using the technologies with an affordable security and cost. As the new technologies are used for solving issues in agriculture there will be an improvement in the agriculture and farmers. As there is increase in the productivity then the products that we get from the agriculture will be at the cheaper rate and awareness need to be created in the farmers based on the new technologies that is evolving to help agriculture and the farmers.

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