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Modern Agriculture Using Wireless Sensor Network (WSN)

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Abstract - Agriculture is the back bone of India and nearly 70% of people in our country depend on agriculture. The yield of agriculture should be increased rapidly to fulfill the food requirements of population throughout the world. Now days Wireless Sensor Network (WSN) used for solving many real time problems. WSN plays vital role in many field like transport, medical, military, mobile phones, home appliances and so on. Agriculture is one of the important sources for all living things. But nowadays agriculture crops are affected due to many environmental changes. To overcome this WSN takes important role in the field of agriculture. In agriculture WSN used for monitoring, measuring temperature, irrigation system, measuring water supply and so on. WSN helps the farmer to produce the crop with high quantity and reduce the cost of yield. Agriculture gets affected by climatic change, environmental change, and natural disaster. Using WSN the soil and water management can be done. Here wireless sensors are used so the cost of implementation is very low. In this paper wireless sensor nodes are used to monitor the crops. The temperature, humidity and some other theft detection can be made using sensors. This helps to increase the productivity of agriculture. The human effort is reduced by automatic process and it encourage the farmer to develop the farm land. The location of the farm land can be send using GPS. Some components like sensor, Wi-Fi, camera and some other devices are used to make the agriculture as smart. All the gathered information are stored in memory or in cloud.

Keywords: Access point, Sensor nodes, Smart phone, Web server, Wireless Sensor Network (WSN)

I. INTRODUCTION

Wireless Sensor Networks helps the farmers to change the traditional agriculture to modern agriculture. WSN helps the farmers in different aspects. Wireless Sensor Networks use distributed sensors to gather the information and transmit the gathered information using wireless networks. In WSN micro sensors are used and global positioning system (GPS) is used in the sensors to find the exact location. It is mainly used to monitor the environmental changes as well as climatic change, temperature, humidity, soil test. Sensor networks are very small, cheap and can be used even in rural areas. Wireless Sensor Networks use three types of topologies. They are star, cluster tree, mesh and by using these topologies connection can be done. WSN use some components like battery, radio, microcontroller, analog circuit and sensor interface.

Crops must be developed with low cost and with less time this helps the farmer to earn high profit. Using WSN the human effort can be reduced in agriculture. Agriculture is basic of life for all the human for the food and other raw materials.

Agriculture is main source for growth of economy. Many uneducated people get employment in agriculture. Unfortunately, farmers use traditional method which reduce the yield of growth. But when the automatic system is implemented in agriculture, it used to increase the yield of crop. The most of the paper use Wireless sensor network to collect the data of farm land using sensors and sent it to server using some wireless protocols.

All the collected information provides data and it used to increase the yield of crop. The collected data present in server is not enough to increase the growth of crop. There are some other factors which affect the growth of crop. The wild animals and birds can affect the crop it can't be reduced. There are some other factors like insects and pests can affect the agriculture. Some people involves in theft when the growth of crop reached for harvesting. The storage of harvested crops is very difficult for farmers.

In this paper the soil moisture content is measured. The infected plants is measured using bio sensor and the result is send to farmer's mobile phone. The role of sensor is very important and all the devices are connected to internet. The GPS is used to share the location of farm land with farmer and also with agriculture officer.

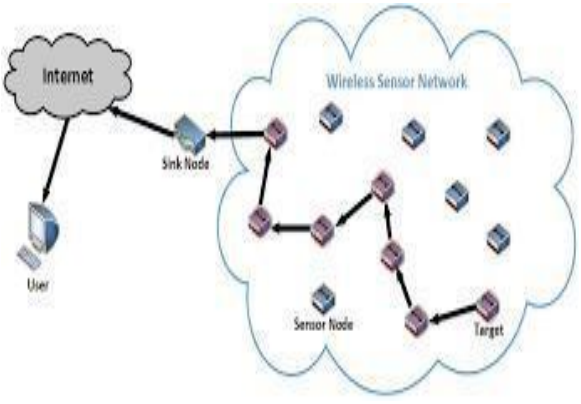

Fig: 1 Overview of Wireless Sensor Networks

Here the temperature, humidity sensor is used to measure the temperature and humidity of the farm land is measured.

II. LITERATURE SURVEY

Pratibha Gangurde, Manisha Bhende Proposed a Novel Approach for Precision Agriculture Using Wireless Sensor Network [1]

In this paper wireless sensors are used to monitor the crops found on the agriculture lands. Sensor networks are used to measure the water level, temperature, humidity, pesticides and so on [2] [3]. Wireless sensors are very cheap, small. Here few sensors are developed for monitoring the agriculture lands.

Using these sensors the time and effort for growing the crops can be reduced and the productivity can be increased. WSN use different types of topologies like bus, star, grid and ring. In star topology all the nodes cannot communicate directly [4]. Compare to other topologies ring network is better because for every node only two neighbors are present for communication. The messages can be transmitted in both clockwise and also in anticlockwise direction.

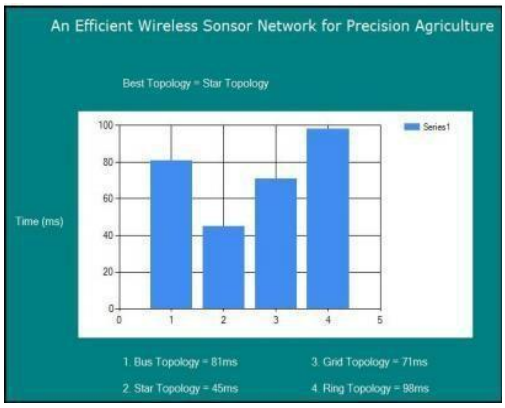

Fig: 2 Efficient Wireless Sensor Network for Precision Agriculture

Vaibhavraj S. Roham, Ganesh A. Pawar Proposed Smart Farm using Wireless Sensor Network [5] [6]

In this paper wireless sensor network is also called as Zigbee Network. In this sensors are called as nodes and those nodes are embedded with other sensors. It used to measure temperature and humidity. Nodes monitor the environment and forward the information to router. Router forward the data's to co-coordinator which is connected to internet [7]. Finally all the

collected data's are stored in database for processing. Here computers and mobile application are used to monitor the greenhouse [8]. Smart phone android applications are designed and connected to internet. Application is connected to web server and can monitor the crops without the help of human.

J. Infantial Rubala, D. Anitha Proposed Agriculture Field Monitoring using Wireless Sensor Networks to Improving Crop Production [9]

In this paper WSN are used in all kinds of crops for monitoring as well as for delivering the water, fertilizer and also for other uses. Data are not collected frequently from the crops because frequent collection does not provide any useful information and it provide heavy burden to sensors [10] [11]. Hour based data collection can be done. This helps the farmer to grow the crop and earn high yield with low cost.

K. Lakshmisudha, Swathi Hegde, Neha Kale, Shruti Iyer Proposed Smart Precision based Agriculture using Sensors [12] [13]

In this paper sensors are used for monitoring the soil moisture, humidity level and send the data through network. It reduces the human effort and the crop can be yield with low cost. In the implementation raspberry pi is used and it is connected to 5V power supply. The soil moisture sensor and humidity sensor are used for measuring soil and humidity. Using serial communication data are transmitted in the form of 0's and 1's [14] [15]. Where 0 indicate the motor is turned on. Permissible level get reach the notification is send to user mobile. Motor can be turned using smart phones. Each and every 1 minute moisture values are monitored using moisture sensor. Required level is reached motor gets off automatically.

Nikesh Gondchawar, Prof. Dr. R. S. Kawitkar proposed the IoT based Smart Agriculture [16]

In this paper the mobile robot sensor is used as node 1. It is used to control the water pumps automatically. The level of water content is low the pump gets ON automatically or the level of water content in a land is high the pump gets OFF automatically. In node 2 some sensors like light sensor, motion detector, humidity sensor, room heater, temperature sensor are used in raspberry pi. The temperature sensor used to measure the level of temperature in farm land. In node 3 the moisture sensor is used to measure the soil content in farm land. The transmitted data is send to node 2 and it is send to microcontroller. The data is used to control the water pumps. Raspberry pi is a small size computer used for computing and network. All the data is send to farmer mobile phone. The data is send to base station through GPS (Global Positioning System). The microcontroller is used to transmit the data to raspberry pi.

Gokul L. Patil .et.al proposed the Smart Agriculture System based on IoT and its Social Impact [17]

In this paper to produce the crop with high yield and to reduce the human effort. In this paper some sensors are used to measure the crop land. Sensors like Temperature Sensor, Moisture Sensor, Pressure Sensor and Humidity Sensor are used in farm land. The change in Temperature in the form land used to reduce the nutrient content in form land. Moisture Sensor works on the principle of electrical conductivity. The Moisture content is one of the important factor of crop growth. The Pressure Sensor connected to microcontroller to regulate the water flow. The Humidity Sensor used to measure Humidity level in air.

III. TEMPERATURE SENSOR

The temperature sensor used to measure the amount of temperature in the farm land. The temperature like coldness or heat can be measured using temperature sensor. There are two types of temperature sensors are available. The contact temperature sensor and non- contact temperature sensor used to measure the temperature.

Fig 3: Temperature Sensor

IV. HUMIDITY SENSOR

The humidity sensor is used to measure the level of humidity in air. It measure both moisture and air content. The humidity sensor is also called as dew sensor. There are two electrical conductors conduct the electric field between them. The sensors is composed between two metal plates and conduct the polymer firm between two electrical conductors.

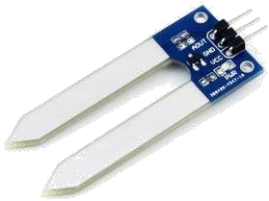

Fig 4: Humidity Sensor

V. SOIL MOISTURE SENSOR

It used in farm lands to measure the water content of soil. The soil moisture sensor is very simple to measure the volumetric water content in farm land. It helps the farmer irrigation system more efficiently. This soil moisture sensor is used in urban and suburban areas. It is also used in horticulture, climate research and also in environmental science. The voltage used by soil moisture sensor is 5V and the current used by it is < 20mA. The temperature used by soil moisture sensor is 10-30 degree C.

Fig 5: Soil Moisture Sensor

VI. BIO SENSOR

The bio sensor is used to measure the microorganism, antibodies and so on. It use the components like bio element, transducer, amplifier, processor and display. Here it used to measure the infection of plants. The level of defect is measured and the process is done. The level of infection is less the notification message is send to mobile phone of farmer. The level of infection is high the message is send to mobile phone of farmer as well as to the agriculture officer of particular village. The agriculture officer receive the message with location of the farm land. The location is determined by GPS and send to officer.

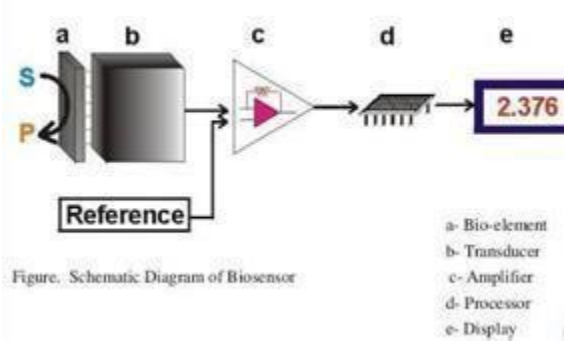

Figure. Schematic Diagram of Biosensor

Fig 6: Bio Sensor

VII. PROPOSED SYSTEM

Instead of using traditional agriculture modern agriculture can be done by farmers in this modern word. In this paper the wireless sensor networks are used to monitor the crops. The farmer can measure the water level, humidity, moisture content and also the diseases affected in the crops. The sensors collect the related information and store it on the webserver. Immediately sends the related data to two members using already registered phone numbers. One is farmer and another one is nearby agriculture specialist. The agriculture specialist communicates with the farmer directly and suggests the pesticides. Both can monitor the crops using their smart phones. The information is received through their smart phones.

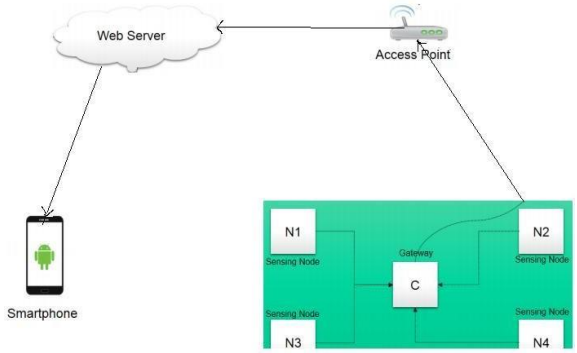

Fig 7: Architecture of Proposed System

VIII. APPLICATION OF SMARTPHONE

The android smartphone is used by all kind of people. The smart phone consist of multiple applications (apps). For modern agriculture the special kind of app is designed to monitor the agriculture land. These applications can be accessed through internet, which is connected to webserver. The farmer can monitor the land from anywhere. The agriculture specialist can also monitor the land from anywhere

and send the solution to the farmer through the application itself. Many farmers are connected to the application, they can also give their solution to the infections on the crop.

IX. FUTURE SCOPE

The smart farm helps the farmer to yield high profit by growing the crop without infection and at exact soil moisture content. Due to automatic process it reduce the human effort and view the growth of crop through smart phone. The wireless communication reduce the cost of implementation. In future this is implemented for large area of land. The internet connectivity is required at all the time to communicate the data to farmer. The predefined prediction of weather condition helps the farmer to cultivate the crop based on weather condition.

X. CONCLUSION

Agriculture can be done in this modern world using many latest technologies. Here WSN are used for producing crop with high yield and with low cost. Nowadays human beings are not involved in cultivation. To reduce the effort of human wireless sensors networks are used. Here sensor nodes collect the data and send to farmers as well as agriculture specialist. Using some additional hardware and software data are transmitted to smart phones. The farmer can operate mobile phones from anywhere at any time. This application can group many farmers into it and also the specialist. This is more suitable for agriculture dependent countries like India.

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