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Smart Agriculture System using IoT Technology

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Abstract

The farming of agriculture has started past 12000 years back, Neolithic age gave birth of civilization, Farming and later being continued as traditional farming practices. India being an agrarian's country, Mostly Indian farming are dependent on rains, soil, dampness andenvironment challenges .Our farmers upgraded tomodern state of art technology in cultivation. Globally the IoT systems has contributed its application in many fields and proven to besuccessful. It is the time that Indian farmer need to introduce the Smart Agricultural systems forhigher crop yield. The productivity with compilation of data from sensors, actuators and modern electronic gadgets the farmer can monitor agricultural fields. Smart Agriculture can forecast weather data, switching ON the pump motor acknowledging the dampness of soil terms of moisture levels with help of sensors which are interfaced to process module Arduino-UNO. The Smart agriculture system can be operated from anywhere with help of networking technology. On joining process in research and development in Smart Agriculture& Artificial Intelligencecan be cutting edge technology indata compiling and resource optimization .The pest & insectscontrols that protects damaging the crop and alsooptimisation resources utilisationcan be breakthrough.

Keywords: SMART (S-Specific, M-Measurable, A- Attainable, R-Realistic T-Time Bound) Soil moisture sensor, raindrop sensor, Humidity sensor, Temperature sensor, Arduino, Networking, WIFI and IOT (Internet of Things)

A. INTRODUCTION

The identification of the techniques of smart farming that can give a boost to the deteriorating traditional agricultural sector. Use of smart techniques like Precision farming, efficient water management, Soil moisture and humidity monitoring are sure-shot methods to increase yield per acre of land. Precision Agriculture avoids the improper and excess application of pesticides and fertilizers and enables the farmer to use land according to its quality and nature. Precision Farming is a potential salvager at a time when the water tables in India are diminishing at a rapid rate due to unprecedented demand by the agricultural and industrial sectors. Farmers still procrastinate or stubborn to traditional practices and delay in implementation may further decent the GDP in India.Recently skill acquired migrants all over the India who had returned to their natives during the Pandemic Covid-19 had chosen farming as their profession and are not interested go back. These migrants can now move closure to smart agriculture systems as it takes lesser time than traditional farmers to convince the adopt for the implementation of Smart agriculture system.

B. EXISTING AGRICULTURAL PRACTICES

The majority of rural people, agricultural activities continue to be one of their main livelihood strategies. Production of food crops is not dependent on any formally acquired knowledge of farming but is solely based on indigenous agricultural knowledge passed from generation to generation through experience and careful observations. Resource-poor farmers, especially in rural areas, follow traditional farming methods to produce their food crops and these are specifically tailored to suit their environments.Household members are the main source of farm labour with men mainly responsible for ploughing activities while the bulk of planting, weeding and harvesting activities is the responsibility of women. Crop protection against pests is done through traditional methods where farmers mix some combinations of pest control made from locally available resource in order to minimise losses. However there are no weather monitoring, moisture dampness and water management, they depend on rains and flow of water upstream to downstream and canal watering system. As the agriculture hasturned to more labour intensive, and skilled people have migrated to urban community for livelihood and comfort living, left the traditional agriculture farmers much more expensive and risky. We heard yield versus suicidal of farmer. To convert loss making traditional farming into high crop yielding and profit making proposed smart agriculture system is brought out.

C. PROPOSED SYSTEMS

As traditional farming are more labour intensive,Risky and resulting to suicidal due low yield or Act of God. Small farmers unaware of the smart agriculture system big fishes and corporate community are enjoying the advantages of smart agriculturetechnology. Thanks to Pandemic Covid-19 which returned the migrantsback to their respective villages and having no source of income are happily willingto come backto their original agriculture farming as their occupation. At this time when the Smart Irrigation System is an IoT based device which is capable of automating the irrigation process by analyzing the moisture of soil and the climate condition (like raining) can be incorporated by small players in farming and enjoy high yield profit earning. IOT advancement helps in agrarian societal information on conditions like atmosphere, temperature and productivity of soil, harvest web watching engages area of weed, level of water, bug acknowledgment, animal interference in to the field, alter improvement, cultivation. The farmers can know get details of farm conditions with the help of remote sensor frame work andWSN(Wireless Sensor Networking) systems sitting at home or any other place.

D. METHODOLOGY

a. Use of Wireless Sensor Networking System :

Wireless Sensor network in the process of development in smart and precision agriculture can be used to monitor regularly the changes in environmental conditions such as climate, hydrology, plant physiology, humidity, temperature, rains dampness of soil and others. As a process input, it can also demonstrate as a controller in the providing the inputs for seeds, fertilizers, pesticides etc. The WSN application shall aid the data

collection process to for information needed by the farmers for cultivation and also as Input feeder control system on agricultural machinery. The failures and breakdown issues such as malfunction of sensor and power supply related issues and also the information security may be an area of concern in the Wireless Sensor networking systems[8].

b. We maintain water level and flow it as required by relay switch on /off the Pump. Soil moisture sensors are fixed under the ground in field. Initially the water level reading is taken and decisions are made according to it. The temperature sensor (DTH11) is fixed at the centre of the field to get the overall reading of temperature of the soil. These sensors are connected to Arduino where we will get the readings. All sensors will send data to Arduino and data will be forwarded to WSN systems. The threshold value will be set according to the crop. The threshold value will be marked based on the requirement of the crop specified and predefined in the raspberry pi for every sensor. Whenever any sensor reaches a threshold value, message alert is sent to the user and action is taken according to it.

E. LITERATURE SURVEY

The Internet of things (IOT) are being revamping the agribusiness engaging the farmers by the expansivecompilation of techniques, for instance, accuracy and conservative cultivation to go up against challenges in the field. Researchers have proposed different modalities for the agriculture sector with one or multiple technologies mentioned, e.g. irrigation system based on soil water measurement to decide irrigation amount of the water is described in [1]. Which uses the Bluetooth model for the communication which has its own limitations like limited range and device accommodation? In the year of 2016, an author suggested scheduling in the power supply to the sensors which will help in improve energy efficiency [2]. Use of IoT in agriculture is mentioned by an author in paper [3] . However it shows lack of interoperability which is necessary when we talk about large agricultural fields. For comparison of energy consumption between two appliances, Jinsoohan has provided an approach in paper [4] published in 2017. N.K. Suryadevara, S.C. Mukhopadhyay has used concepts of pervasive computing, data aggregation etc to monitor the environmental factors using Zigbee [5] in their paper. However it might raise the issue of more power consumption, automation of agriculture as more nodes have been deployed [6]. Approach to provide the real time information to the farmers about the land and crops is defined in the paper [7], which provides the necessary information yet it's a standalone system. In the year of 2015 concepts of IoT, cloud-computing, Mobile computing are used in smart agriculture in paper [8], where by Prem Prakash Jayaraman, Doug Palmer, ArkadyZaslavsky the concept of phononet was introduced [9], which is network of smart wireless sensor nodes who shares the information with each other as well as central system.

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F. BLOCK DIAGRAM

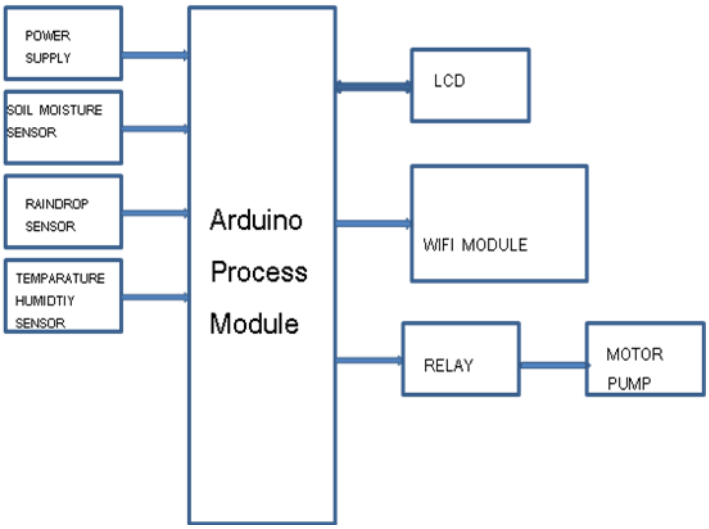
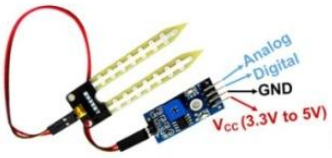
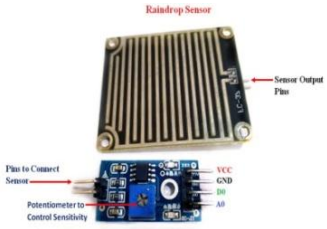


Figure-1





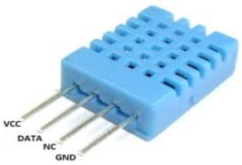


Figure-2 Soil Moisture sensor Figure – 3 Raindrop sensor Figure-4 Temperature & Humidity sensor

A Soil Moisture sensor

Soil sensor which stipulates the wetness of the soil measures the volumetric contents of water inside the soil and gives us the moisture level as output. The sensor averages the water content over the entire length of the soil environment wet or dry and the propelled yield.The sensors can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%[13] .

B RAINDROP SENSOR

The rain sensors detect the rain, the basic principle of working is checking resistance of sensor, and the sensor comprises two different conduction printed leads on whole surface. When water droplets fall on surface of sensor it completes the circuit and thus creating a resistance which is far less than open circuit resistance of sensor and the sensed data is sentto controlling unit[9] .

C TEMPERATURE & HUMIDITY SENSOR

The humidity sensing device DHT11 is a moisture holding substrate with the electrodes applied to the surface. The change in resistance between the two electrodes is proportional to the relative humidity. Humidity sensors

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work by detecting changes that alter electrical currents or temperature in the air[13] ..

D ARDUINO UNO BOARD

Arduinois an unwrapped-source electronics prototyping platform based on flexible, easy-to-use hardware and software[13]. Arduino can take the input from various sensors as input to it and reproduce the given output required for actuators, motors etc. It's a User friendly to those who have awareness in basic electronics and C programming language. Arduino platform mainly contains a Hardware Board called Arduino Board & software Arduino IDE to program it. Other external hardware as Sensor Modules, Motors, Arduino UNO and Arduino Software (IDE)- 1.0. The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Compatible to support the microcontroller; Its as simple as plug and play concept just connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can fiddle with your UNO without worrying too much about doing something wrong, worst case scenario it can be easily replaced at every minimal cost.

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, Mac, OS, Linux) written in the Java programming language. It is used to write in the java programming language. It is used to write and load programs on the Arduino board[12].

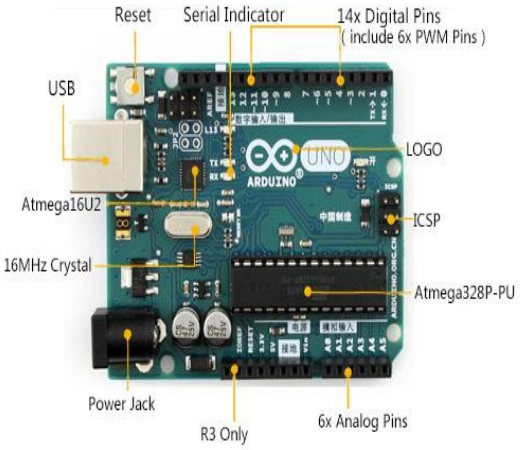

Figure -5 Arduino UNO board

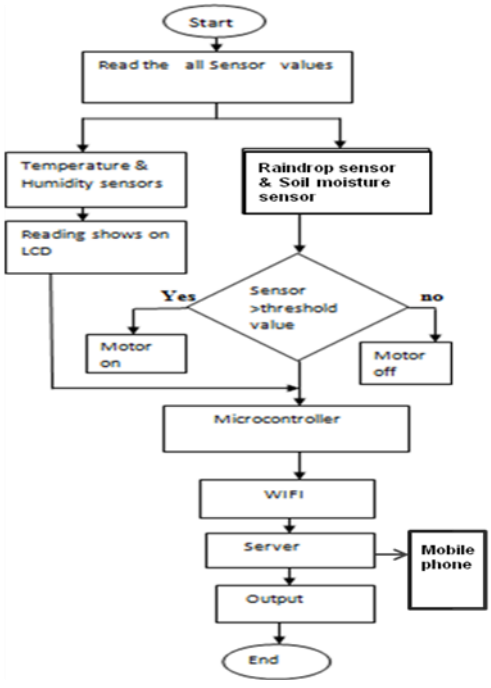

Figure -6 Flow Chart

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Figure- 7 LCD data

E PERFORMANCE OF OPERABILITY

The system has checked for the performance with the help of thing speak.com platform to check the Temperature, humidity rain and soil parameters. Thefigure depicted enables the performance the smart irrigationproject being operational [7].

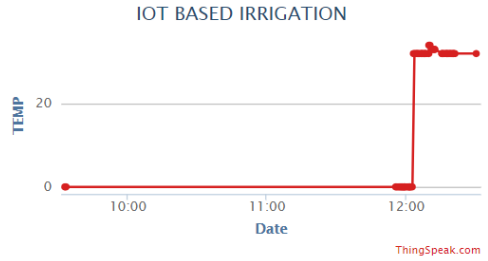

Figure- 8 Temperature Data

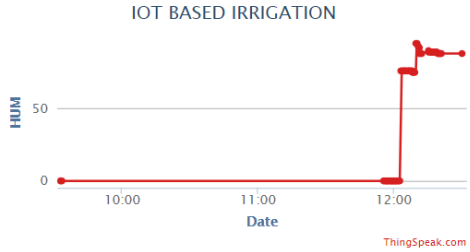

Figure- 9 HumidityData

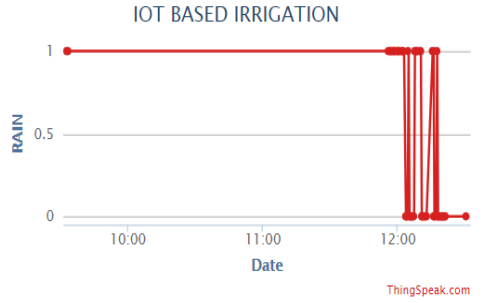

Figure- 10Rain Data

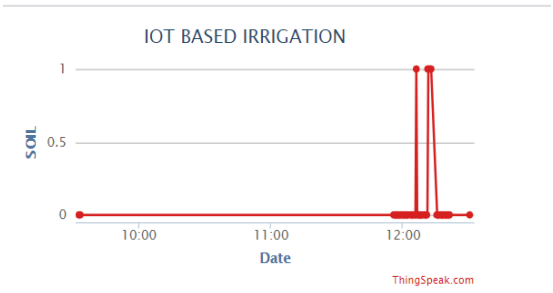

Figure- 11 SoilData

G. CONCLUSION

With the incorporation of the WSN&IOT, we can upgrade the agriculture farm.These systems enable to check the quality of the soil and the growth of the crop in soil and with these system farmers are able to solve irrigation problems, temperature problems, humidity problems, etc. The availability of sensors for the agricultural

parameters and microcontrollers can be easily interfaced with each other and with the help of Internet of Things, wireless sensor networks communication the challenges encountered by the farmers can also be reduced and a better communication path for the transfer of useful data can be achieved between various nodes. So, farmers are able to control various equipment's related to agricultural and monitor their crop on Smartphone or on computers. These systems offer a high application area to the users to improve their skill and output of the crops in better way. Use these systems help to increase the Rice, wheat and maize and other agricultural production in India in the near future. IOT capable to control the condition of the yield and growth, it can also able to check soil, temperature, humidity, etc. with help of IoT[13].

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