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INTELLIGENT IRRIGATION SYSTEM

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Abstract: In our country, the economy is mainly based on agriculture and agriculture are depends on the monsoons which is not sufficient source of water. So the irrigation is used in agriculture field. In Irrigation system, depending upon the soil type, water is provided to plant. India has a major problem for daily changes in the weather conditions and soil moistures. Our aim is to provide information about the soil moisture, humidity, temperature of the soil and irrigate the field incorporating weather condition. Primary focus is to save water and reduce human intervention in the agriculture field. In this technology, the humidity and temperature of plants are precisely controlled. The main objective of our irrigation system is to make the system more innovative, user friendly, time saving and efficient system using IOT.

Keywords: Agriculture, Irrigation, Soil moisture, Humidity, Temperature

I. INTRODUCTION

In India, agriculture plays an important role for the development of food production and it is the most important sector of economy. Irrigation plays a vital role in agriculture as water moistens and provides the essential nutrients to the soil for the proper germination and development of crops. The rate, amount and time of irrigation vary for different types of crop based on the types of soil and seasons. Agriculture and farming are mainly dependent on seasons and weather. Weather changes and sudden unseasonal rainfalls can cause a large proportion of crops. As per the recent study sudden changes in climatic behavior and uncertain rainfall conditions will cause a direct impact on production and serious suspect for agriculture. Due to this many farmers across the country have faced financial problems. According to Food Corporation of India these sudden rainfalls usually hits harvest season and affect the annual production of food grains.

Irrigation is a method to supply water to the crops at regular intervals of time. Thus Irrigation has been a key strategy in the development of agriculture in India and water is the most crucial input for enhancing productivity for the crop. Also India has a major problem for daily changes in weather conditions and soil moisture. Due to this farmers do not have a proper knowledge about the irrigation, soil and weather conditions and they keep doing their job based on predictions. Weather forecasting is a prediction on conditions of atmosphere depending on location and time. In India, most of the farmers do not have adequate knowledge regarding proper irrigation for different types of crops and they irrigate their farms according to their ancestor's methods. Also many times erratic rain fall results in over irrigation which may lead to crop damage. For increasing crop production efficiently we need to know proper information about the soil and weather condition can be used to avoid damage of crop.

The objective of the present work is to develop an intelligence based system for an agricultural environment. We measure five parameters such as soil temperature, soil moisture, air humidity, and air temperature and weather conditions. Due to server updates farmer can know about crop field nature and weather forecast at anytime anywhere. The developed system incorporates data base of crops along with weather forecasting. With the help of weather forecast system farmer will aware of rain condition that help him in water management and also prevents crop damage. Thus, farmers can irrigate their crops with the optimal use of water and restrict over irrigation and thus helps to save water as well as damage of crops. It is more innovative, user friendly, time saving and efficient than the existing system using and the primary focus is to save water and reduce human intervention in the agriculture field. The main objective of our irrigation system is to make the system more innovative, user friendly, time saving and efficient system using IOT.

II. OBJECTIVE OF THE RESEARCH WORK

In India, most of the farmers do not have adequate knowledge regarding proper irrigation for difference types of crops and they irrigate their farms according to their ancestor's methods. The designed system incorporates crop knowledge

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along with weather forecast and also integrates the current crop field parameters such as soil moisture, humidity and temperature before making decision for crop irrigation.

- The main objective of the project is to provide optimal irrigation thus unnecessary wastage of water can be saved.
- It helps farmers to restrict over irrigation by incorporating crop knowledge, which leads in saving water as well as damage of crops due to over irrigation.
- Many times erratic rain fall results in over irrigation which may lead to crop damage. Weather forecast will provide prior information regarding rain falls.
- To provide information about the soil moisture, humidity, temperature of the soil at a regular interval.
- To reduces human intervention in the field of agriculture which can lead increasing crop yield.
- Finally to design and implement "Intelligent Irrigation System" which will be more efficient and profitable Irrigation System.

III. LITERATURE REVIEW

Agriculture is the art and science of cultivating the soil, growing crops and raising livestock. It is the key development in the rise of sedentary human civilization, whereby farming of domesticated species created food surpluses that enabled people to live in cities. The history of Agriculture in India dates back to Indus Valley Civilization. India ranks first in the world with highest net cropped area followed by US and China. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Still, agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India. The Green Revolution in India marked a period of time when agricultural practices shifted from traditional practices to more technological methods. Traditional farming includes mixed cropping and the planting of local species. Technological approaches have given rise to input intensive and unsustainable agricultural practices that ultimately reduce the ground water table, causing erosion and loss in biodiversity. As part of this shift, farmers shifted from using wheel-barrows and bullock carts to mechanized vehicles. The Green Revolution focused on the introduction and growth of high yielding varieties (HYVs) of plants and grains. This practice spread across various states in India such as Punjab, Haryana, Western Uttar Pradesh, Tamil Nadu and Kerala. This shift in agricultural technique has caused and continues to cause irreversible changes including deterioration in soil health and nutrients. In these years since independence, India has made immense progress towards food security. Indian population has tripled, and food-grain production more than quadrupled. There has been a substantial increase in available food-grain per capita. India ranks 74 out of 113 major countries in terms of food security index.

IV. METHODOLOGY

We have design the system to measure five parameters such as soil temperature, soil moisture, air humidity, and air temperature and weather conditions. Due to server updates farmer can know about crop field nature and weather forecast at anytime anywhere. For increasing crop production efficiently we need to know proper information about the soil and weather condition can be used to avoid damage of crop. For this we propose "Intelligent Irrigation System" as an solution. The system is designed in such a way that first it take data by checking soil moisture, temperature and humidity, after that it will check the weather prediction (with the help of weather agency or a open weather) and according to the inputs it will supply water to crop as per the crop need and according to knowledge base. It will also send information to the user mobile.

The working of the proposed "Intelligent Irrigation System" can be explained with the help of block diagram as shown in Fig.1.

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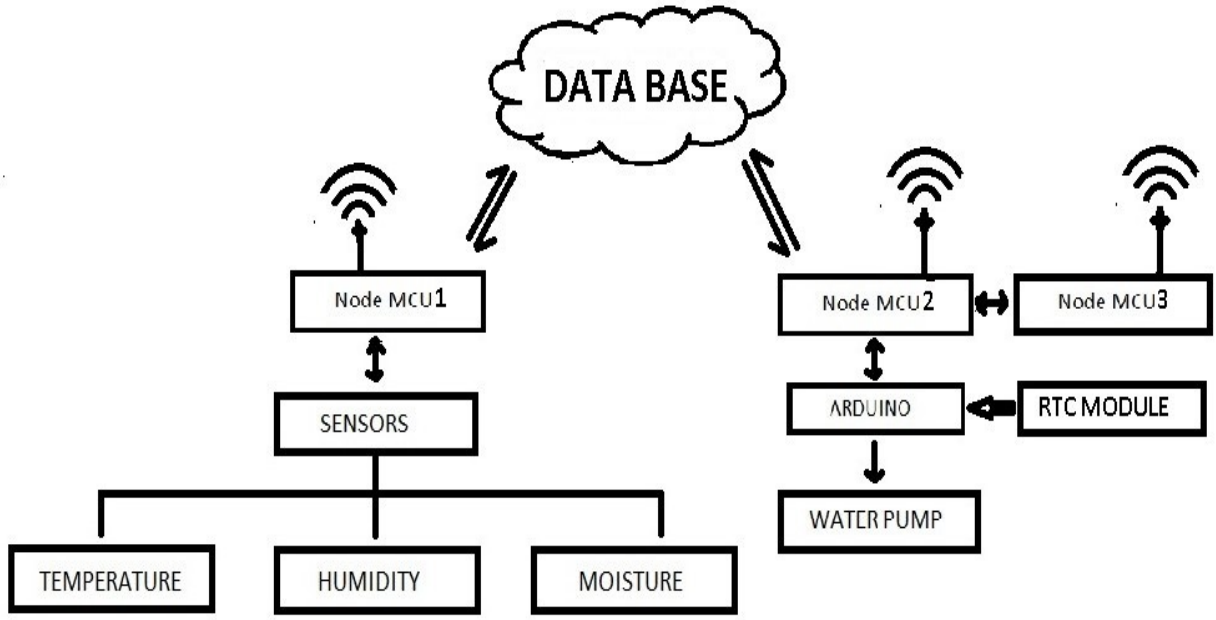

Fig.1. Block Diagram of Intelligent Irrigation System

There are two parts in our project one consist sensors (soil moisture sensor, temperature and humidity sensor) along with Node MCU1 which is placed in farm as transmitter and another section is receiver section which consist MCU2 and MCU3 along with arduinouno and RTC module. Soil moisture sensor is used to measure the amount of moisture content present in soil and temperature and humidity sensor measure the amount of temperature and humidity content present in air. Node MCU 1 collects the data from all the sensors and fed data to the google firebase database which API key used in programming. Which show the information on the phone. At the another part of project Node MCU 2 is also connected with database which gather the data and Node MCU 3 check the weather conditions by google open weather which API key use in programming and send the information to database and Node MCU 2. After getting the complete information Node MCU 2 send the information to the Arduino where RTC module check the time for irrigation and confirm that user wants to irrigate crop or not this time and send the information to Arduino and then Arduino controls the relay to On/Off the water pump accordingly. When the moisture content present in the soil is dry and there is no rain detect by weather map then it will pass information to the arduino where real time clock module already setup which fed the current time, date, month, year to arduino. After that arduino take decision on the basis of data base which are store in programming and relay ON/OFF the water pump accordingly.

Following sensors and controllers has been used for the design and development of our proposed “Intelligent Irrigation System”

SOIL MOISTURE SENSORS :

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content. It will help us to measure the soil moisture of field.

TEMPERATURE & HUMIDITY SENSOR:

Humidity and Temperature Sensor generates calibrated digital output. The DHT11 Humidity and Temperature Sensor consist of 3 main components. A resistive type humidity sensor, an NTC thermistor (to measure the temperature having negative temperature coefficient) and an 8-bit microcontroller, which converts the analog signals from both the sensors and sends out single digital signal. This digital signal can be read by any microcontroller or microprocessor for further analysis. This sensor will help us to measure the temperature and humidity of air in the field.

NODE MCU:

This is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. We will use this for wi-fi connection to transfer the value of parameters.

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ARDUINO UNO:

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (For prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers can be programmed using C and C++ programming languages. We will this for storing programming data.

RTC MODULE (DS3231):

The DS3231 is a low-cost, extremely accurate I2C real-time clock (RTC) with an integrated temperature compensated crystal oscillator (TCXO) and crystal. The device incorporates a battery input, and maintains accurate timekeeping when main power to the device is interrupted. The date at the end of the month is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with an AM/PM indicator.

GOOGLE OPEN WEATHER MAP API:

Open Weather Map is an online web service provider that provides interactive maps of current and historic weather conditions. The Open Weather Map API enables users to retrieve the current weather report at a city or weather station, the historical measurements for a weather station, or a list of cities. The API uses REST calls issued in JSON format. Open Weather Map processes all the data such that it attempts to provide accurate online weather forecast data and weather maps, primarily for clouds or precipitation.

V. RESULT

"Intelligent Irrigation System" is a system which incorporates the data base of crops and weather forecast along with the current crop field parameters such as moisture humidity and temperature being measured using different sensors before making decision for crop irrigation, thus help farmers to irrigate their field properly with the optimal use of water and restricting over irrigation, hence leads in saving water as well as damage of crop due to over irrigation.

The working of the designed system is implemented using it's prototype model as shown in Fig.2. In the designed system weather forecasting has been implemented using Google open weather map API and knowledge base for the crops has been implemented seasonally using RTC module.

Fig.2. Actual Photograph of the Designed System

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The system is beneficial for all farmers and help the farmers as well as to make them innovative. The system is also cost effective for the farmers, as the cost incurred in installing the system can be recovered within 2 -3 crop or in a year. Un-necessary wastage of water can be saved. Reduce human intervention in the agriculture field.

VI. CONCLUSION

The designed system is an Intelligent Irrigation System as it have knowledge regarding irrigation which leads saving of water as well as damage of crops mainly because of over irrigation. Also the system is IOT based system and due to server updates farmer is able to know about crop field nature and weather forecast anywhere at any time.

REFERENCES

1. Meghana Gupta Arakere, Avik Seal and Tejomurthula Bhuvana Teja, "SMART IRRIGATION SYSTEM USING IOT", Asian Journal of Science and Technology, Vol. 10, Issue, 06, pp.9756-9768, June, 2019.
2. Komal Kumar Napa, Vigneswari Dhamodaran, Rogith.C, "AN EFFECTIVE MOISTURE CONTROL BASED MODERN IRRIGATION SYSTEM (MIS)WITH ARDUINO NANO", International Conference on Advanced Computing &Communication Systems, page 70,June 2019
3. V R Balaji, "SMART IRRIGATION SYSTEM USING IOT AND IMAGE PROCESSING", International Journal of Engineering and Advanced Technology, Volume-8 Issue-6S, August 2019
4. AashuBedrae R. K, Jayalakshmi A, Nayana M, Swetha D, ShridharaY,"Development of SMART IRRIGATION SYSTEM",International Research Journal of Engineering and Technology,Volume: 05 Issue: 06 June 2018
5. Varshali Jaiswal, KratiMahalwar, Shalivahan Singh, ShrayKhandelwal, "MODERN IRRIGATION SYSTEM", International Journal ofComputer Engineering and Technology, Volume 9, Issue 6, pp. 189–195, November-December 2018
6. Priyadharsnee.K, Dr.S.Rathi,"AN IOT BASED SMART IRRIGATION SYSTEM", International Journal of Scientific Engineering and Research, Volume 8, Issue 5, May-2017
7. Srishti Rawal, "IOT BASED SMART IRRIGATION SYSTEM",International Journal of Computer Applications, Volume 159 – No 8, February 2017
8. Apurva Tyagi, Nina Gupta, J P Navani, RaghvendraTiwar, Anamika Gupta, "SMART IRRIGATION SYSTEM", International Journal of Innovative Science and Research, Volume 3, Issue 10.March 2017
9. G. Parameswaran and K. Sivaprasath, "ARDUINO BASED SMART DRIP IRRIGATION SYSTEM USING IOT", International Journal of Engineering Science and Computing, May 2016
10. Archana and Priya, "DESIGN AND IMPLEMENTATION OF AUTOMATIC PLANT WATERING SYSTEM",International Journal of Advanced Engineering and Global Technologies, vol-04, Issue-01, Jan-2016
11. Chandan Kumar sahu, Pramitee Behera, "A LOW COST SMART IRRIGATION CONTROL SYSTEM", International Conference on Electronics Circuits and Systems, page 1146, 2015
12. Sonali.D. Gainwar and Dinesh.V.Rojatkar, "SOIL PARAMETERS MONITORING WITH AUTOMATIC IRRIGATION SYSTEM",International Journal of Scientific Engineering and Technology Research, vol- 04, Issue 11, Nov 2015
13. S.Darshna, T.Sangavi, Sheena Mohan, A.Soundharya, Sukanya Desikan, "SMART IRRIGATION SYSTEM", International Organization of Scientific Research- Journal of Electronics and Communication Engineering, Volume 10, Issue 3, Ver. II, PP 32-36 May - Jun.2015
14. Mr. Deepak Kumar Roy,Mr. Murtaza Hassan Ansari, "SMART IRRIGATION CONTROL SYSTEM",International Journal of Engineering Research and Development, Volume 4, Number 4, pp. 371-374, 2014