AGRICARE: A Farming Platform to Improve Production

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Abstract- ***The paper proposes an idea of combining the latest technology into the agricultural field to turn the traditional methods of irrigation to modern methods thus making easy productive, and economical cropping. The inputs to Arduino WIFI are soil moisture sensor, DHT11 sensor, LDR, TDS sensor and Color sensor. As the proper water supply is required the water pump can be switch on and off by using moisture sensor i.e. auto irrigation. Monitoring real time temperature and light intensity, by this we make sure that proper photosynthesis process is taking place in crops and by this we can yield good quality crops. By using camera and AI technology we can reduce the diseases in crops and predators attack to the field. So, by collecting all the data from the field through camera, colour sensor, light intensity sensor, temperature and humidity sensor and sending to the cloud then to the dashboard we can analyse the health of the crops growing in different stages from cultivating to harvesting. This helps the farmers by monitoring growth stages of thecrop, and estimation of the yield by giving otherwise restricted low-power, low-costdevices access to greater processing capabilities via the Internet.***

I. INTRODUCTION

Food is one of the basic needs of any living being. By year 2050, the world needs to supply food for around 9.5 billion people. In all the available food sources, agriculture plays a major role. Hence agriculture has being the backbone for any country's development. The developing and highly populated countries like India, mainly depends on the field of agriculture for even economic growth. Around 70% of the Indian population depends on agriculture for living. Majority of the farmers still follows traditional and conventional approaches for doing farming that requires vast manpower, but lack of manpower is one of the major problems faced by the farmers nowadays. Also, in irrigation, weather is a crucial factor. Due to uncertainties of the weather, continuous remote monitoring of environmental factors will surely improve the productivity. The agricultural development is accelerated with the increase in the productivity and upgradation of the plantation systems. Advanced automated IoT technologies have to be used in agriculture to meet the demand. By using IOT in agriculture we can adopt many machines to improve the yield. Field (soil and environmental parameters) and crop health monitoring are important factors for the yield to be of better quality. This leads to technological advancements in agriculture to increase productivity and immunity of the crops. The IoT networks are reducing human labor requirements by monitoring crop health and field environment remotely. IoT uses a wireless sensor network (WSN) as the backbone for gathering information for these monitoring and control applications. The monitoring system consists of end devices equipped with a variety of sensors to monitor various parameters like temperature, humidity, soil moisture, colour sensor and is capable of communicating this data to theother devices. In a monitoring network, there are many sensor nodes, sink nodesand a gateway depending on the network topology and area of the field. The sinknode collects data from the sensor nodes and uploads it to the cloud server.

II. LITERATURE SURVEY

In [1] an idea of combining the latest technology into the agricultural field to turn the traditional methods of irrigation to modern methods thus making easy productive, and economical cropping. Some extent of automation is introduced enabling the concept of monitoring the field and the crop conditions within some long-distance ranges using cloud services. The advantages like watersaving and labor-saving are initiated using sensors that work automatically as they are programmed. This concept of modernization of agriculture is simple, affordable and operable. Later, it can be interfered with hydrophonics which is hydro-

irrigation method (requires no soil) for complete transformation of phase of Irrigation. Every other person can monitor condition of the filed by working at their own places without being present in the field, thus encouraging agriculture. The camera module can be placed on a drone to capture huge number of fields at once by flying in the air both horizontally and vertically such that every look and corner of the plant is visible.
In [2] they proposed a method for efficient crop monitoring for agricultural field.With the application of IOT the datas can be stored and retrieved from anywhere. In this proposed work, the sensor part is limited only for monitoring of crop hence in future it can be automated for irrigation and the system can be enhanced with security of farmland under video surveillence which prevents it from obtruder intrusion. Crop monitoring is done where sensors are used to collect information in the agricultural field. The sensor is set up by two pieces: the electronic board and the probe with two pads, that detects the water content .The sensor has a built-in potentiometer for sensitivity adjustment of the digital output LED. thermal imaging is used for irrigation in the crop field. There is no need for modifications in the surface temperatures when thermal imaging technique is used which is a noncontact and nonintrusive technique. . Thermal imaging cameras are not widely used because of its high cost.

In [3] they have designed automated Smart Agriculture system which reduces the time and resources that is required while performing it manually. This system uses the technology of Internet of Things. The system also measure moisture of soil and level of water in fields. This system works well in the ideal conditions and further improvement can be made when the conditions are not ideal like proper illumination or lightning. Internet of Things (IOT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IOT refers to a network of things which make a self-configuring network. The development of Intelligent Smart Farming IOT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim / objective of this paper is to propose a Novel Smart IOT based Agriculture assisting farmers in getting good crop production.

In [4] the sensors and microcontrollers of all three Nodes are successfully interfaced with raspberry pi and wireless communication is achieved between various Nodes. Dip race is EDA/CAD software for creating schematic diagrams and printed circuit boards. The developers provide multi-lingual interface and tutorials (currently available in English and 21 other languages). DipTrace has 4 modules: Schematic Capture Editor, PCB Layout Editor with built-in shape-based auto router and 3D Preview & Export, Component Editor, and Pattern Editor. The sensors gives input to the controller and according to that microcontroller controls the devices in auto mode and also sends the value of sensors to R-Pi and R-Pi forwards it to user's smart device using internet. All observations and experimental tests proves that project is a complete solution to field activities, irrigation problems, and storage problems using remote controlled robot, smart irrigation system and a smart warehouse management system respectively. Implementation of such a system in the field can definitely help to improve the yield of the crops and overall production.

In [5] IOT allows farmers to get connected to his farm from anywhere at anytime. Wireless sensor networks are used for monitoring the farm conditions and micro controllers are used to control and automate the farm processes. Wireless cameras have been used to view remotely the condition of the form. A smart phone empowers farmer to keep updated with the ongoing conditions in any part of the world. The level of water is maintained by sensor which is presented inside the tank and the data will stored in the cloud using mobile application. Users can view the level of water thorough mobile phones; according to that motor will be work automatic and manual. there were huge needs for consumer based humanitarian projects that could be rapidly developed using Internet of Things (IoT). Climate changes and rainfall has been regular over the past decade. Smart agriculture is an automated and directed information technology implemented with the IOT (Internet of Things). This overcomes the manual operations required to monitor and maintain the agricultural farms in both automatic and manual modes.

In [6] the smart agriculture using IOT has been experimentally proven to work satisfactorily by monitoring the values of sensors. This helps user to

analyze the conditions of various parameters in the field anytime anywhere. Automatic control of smart irrigation using IoT refers to the operation of system with minimum manual interference. Most of these systems are automatic controlled which provide a method to control application of water, soil moisture, temperature & humidity condition and monitor in the real time. The different types of sensors can be connected to the WeMos which has inbuilt Wi-Fi through software. Software calculates water requirements based on various inputs such as soil type, weather data and other known factors that determine water requirements. Soil moisture sensor is a sensor which sense the moisture content of soil. A well-controlled irrigation system is one which is most advantageous for farmers and maximize the benefit cost ratio. we can control motor in the field based on humidity, temperature and moisture level. Firstly, the moisture level of soil measured by the sensor this analog value of sensor converted into digital form and applied to WeMos. If the moisture level of soil decreased below the certain value.

In [7] This system avoids over irrigation, under irrigation, top soil erosion and reduce the wastage of water. The main advantage is that the system's action can be changed according to the situation. By implementing this system, agricultural, horticultural lands, parks, gardens, golf courses can be irrigated. Thus, this system is cheaper and efficient when compared to other type of automation system. In large scale applications, high sensitivity sensors can be implemented for large areas of agricultural land. Monitoring efforts should be broadly conceptualized so that they incorporate not only farm production and productivity, but also natural resource. DHT11 used in the paper is a basic, ultra low-cost digital temperature and humidity sensor. The proposed system will give results based on the necessity of the crops, which will help to deal with the requirement and crisis faced during crop productivity. Measure temperature to deal with crops which cannot bear high or low temperature. Some crops fail due to humidity,gauging humidity is a necessity.

In [8] IOT technology in agriculture, gathering crops growth environmental parameters in a fixed place to help farmers find problems in time. Agriculture experts give guidelines with specific information to increase the farmer‟s income and help them in the prevention and control of crop diseases and pests. Android client and PC client to achieve scalability, high reliability, security, compatibility of technical requirement. IOT Based Smart Agriculture Monitoring System develops various features like GPS based remote controlled monitoring, moisture and temperature sensing, intruders scaring, security, leaf wetness and proper irrigation facilities. Soil moisture sensor is a sensor which senses the moisture content of the soil. The sensor has both analog and digital output. Hence the output is said to be maximum. When the soil is wet, the current will pass from one terminal to the other and the circuit is said to be short and the output will be zero. This paper describes automated irrigation system using IOT. This system will sense all the environmental parameters and send the data to the user via cloud. User will take controlling action according to that this will be done by using actuator. This asset allows the farmer to improve the cultivation in a way the plant need. It leads to higher crop yield, prolonged production.

In [9] IoT is the collection of the sensor data through embedded system and this embedded system uploads the data on internet. Fuelled by machine-to-machine (M2M) communications, the Internet of Things (IoT) is all about connecting a wide range of internet-enabled devices – from cars, lighting, smart meters and more – that generate actionable data. In the print industry, proactive maintenance and support is nothing new. Crop farming in India is labour intensive and obsolete. Farming is still development on techniques which were evolved hundreds of years ago and doesn't take care of conservation of resources. My project is to give cheap, reliable, cost efficient and easy to use technology which would help in conservation of resources such as water and also in automating farms. The sensors and microcontrollers of all Nodes are successfully interfaced with NodeMCU and thingspeak is achieved between various Nodes All observations and experimental tests proves that project is a complete solution to field activities, irrigation problems, and smart irrigation system and a smart warehouse management system respectively. Implementation of such a system in the field can definitely help to improve the yield of the crops and overall production.

In [10] Agriculture are gradually being replaced and enhanced by more sophisticated and accurate digital

and electronic device. A high percentage of agriculture revenue is lost to power loss, incorrect methods of practicing. This is reduced by the use of smart sensors. The proposal is to perform the agriculture in smart and more efficient way. In addition, this method advocates for the use of the Internet of Things. Internet of Things has enabled the agriculture crop monitoring easy and efficient to enhance the productivity of the crop and hence profits for the farmer. Sensors of different types are used to collect the information of crop conditions and environmental changes and this information is transmitted through network to the farmer/devices that initiates corrective actions. Farmers are connected and aware of the conditions of the agricultural field at anytime and anywhere in the world. IOT leverages farmers to get connected to his farm from anywhere and anytime. Agricultural crop monitoring and control can be done using Arduino Uno.Wireless sensor networks are used for monitoring the farm conditions and micro controllers are used to control and automate the farm processes. This paper is useful for farmers in maintenance and controlling of crop production.

III. WORKING

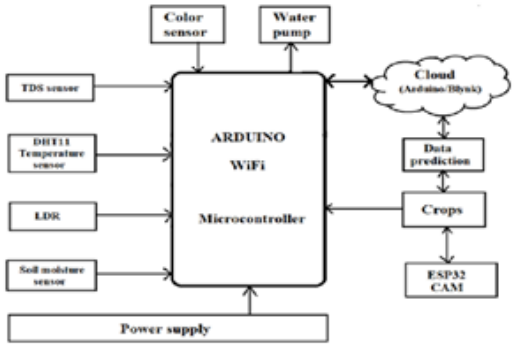

Fig: Block Diagram

The inputs to Arduino WIFI are soil moisture sensor, DHT11 sensor, LDR, TDS sensor and Colour sensor. As the proper water supply is required the water pump can be switch on and off by using moisture sensor i.e. auto irrigation. Monitoring real time temperature and light intensity, by this we make sure that proper photosynthesis process is taking place in crops and by this we can yield good quality crops. By using camera and AI technology we can reduce the diseases in crops and predators attack to the field. So, by collecting all the data from the field through camera, color sensor, light intensity sensor, temperature and humidity sensor and sending to the cloud then to the dashboard we can analyse the health of the crops growing in different stages from cultivating to harvesting. This helps the farmers by monitoring growth stages of thecrop, and estimation of the yield by giving otherwise restricted low-power, low-cost devices access to greater processing capabilities via the Internet.

A. WeMos D1

WEMOS D1 is a WIFI development board based on ESP8266 12E. The functioning is similar to that of NODEMCU, except that the hardware is built resembling Arduino UNO. You can use the Arduino IDE, NodeMCU and there are other development environments available. All the sensors are connected to this board and it sends the reading through cloud and we can monitor the range for the better growth and quality of the crops. The Wemos D1 Mini is a great board to develop Wi-Fi based IoT Projects. It uses the popular ESP8266 Module for its IoT operations

Fig: WeMos D1

B. SOIL MOISTURE SENSOR

The soil dampness sensor in water system field is utilized to gauge the soddenness content in the soil and in the event that the sogginess content is not exactly the limit esteem, at that point NodeMCU will impart the control sign to the Relay and will turn on the motor that turns over watering the plants. The yield field will be checked consistently by the NodeMCU and on the off chance that the sogginess content gets over the edge esteem, at that point the motor goes to off state and quits watering the plants. The information is sent to the cloud and can be observed through portable application, this is useful in robotized water system.

Fig: Soil Moisture sensor

C. DHT11 SENSOR

The DHT11 is a major, ultra-negligible exertion propelled temperature and moisture sensor. It uses a capacitive clamminess sensor and a thermistor to measure the incorporating air, and lets out a modernized sign on the data pin (no basic data pins required). It's truly simple to use, anyway requires mindful wanting to grab data. The principle veritable disadvantage of this sensor is you can simply get new data from it once as expected, so while using this library, sensor readings can be up to 2 seconds old.

Fig: DHT11 Sensor

D. TDS Sensor

A TDS meter is a small hand-held device used to indicate the Total Dissolved Solids in the soil . Since dissolved ionized solids, such as salts and minerals, increase the absorption of the soil, a TDS meter measures the conductivity of the soil and estimates the TDS from that reading. TDS is an abbreviation for Total Dissolved Solids in a liquid, including organic and inorganic substances in a molecular, ionic, or micro-granular suspended form. TDS is generally expressed in parts per million (ppm) or as milligrams per liter (mg/L).

Fig: TDS Sensor

E. Colour Sensor

Colour sensors TCS3200 contains RGB (Red Green Blue) arrays. The square boxes are arrays of RGB matrix. Each of these boxes contain Three sensors, one is for sensing RED light intensity, one is for sensing GREEN light intensity and the last in for sensing BLUE light intensity. By this we can continuously monitor step by step growing from cultivating to harvesting the crops. An automated system for measuring plant leaf colour, as an indicator of plant health status, has been developed for plantlets growing in a modified micropropagation system.

Fig: color Sensor

F. LDR

A light-dependent resistor (LDR) is a component that has a (variable) resistance that changes when light intensity falls on it and continuously measure the real time light intensity following on crop.Light dependent resistors are widely available: - they are normally stocked by electronic component distributors, and in view of the way the electronics industry supply chain operates these days, this is the normal way to obtain them.

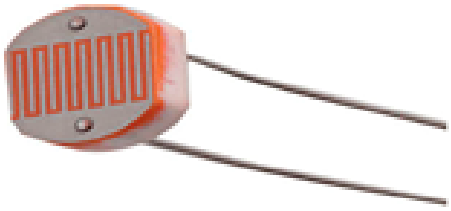

Fig: LDR Sensor

G. WATER PUMP

A pump is a device that moves fluids (liquidsorgases), or sometimesslurries, by mechanical action, typically converted from electrical energy into Hydraulic energy. This is Micro Submersible Water Pump DC 3V-5V, can be easily integrate to your water system project. The water pump works using water suction method which drain the water through its inlet and released it through the outlet. Firstly, simply connect the red wire (+) and black wire (-) to a 3V or 5V DC supply.

Fig: 5V submersible water pump

IV. RESULTS

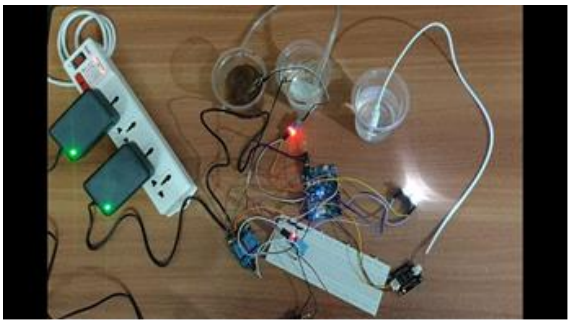

Fig: Practical Model

In the above figure, Soil moisture sensor is placed into the soil at a distance of 2-3 cm. The inputs to Arduino WIFI are soil moisture sensor, DHT11 sensor, LDR, TDS sensor and Color sensor. As the proper water supply is required the water pump can be switch on and off by using moisture sensor i.e., auto irrigation. Monitoring real time temperature and light intensity, by this we make sure that proper photosynthesis process is taking place in crops and by this we can yield good quality crops. By using camera and AI technology we can reduce the diseases in crops and predators attack to the field. So, by collecting all the data from the field through camera, colour sensor, light intensity sensor, temperature and humidity sensor and sending to the cloud then to the dashboard we can analyses the health of the crops growing in different stages from cultivating to harvesting. This helps the farmers by monitoring growth stages of the crop, and estimation of the yield by giving otherwise restricted low-power, low-cost devices access to greater processing capabilities via the Internet.

Fig: Output and Reading of sensors in serial monitor

Fig: Sensor reading in BLYNK app

CONCLUSION

The smart agriculture using IOT has been experimentally proven to work satisfactorily by monitoring the values of humidity and temperature successfully through the internet control in the field. It also stores the sensor parameters in the timely manner. This will help the user to analyse the conditions of various parameters in the field anytime anywhere. Then control or maintain the parameters of field properly. Finally, we conclude that Smart and economic farming is more efficient than scheduled irrigation process. The system developed is beneficial and is cost effective when compared to other systems currently being used. This system is versatile and can be used in an extensive range of geographical locations ranging from dry lands to humid lands. The system is cost effective and affordable to farmers who want to step into automation domain and want to increase their productivity.

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