Smart Multi-Crop Irrigation System Using IOT

Anbarasi M, Karthikeyan T, Ramanathan L, Ramani S, Nalini N

Abstract: ***Agriculture falls under the primary sector category which indicates that the majority of the country's economy is depending on that. China is the top in the list of agricultural countries and India is recorded as the second top agricultural country in the world. The yield of a crop depends upon several factors like water, external temperature, the fertility of the soil etc. Among these, irrigation is one of such factors where human attention has to be provided more. Traditional plant watering method has two important things to consider, that is when to water the plants and how much water will be sufficient for the plant. Not all types of crops require the same amount of water. Crops like rice need more amount of water than other weed plants. This paper proposes an idea of a smart irrigation system based on IoT applications to increase the crop yield. If the available land is less then multi-crop is one of the good ideas to improve the profits or the crop yield in less time. This paper proposes an idea of a smart irrigation system with smart control of decision in which decision is made by taking the real-time data from the land. In this automated irrigation system, the pumping motor turns ON and OFF based upon the moisture content of the soil. The pump will be operated by an operation-amplifier which takes the input from a soil moisture sensor. The soil moisture sensor is a sensor that detects the exact amount of moisture in the soil. Now here comes the role of IOT to give the information to the farmers about the status of the water moisture. Farmers can see the status of moisture content in a web page using a modem or in a mobile application. They can check whether the water sprinklers are turned ON or not at any time. The farmer will be proved with saved data of the amount of moisture required for a specific type of crop. With this, the human presence can be decreased and an accurate amount of water supply can be provided to the field.***

Keywords: Agriculture, IOT, Soil moisture sensor, Smart irrigation system.

I. INTRODUCTION

There are various stages in agriculture right from the crop selection to harvesting in which irrigation is the most important step which shows more impact on the yield of the crop. There are many irrigation systems including the traditional system in which a farmer supplies the water through pipes or through canals. In these methods, the eventual supply of the water is not possible. The water supplied should reach the root zone. Surface drip irrigation is one such method which is 100% efficient in making the water to reach till root zone. The advantages of surface drip irrigation are:

→ improved proficiency of supplement take-up at the edges of the wetted soil volume
→ less water lost from soil surface vanishing
→less weed germination and development
→unrestricted go for field activities, for example, showering and reaping
→improved access to precipitation penetration in some line edit circumstances.

Although we selected the correct irrigation method when to supply water to crop is also a very important thing to consider. The oversupply of water to the crop may lead to unwanted situations. Therefore the crop should be watered only when it needs. Hence a smart technology is needed to know when the crop needs the water. All these technologies are aimed to improve the yield of the crop. In that direction, the multi-crop system is most efficient. In a multi-crop system, farmers plant different types of crops that suit the soil to increase the crop yield and to make sure that the minerals of the soil are eventually supplied. In this paper, we are proposing a smart irrigation system using IoT in the multi-crop system. In the agricultural domain, people need smart farming technologies to reach all specification where smart farming methods are used in several ways by using IOT technologies. [1] proposed a low cost and efficient wireless sensor network technique to acquire the soil moisture and temperature from various locations of farm and as per the need of crop controller take the decision to make irrigation ON or OFF. [2] proposed an ease and proficient remote sensor arrange system to obtain the dirt dampness and temperature from different areas of homestead and according to the need of harvest controller take the choice to make water system ON or OFF.

Smart precision based horticulture makes utilization of remote sensor systems to screen the farming condition [3]. Zigbee and raspberry pi-based agribusiness observing framework fills in as a dependable and proficient technique for checking rural parameters. Remote checking of field not just enables client to diminish the human power, however it likewise enables client to see exact changes in it. A keen framework in light of exactness horticulture would make ready to another transformation in farming. The client can screen the farming condition from a remote area, hence giving a nursery condition to the plants. [4] Proposed a mechanized water system framework was made to enhance water use for green yields. The structure has a dispersed remote arrangement of soil-moistness and hot sensors put into the root zone of the plants. [5,6] authors built up the choice openly solid framework to gauge farming creation utilizing IoT sensors. This structure was

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in like way a bound together framework that sponsorships the strategies sowing seeds through pitching developing things to buyers. [7,8] Proposed animal monitoring applications, both creature location and their developed forecast are significant assignments and focused on three applications of wildlife monitoring: location tracking, behavior recognition and habitat environment observation. In this paper proposing some existing methods for multi-crop planting.

When farmers have less agriculture land they can go for the multi-crop for getting more profit. Nowadays there are ups and downs in the market price for different vegetables and fruits it is like seasonal price due to the difference in the yield .farmers do not have a proper idea which crop has to grow in less time with available land so this paper gives a solution to the problems. The solution is multi-crop planting and irrigation using IOT. Where by adopting IOT methods need to cultivate different crops in small available agriculture land. After cultivating different crops again raises one more problem about harvesting the different plants with different water requirements. So the paper has a problem about how to harvest the agriculture land when it cultivated with different crops.

Brief information regarding cultivating the multi crops in agriculture land. As shown in figure 1 the agriculture land has been divided into smaller portions and arranged in rows of specified length and width. Different vegetables and fruit plants have been planted. The water irrigation system was installed to water the plants.

Figure 1 multi crop land

These analysis works hold valuable technique and techniques which can enhance the trifle of the paper done. These papers have guided the paper to achieve the required ends up in a correct and efficient manner.

In this modern framework of the water system, water is run physically. Here, an agriculturist hauls water from wells or waterways without anyone else's input are utilizing steers and conveys to cultivating fields. This technique can shift in various locales. The principle favorable position of this strategy is that it is shoddy yet effectiveness is poor in light of the fact that the even dissemination of water isn't generally conceivable. Additionally, the odds of water misfortune while conveying is high. A few cases of the customary framework are pully framework, lever framework, chain pump, and Thekla. Among these, the pump framework is most normal and utilized generally.

There is a high level of water application control with the potential for high consistency of use for new frameworks is this conveyance consistency (DU) can be high (93% or higher) contrasted and that accomplished for sprinkler (60% to 80%) and surface (50% to 60%) water system. The high recurrence of the water system with SDI permits upkeep of ideal soil dampness content in the root zone.

This is imperative where salty water is utilized and with shallow established products, and is leverage over surface and sprinkler water system where the vacillation in the soil water potential is more prominent, expanding the weight on the yield- the significance of this fluctuates between crops.

Contrasted and sprinkler water system it is conceivable to inundate paying little heed to wind conditions. Lower weights are for the most part required and bring downstream for unit region requiring littler width mains and laterals. Land leveling adequate to empower seepage is required for SDI. This ought to be not as much as that required for a surplus water system. SDI can be introduced on the scope of enclosure sizes and shapes. SDI keeps up the soil surface structure more viable than other water systems. Writes and makes it less demanding to take into consideration precipitation occasions or make up for lost time, gave there is adequate framework limit. A very much kept up SDI framework requires less work to work than elective frameworks in figure 3 as shown the feature model has the sensor node where it is dipped into the soil to detect the soil moisture of the soil.

II. METHODOLOGY

This product keeps a track of moisture content and temperature of the soil at particular times. A specified range of temperature and moisture values for a particular crop and for particular soil type. Whenever the farmer waters the crop the moisture value and temperature will change. After reaching the extreme value of the temperature and moisture values the watering system will be turned off. In case of negative extreme values that is dry soil and hot temperature, the watering system will be turned on and the watering system will be activated. The flow diagram of the water system is given in figure 2. The node of the sensor is inserted in the field for sensing the moisture content of the soil. The data is sensed and the sensed data is sent to the controller node of the microcontroller. After receiving the sensed data the sensed value is cross-checked with the given data of the moisture content and when the soil moisture is not up to the needed level the irrigation system is turned on and a message is sent to the farmer. The output pins are coupled with a servo motor and water pumps. If the sensors deviate from the predefined range then the irrigation system is turned on. An LED indicator indicates the status of the pump. Internet of things is the most proficient and essential systems for the advancement of answers for the issues. IoT develops from various building pieces which incorporate loads of sensors software arrange parts and other electronic gadgets. Additionally, it makes information more successfully. IoT permits to

trade the information over the system without human inclusion. In the internet of things, we can speak to things with characteristic way simply like a typical person, similar to a sensor, similar to auto driver and so on. This thing is appointed an IP address so it can exchange information over a system. According to the report created by Garner, toward the finish of 2016, there will be 30% ascent in consider of associated gadgets contrasted with 2015. He additionally says that tally will increment to 26 billion by 2020.

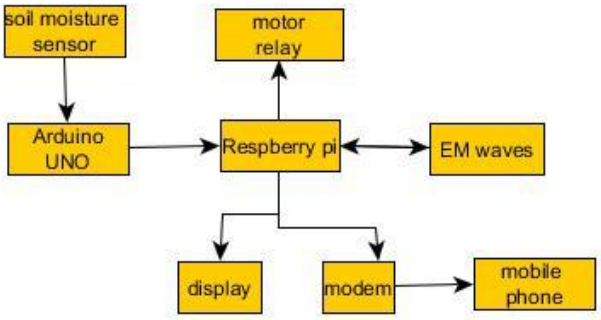

figure 2.proposed architechture

IoT sensors are capable of furnishing information with agriculturists with the collected data about precipitation, harvest yields, bug invasion, and soil fertility enhancement are priceless for creating and offering precise information that can be utilized to enhance cultivating systems after some time. Web of things with its continuous and precise and shared attributes will convey incredible changes to the agrarian production network and give a basic innovation to building up a smooth stream of farming coordinations.

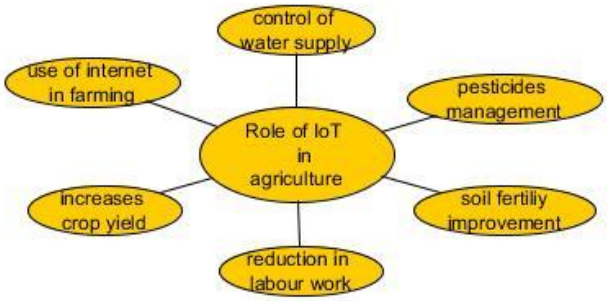

Figure 3a. Data Flow Diagram

The entire methodology can be depicted as the data flow diagram in the following Figure 3a and 3b.

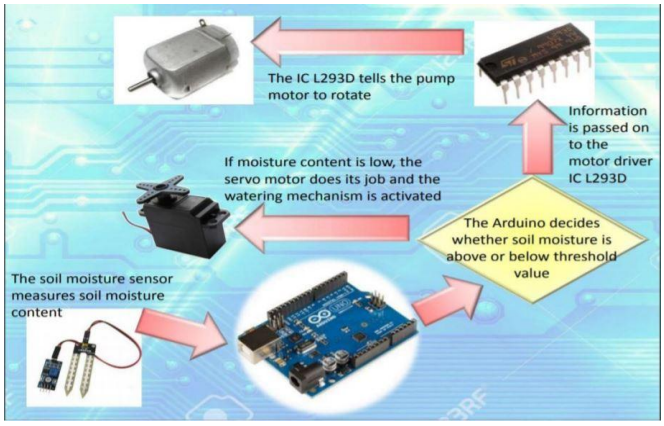

Figure 3b. Flow Diagram

III. RESULTS

The node of the soil moisture sensor is inserted to get the data from the soil and data is received. The LED bulb glows whenever the water is supplying to the field until the required level of water according to the saved data. When once the soil moisture is up to the adequate level the LED bulb stops glowing. The description of the data sensed in experimental results are shown in figure 4 and the audio setup of the smart irrigation system is depicted in figure 5. This system can be individually placed in the different fields or multi crop system and different crop data are saved in a database. So that the moisture and temperature required for each and every crop is saved and used when the soil moisture sensor node is deployed in the soil the data can be sent to the controller node. This gives an alert message to the farmer using IOT techniques.

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1023
985
Watering Pot 1
Watering pot 2
1019
544
Watering Pot 1
1019
684
Watering Pot 1
Watering pot 2
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Figure 4. data sensed by the soil moisture sensor

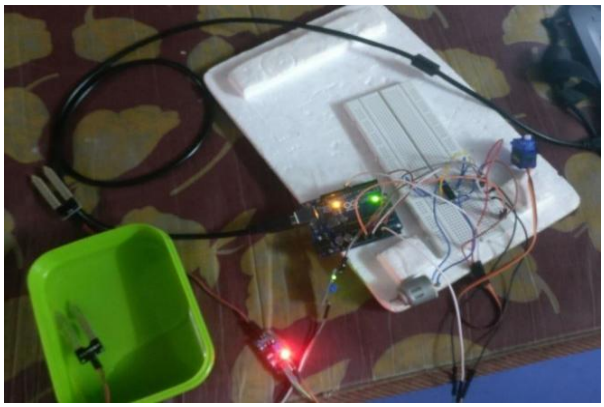

Figure 5. Aurdino set up of the smart irrigation system

IV.CONCLUSION

The populace has been expanding in the exponential request in the most recent years. Consequently increment in the nourishment creation is vital for the survival of the whole populace. This can be accomplished just when there is productivity in each phase of the cultivation. Hardware must be joined in each phase to decrease the human information and improve the yield in less time.

In this paper, we proposed a model for programmed controlled water system framework for multi-crop cultivating. This model incorporates a sensor hub and control hub. In the multi-crop cultivating framework, the information of dampness content required for an assortment of yields is put away in information and it is confirmed with the

information detected by the sensors. At the point when the dampness in soil is not exactly the required the water system framework is turned on and when the dampness is more than required the water system framework is killed. In the event that the water system framework is turned on an alarm message is sent to the rancher. This framework enhances the water use and the water is productively utilized for the harvests. In this framework, a rancher can obviously comprehend when he should water the plant. This framework decreases the physical contribution of the rancher and improves the proficiency and subsequently the yield of the harvest is expanded.

V. FUTURE SCOPE

The venture which is to be executed is a mechanized water planting technique and has an immense extension for future improvement. The task can be stretched out to nurseries where manual supervision is far and few in the middle. The rule can be reached out to make completely robotized greenery enclosures and farmlands. Joined with the standard of downpour water collecting, it could prompt immense water funds whenever connected in the correct way. In rural grounds with a serious deficiency of precipitation, this model can be effectively connected to accomplish extraordinary outcomes with most sorts of soil. By building up a Shrewd Remote Sensor and by utilizing up and coming strategies a rancher can expand his benefit by taking care of various issues that are looked by the rancher in his standard life. It is prescribed to execute the venture for communicating something specific utilizing GSM to a PC that occurs amid water system for framework dependability. Likewise, it is intriguing if the venture controlled including the power wellspring of the framework, particularly sun oriented power which is constantly open and can be executed all over. By and large, the water system framework is worked to tackle social, financial, and natural and societal issues for one's nation which will prompt improvement.

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