Protection of Crops from the Rain Water and Generation of Solar Energy with an Embedded System using GSM Technology

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Abstract:
Agriculture is an important sector of India. It is indispensible for the sustenance and growth of the Indian economy so agriculture is a backbone of our country. About 60% of our country's revenue comes from agriculture. On an average 70% of the household and 10% of the urban population is dependent on agriculture as their source of livelihood. But during heavy rain falls, the farmers face lot of problems because their cultivated crops get washed off or destroyed. So in order to avoid this problem a project is designed which helps in saving the crops from heavy rainfall, fog and protecting that rain water to use it for other purposes. The saved and stored water can be used for feeding animals, washing, cooking etc. and can also be reused to sprinkle the field when needed.

Keywords: DC Motor, Rain sensor, Temperature sensor, Soil moisture sensor, LCD display, GSM modem, water tank, pump, solar panel, polythene sheet, PH Sensor.

I. INTRODUCTION

The science and heart of cultivation of soil and rearing livestock is called agriculture. Agriculture is the key development in the rise of sedentary human civilization. The major agriculture products can be broadly grouped into foods, fibre, fuel and raw materials(such as rubber). It is expected that the world's population will reach 9.2 billion people by the year 2050. In order to keep up with the raising population, global food production must increase by 70%. The prediction for immense group has made agriculture management practices necessary. One such practice, precision agriculture, can slightly reduce the amount of nutrient and other crop inputs used while boosting yields, making it extremely lucrative businesses. With precision agriculture, control centers collect and process real time data regarding soil and air temperature and humidity gathered by sensors placed throughout the fields being farmed. This data helps farmers make the best decision regarding planting, fertilizing and harvesting crops. The frequent climatic changes taking place as caused damage and great loss to the farmers where in committing suicide is found to be the best solution to this problem for them. On the other side, some have found in new techniques and new varieties of crops as well. Due to growing population there is more need for food and due to urbanization there is more demand for land so producing more in less available and cultivable land is great challenge.

A solar tracker is a device that orients a payload towards the sun. Payloads are solar panels that generates the solar energy. For flat panel photovoltaic system, trackers are used to minimize the angle of incidence between the incoming sunlight and a photovoltaic panel. Sunlight has two components, the direct beam that carries 90% of the solar energy and the diffused sunlight that carries the remainder. The diffused portion is the blue sky on a clear day and is a larger portion of the total on the cloudy day. In this paper we have three sections namely introduction, literature survey and conclusion. Introduction is about agriculture and the different practices used. The literature survey describes the method used, merits and demerits. Comparision table gives the comparision of all the papers. Conclusion is used to summarize the current state of knowledge and understanding of the topic.

II.LITERATURE SURVEY

Sanjay Kumawat, Ashwini Kapadnis et al [1] has proposed this RainGun Irrigation System uses automatic micro-controller in which the irrigation will take place only when there is intense requirement of water and a large quantity of water can be saved. This system has developed a software stack called Android used for mobile devices that include operating system, middleware and key applications and the management of the field resources can be enhanced. The Android SDKprovides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. An integral part of serving multiple needs of humans is mobile phone. The use of GPRS feature in mobile is the solution for irrigation control system. These systems covered lower range of agriculture land and not economically affordable. The GSM is used to send message when there is enormous amount of water in the land. In order to avoid washing away of soil contents which the nutrient availability an Android app is used. The Micro-controller increases System Life and lowers the power

Consumption. This system lacks in extra ordinary features and is limited to automated irrigation. The merit is installing the automatic irrigation system and determining the PH value which saves time and ensures judicious usage of water and farmers get to know earlier that what crops can be grown in this field. The demerit is this system works in areas where there is no regular supply of electricity. Naveen K.B,Sagar G.H et al [2] has proposed this system design and simulation can be done using proteus software. There are two sensors which are rain sensor and soil moisture sensor. Rain sensor determines the amount of rainfall and moisture content is measured by the moisture sensor which will be displayed on LCD. The auto roof is used. The automatic rain water and crop saving system protects crops from large amount of rain water and also prevents wastage of water. Human efforts are reduced by the use of auto roof and electricity can be saved and productivity can be maximized during sunny and rainy season. Irrigation is the back bone of human civilization since beginning of agriculture. In the present scenario on conservation of water and save the natural resources available for mankind. By continuously monitoring the status of the soil and using soil moisture sensor we can control the flow of water and thereby reduce the wastage. The merits are Low power consumption and easy to install. Remote monitoring is possible from field to farmer's home. By automatic control of DC motor, we can reduce power consumption. Wastage of water can be reduced. High Humidity and temperature can be detected and controlled. Controlling moisture of soil. The demerit is costly to implement. A.Pederi and H.S.Cheporniuk et al [3] has proposed this paper presents combination of new approaches and technologies in modern-day agriculture. Perspectives and benefits of usage of Unmanned Aerial Vehicles in different spheres of agriculture considered on the base of spraying drone project called "Aerodrone". The merit is Unmanned System Reduces Human Effort. The demerit is Costly to implement. For couple of years the term precision agriculture has often been used in UAV industry. This can be explained by the fact that farmers worldwide are making their decisions more often depending on the data that were collected by the drones. UAVs can spray different types of plant protection chemicals. There are a lot of plant protections products exist today. Main pesticides that used in precision agriculture are insecticides, fungicides, herbicides. Ukraine based start-up "Aero Drone" develops a unique project that has no analogues worldwide. As far as it known, this project is the first working prototype of fixed-wing spraying UAV. It has many advantages comparing with traditional crop protection methods. "AeroDrone" PAM-20 has suspended portable control unit that includes autopilot, modems, measuring devices, sensors and other electronics. Such control unit may be installed on other UAVs, but with other settings file, which should be uploaded by the operator before the flight. Autopilot provides full-automated mission and supports up to 1000 GPS-points for mission routing. Shital Mahadik,Monika Paygude, Supriya Randive et al [4] has proposed this paper brings forward modified device based on wireless network and radio communication. Three levels are included in the system. The android control platform or a android cellphone for surveillance, the controller and action unit (sensors and detectors). Orders can be sent from the Android control platform or cellphone to the controller information such as soil moisture, saline content, water level processed by the controller can be sent to the android platform or cellphone by GSM modem. The merits are reduces man power, reliable system, low cost system. The demerits are consumes more water and slow growth rate. Wen-Yaw Chung, Jocelyn F.Villaverde, Janine Tan et al [5] has proposed this soil moisture sensor in determines volumetric water content. Volumetric water content is defined as the ratio of the volume of water and the total sample volume of dry soil. The calibration curve of the EC-5 sensor can be obtained from the soil sample from Dai-Yun organic farm. The analog data obtained from the characteristic curve serves as the voltage input of the analog to digital converter. The MPC82G516A micro controller is programmed by using KEIL uVision4 IDE. The wireless transceiver nRF24L01 is connected to the MPC82G516A micro controller to transmit the data to the receiver node. Tera Term terminal emulator is used such that transmitted data can be viewed to the computer monitor and stored in the database. The stored values will be used in making the irrigation schedule of the green house. These values determine the volumetric water content of the soil. The four classifications considered in the irrigation scheduling are dry soil, slightly moist soil, moist and wet soil. The merits are easy installation and replacement in the farm. The demerit is it is very difficult to reach the increasing food demand. Vidadala et al[6] has proposed this implementation of agricultural automation system is done by using web and GSM technologies. The embedded project is to design and develop a low cost system which is based on embedded platform for agricultural automation. Optimum usage of water is the main objective of this system. This project uses soil moisture sensor and temperature sensor to detect the water quantity present in agriculture and water level sensor is used for detecting water level in tank. In this system we monitor the status of sensors through WEB and GSM technology. Here temperature, soil moisture and water level can be monitored in web page through microcontroller and information will be send by SMS. The information about the status of the sensor will be viewed at remote location by using GPRS technology. The merit is to design and develop a low cost system which ensures optimum usage of water.

The demerits of this paper is due to activating sensor for long time it may misbehave and causes a great problem. Kirankumar et al [7] has proposed this considering an area where any of the crops grown and a solution is found for an agriculture system by different deployment technique. The device will successfully help in growth of a plant by monitoring temperature, pesticides, humidity without human interference and can be implemented in half acre of land as a prototype model. The merit is agricultural growth of the plant without human interference. The demerits of this paper device if implemented in the large scale the overall cost can be brought down that is demonstrated using qualnet simulator. Saleemmaleekh et al [8] has proposed this with the advancement in technology, the world around us in every part of our life getting automated. The manual procedures are being replaced by these automated systems, since they are with energy efficient and consume less labor work. This paper proposes the advantages of having Wireless Sensor Network technology in Indian agricultural sector, which shows the path to the rural farmers to replace some of their traditional techniques. Here, multiple environmental data such as Humidity, Soil moisture, Soil pH etc. are collected by a set of wireless sensor nodes and applied as input to the Peripheral Interface Controller (PIC). The data is checked continuously by PIC controller and a set of control actions like Irrigation, Soil fertility check etc. are made if they exceed threshold level. After every activity, an evidence message is sent through SMS via GSM modem to the farmer. The module by module design and implementation of the system are given. The merit of this paper is the system overcomes the limitations of traditional agricultural procedures by utilizing water resource efficiently and also

reducing labor cost. The demerits of this paper is difficult to maintain. Jaichandran et al [9] has proposed this prototype for automatic controlling and remote accessing of irrigation motor. Prototype includes sensor node, controller node and mobile phone. The sensor node is deployed in irrigation field for sensing soil moisture value and the sensed data is sent to controller node. On receiving sensor value the controller node checks it with required soil moisture value. When soil moisture in irrigation field is not up to the required level then the motor is switched on to irrigate associated agriculture field and alert message is send to registered mobile phone. Mobile phone is used for sending request SMS to get soil moisture value in irrigation field and commands can be sent as SMS to switch on/off the irrigation motor. Prototype is experimented by abstraction three pots containing soil with different moisture level as irrigation fields. The experimental results show that the prototype is capable for automatic controlling and remote accessing of irrigation motor based on the feedback of soil moisture sensor. The merit of this paper is that farmer can monitor and control irrigation activity from remote location. The demerits of this paper is farmer have to bear huge financial losses because of wrong prediction of weather and incorrect irrigation method to crop. Priyanka et al [10] has proposed this system involves some sensors, LCD

display, GSM and ARM processor. All the sensors will give analog output but our processor will accept only the digital data. So we have to connect all the sensors to the ADC channel pins which are in-built to the processor.LCD will be on field display purpose. GSM module will contains a Subscriber Identity Module (SIM) user can communicate with this SIM-Number. When the particular command activated or given by the user, immediately the corresponding sensor will activates and reads the present reading and immediately sends results to the same user mobile and displays in the LCD panel in the field. Immediately user will take the necessary action if required. Here we are using total seven sensors to monitor the field condition. Those are Temperature, Humidity, Soil moisture, Leaf sensor, PH sensor, Level sensor, Phase sensor. All these devices are connected to the ARM processor GSM is used for communication purpose, with the help of AT (attention)-Commands we can communicate with the components. For soil module and level sensing applications we are using motors. One motor is used to store water and another is for releasing the stored water into the soil. The merit of this paper is economic growth, income distribution and food security. The demerits of this paper is insufficient data.

Table.1. Comparision Table

SL. No	Name of the paper	Methodology	Merits	Demerits
1.	Sensor based automatic irrigation system and soil PH detection using image Processing.	Rain gun irrigation method	Automatic irrigation machinery.	There is no proper protection of crops in case of heavy rainfall.
2.	Automatic rain water and crop saving system	Crop saving method	Low power consumption and easy to install	costly to implement.
3.	Unmanned Aerial Vehicles and new technological methods of monitoring and crop protection in precision agriculture	Unmanned Aerial Vehicle	Unmanned System Reduces Human Effort	costly to implement.
4.	Irrigation control system using GSM for efficient use of water.	Wireless network and radio communicatio n	reduces man power, reliable system, low cost system.	consumes more water and slow growth rate.
5.	Wireless Sensor Network Based Soil Moisture Monitoring System.	Wireless sensor network	easy installation and replacement in the farm.	difficult to reach the increasing food demand.
6.	An enhanced automation of irrigation sectors: a cost effective GSM approach with intelligent sensors.	Agricultural automation system using web and GSM	design and develop a low cost system	due to activating sensor for long time it may misbehave and causes a great problem.
7.	Leveraging embedded system for improvement of crop productivity in India.	Prototype method	agricultural growth of the plant without human interference.	if implemented in the large scale the overall cost can be brought down
8.	Updation in agriculture using wireless network over traditional agriculture.	Wireless sensor network technology	overcomes the limitations of traditional agricultural procedures by utilizing water resource efficiently and also reducing labor cost.	difficult to maintain.

| 9. | Application of wireless sensor network for agricultural parameter control. | Automatic irrigation system and remote access | farmer can monitor and control irrigation activity from remote location. | farmer have to bear hug financial losses |
| 10. | Economic impact of agriculture technology in India using hard wares. | ARM processor and GSM technology | economic growth, income distribution and food security. | insufficient data. |

III. CONCLUSION

In this paper, we studied and compared different techniques used for the protection of crops from heavy rainfall. Automatic crop saving system, agricultural automation system and automatic irrigation system are the most efficient methods used. These methods reduce the power consumption and farmer can monitor and control irrigation activity from remote location. The corrective action can be taken to reduce the human power. Future scope of this paper is to detect the soil moisture level and reduce the destruction of crops from heavy rainfall.

IV. REFERENCES

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