January-February 2020
ISSN: 0193-4120 Page No. 8235 - 8240

Protection and Prediction of Crop Yield during Natural Calamities

M. Perarasi*, EEE department, R.M.K. Engineering college, Chennai ,India.
B. Nandini *, EEE department, R.M.K. Engineering college, Chennai ,India.
E. Elakkia*, EEE department, R.M.K. Engineering college, Chennai ,India.
Syed Mohammed Ibrahim S D *, EEE department, R.M.K. Engineering college, Chennai ,India.

Article Info
Volume 82
Page Number: 8235 - 8240
Publication Issue:
January-February 2020

Article History
Article Received*: 18 May 2019*
Revised*: 14 July 2019*
Accepted*: 22 December 2019*
Publication*: 07 February 2020*

Abstract:
The improving trend towards automation technology provides a path way to overcome the challenges in the Agricultural Sector. There are various difficulties faced by the farmers such as crop failure, root loss, less or no yield during rainy season. So, in order to save the crop from such calamities we are introducing the automation crop protection system. The two major crops used by Indian Population are rice and wheat. The statistical data shows that the crop loss ranges from 10 to 28% for wheat and 25 to 41% for rice which results in monetary loss to the farmers. The proposed automation crop protection system uses FARMIVOLT APP which is controlled through GSM and activates the operation of the various sensors placed for the protection operation. This system overcomes all the disadvantages faced by the farmers and results in efficient crop yield.

Keywords: *FARMI VOLT, GSM, sensor.*

I. INTRODUCTION

Advancement in technology has paved way for the benefit of people around the world in various domains. On the other hand we are exploiting the agricultural land for various reasons, which pose threat to our next generation for basic livelihood that is food. Especially agricultural fields apply automatic protection system for finding the cause of the problem and control it. Smart Farming is an advanced technology and compelling arrangement of doing horticulture and developing nourishment in a maintainable manner.[1,2] It is a use of actualizing associated gadgets and creative advances together into farming. Smart Farming significantly relies upon IoT consequently wiping out the need of physical work of farmers and cultivators. With the ongoing farming patterns subject to horticulture, Internet of Things has brought immense advantages like effective utilization of water, improvement of information sources and some more. IoT based Smart Farming improves the whole Agriculture framework by observing the field continuously. With the assistance of sensors and inter connectivity, the IoT in Agriculture has spared the hour of the farmers as well as diminished the unrestrained utilization of assets, for example, Water and Electricity. It keeps different variables like dampness, temperature, soil and so on under check and gives a completely clear constant perception. But now a day's automation system with arduino has been contributing a major role in many applications, extending our perceptions and requirements to adapt the environment according to the need.[3] Our paper aims to build a Automatic crop protection application named "FARMIVOLT"APP for optimization of the agricultural yield. In this system, we use various sensors to collect array of data's to anticipate the consequences and take a proper supportive decision by operating the various layers of shelter which can withstand natural calamities, installed in the field. In this system, the authors has used a lookup table to calculate and envisage the planning of the crop yield by using sensors like temperature sensors, soil

January-February 2020
ISSN: 0193-4120 Page No. 8235 - 8240

moisture sensors and humidity sensors. The protection system is more enhanced with the inclusion of a Protective three layers for required flow of water to the crop. The soil moisture sensor is used to monitor the moisture of soil in the yield area and data is stored & given to the actuators for protection during calamities. In the same way temperature and humidity sensors measures the respective parameters and collected information is processed using a microcontroller for enabling the actuators used for protecting the crop. Actually all sensors data is sent through arduino to PC for processing and finally decision making is done according to the need. Now we have proposed a system, which is optimally working for watering the crop based on inputs from various sensors and activation of protective layers installed, finally save the crop from natural calamities. This system allows either automated or physical control by the end user for protection purpose resulting in optimal management of crop in future. For the functioning of the complete unit, the most essential facet to be considered is data storage and finding out the appropriate method to accumulate data and interaction with the user. As one the major contribution, the proposed system has used arduino to process the information collected and delivers the control to increase the efficiency of the yield with compared to all the existing methods.

II. EXISTING SYSTEM

In existing system, decision regarding irrigation with real time data is done using IoT. The system monitors the parameters such as temperature, pH level and moisture of the soil. Soil moisture sensing device may initiate or terminate the irrigation process based on the moisture concentration in the soil. Wetness content is obtained by the Impedance change between two electrodes which is kept in the soil. Threshold values of moisture content in the soil are maintained continuously. Arduino is a hardware and software combination platform which collects analog input from sensors, analyzes it and triggers the actuators. Micro controller embedded on Arduino Uno Programmable board will collect all the values from the sensor. Simultaneously, information gathered from sensor is sent to an android app via the Bluetooth module. Status of the field is periodically monitored and updated to the farmer's device. With respect to the crop used in the farming, threshold values are defined and it is used to take appropriate decision, after the threshold level is reached by a sensor or group of sensors. Say for instance, when there is no rainfall, soil moisture level drops below the threshold level and hence motor pump will be turned on and supply of water is allowed until threshold level is reached again. One of the vital facts for crop growth is soil pH level and every crop has its limitation on pH absorption. High or low level of pH is based on the crop selected. Another important fact for any crops is temperature.

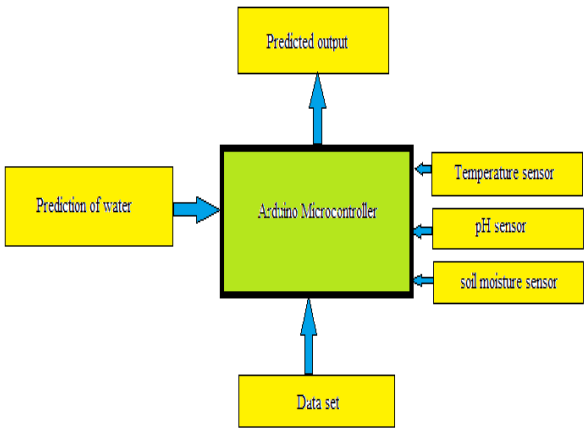


Fig.1 Block diagram of Existing System

According to study, photosynthesis decreases drastically at the temperature of 0-10° Celsius. Even if the temperature increases beyond 40° Celsius, the enzymes carryout photosynthesis lose their shape and rate of photosynthesis may decrease. At 10-20° Celsius, the enzymes work well as a result photosynthesis rates become high. Rise in temperature may increase the transpiration rate of crop. With appropriate amount of water, transpiration happen properly whereas when the quantity of water is low, then more transpiration may cause harm to the crops. Respiration rate becomes

January-February 2020
ISSN: 0193-4120 Page No. 8235 - 8240

very sluggish at 0° Celsius further at the rate of 0-30°C the rate of respiration the plants becomes rapidly high.

III. PROPOSED SYSTEM

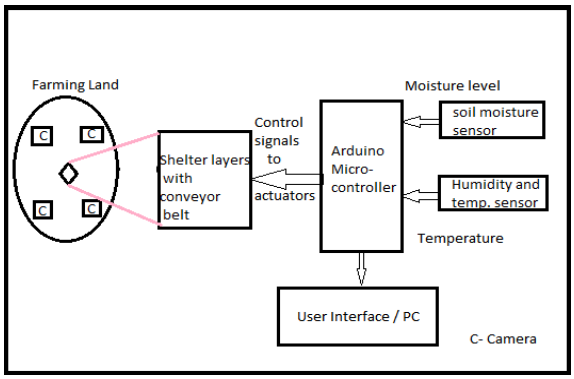


Fig.2 Block diagram of Proposed System

The proposed system uses arduino board as it provides better features such as cross platform functionality, inexpensive, simple, clear programming environment, open source hardware and software. The control is achieved through dozens of inputs from the sensors which are placed for sensing at various parameters. In this system, we have used soil moisture sensor, Humidity and temperature sensor. The soil moisture sensing device senses the humidity level which is compared with the preset threshold value, if that exceeds the threshold value, and then high output (+5V) is sent to the controller and 0V is sent for low output. The DHT11 is used as a humidity and temperature sensor which often senses the humidity by humidness device and temperature by thermal resistor. The digital output is further interface with the arduino for processing and enabling the actuators. The actuators are nothing but the belt conveyors which operates the protective three layer shelter built around the crop area. The shelter height is adjusted automatically by monitoring the crop height using touch Sensor Placed around the shelter. We have provided a camera around the farm which enables the end user for monitoring virtually. This system would result in more yield by reducing the crop loss and prevent the crop from natural calamities which is a problem faced by the farmers long way.

IV. HARDWARE DETAILS

A. Arduino

The Arduino is a microcontroller board which has 14 computerized information or yield pins, 6 simple information pins, on board 16 megahertz and Port for USB.The board is very simple to use as it can be associated to a PC with a USB link. The Arduino uses a battery and micro controller for its operation. The Microcontroller will operate on 6- 20 volts.

Fig.3 Arduino Board

B. Soil moisture sensor

Soilmoisture sensor is a compact device which is used to sense the moisture level or water content in the area by embedding the device inside the soil for measurement. Its functioning is as such when the humidity level is more than the set limit it results in +5V and when the level is lesser than the set point it results 0V. The device comprises of potentiometer as a gauge for detection. The electrical output is of analog type and it is given to the ADC of a microcontroller to meet the intended purpose.

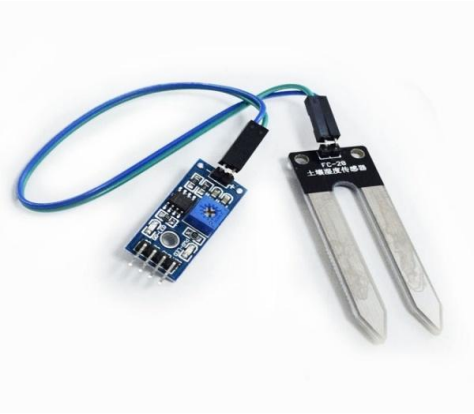


Fig.4 Soil Moisture Sensor

January-February 2020
ISSN: 0193-4120 Page No. 8235 - 8240

C. Temperature and Humidity Sensor

DHT11 is a humidity and Temperature sensing device that generates a digital output. DHT11 is often interfaced with any microcontroller like Arduino, Raspberry Pi, etc. as it produces fast results. DHT11 sensor has high consistency and long-run stability. It consists of a thermal resistor for intended operation and outputs a digital signal on the information pin. This system uses a pull-up resistor to interface with Arduino. The digital signal acquisition technique is incorporated which is the reason for its high reliability and long stability.

Fig.5 Temperature and Humidity Sensor

D. Camera

A camera is incorporated in the farm area to provide the purpose of full time monitoring of the crop without human intervention. It captures images and also records the moving images (i.e. the growth of the crop plant). The microcontroller will control the camera operation. As Arduino has Ethernet port, It controls the machine vision camera through it. The captured image is transferred to the mobile app used by the farmer through the private network for the purpose of monitoring. This will do away with the need for farmer to be present in the farm for 24*7.

Fig.6 Camera

IV.IMPLEMENTATION OF THE PROJECT

Our idea is to provide proper solution to save the crops during heavy rain. This crop monitoring system would check the growth and humidity factor that a crop would require during heavy rain. This system will provide three layers shelter to the crop which is in growing stage. The First layer will be of a transparent material, the second layer will have some pores that will be placed at the left side of the shelter and the final layer would have larger pores when compared to the second layer and this will be placed on the right side of the shelter. These three layers will be controlled by a belt conveyor which is actuated based by Arduino controller based on the inputs from the sensors. A camera is placed in the inner part of the shelter and four other places to monitor the crop growth constantly. All the cameras placed are not stationary and has 360 degree rotating angle, automatic height adjusting feature (depending upon crop height) which will be activated through sensors. These sensors will help the users to get information with regard to any difficulty that would harm the crops health. This control aspect will primarily be based on the crops height which is continuously monitored using a customized APP provided to the users called- FARMI VOLT.

Construction of FARMI VOLT APP

The FARMI VOLT will collect all the information related to the crop by using a control system with the help of GSM/Internet Protocol. The Arduino microcontroller is heart of the control unit as it provides control signals to the actuator for the proposed purpose. After the required data is fed, the data received by the user component will be analysed by the analyser and later the control signal would be sent to the conveyor for verifying which layer would be suitable and optimistic to the crops health. As soon as this process is completed by the conveyor, it would automatically start rotating and will provide shelter using the appropriate layer. Whenever the change in climatic condition is observed, this FARMIVOLT App will start

January-February 2020
ISSN: 0193-4120 Page No. 8235 - 8240

capturing the data and will alert the user about the same. Using this information user can switch the layer of protection to avoid any catastrophe to the crop.

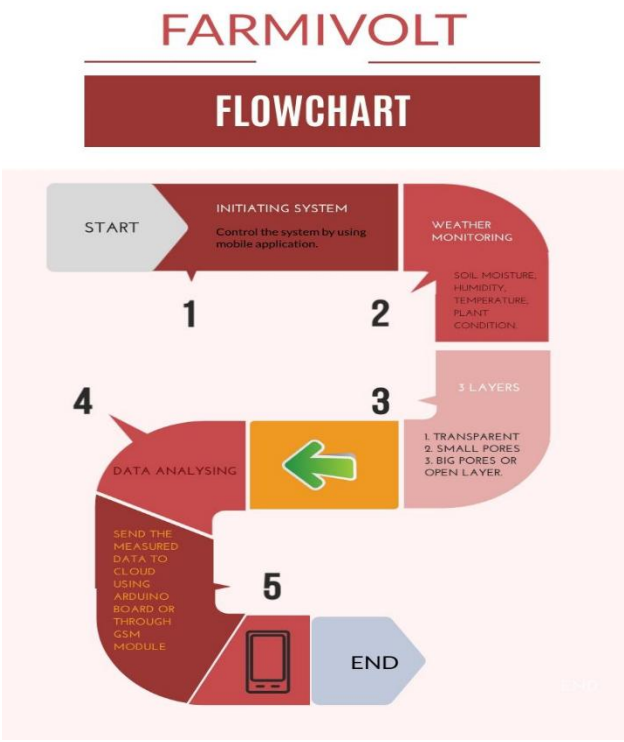
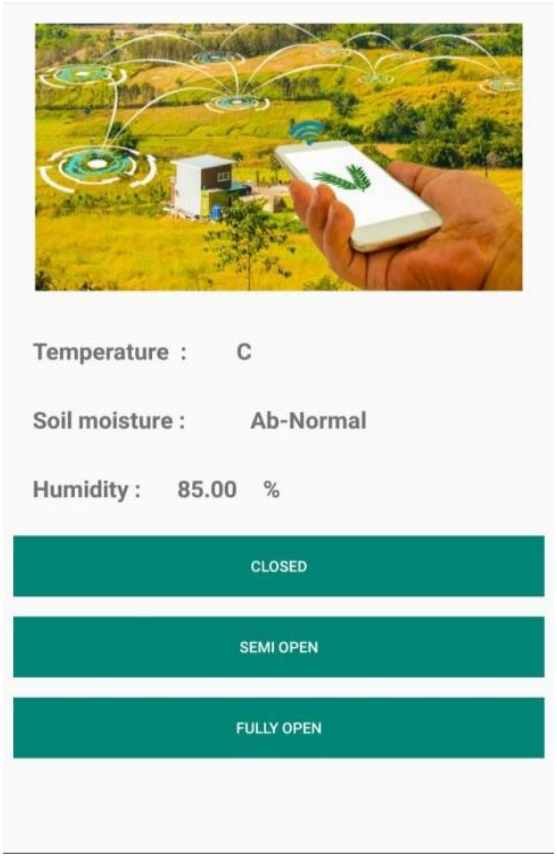


Fig.7 Flow chart of Proposed System

HARDWARE MODEL:

Fig.8 Hardware model of Proposed System

SOFTWARE MODEL:



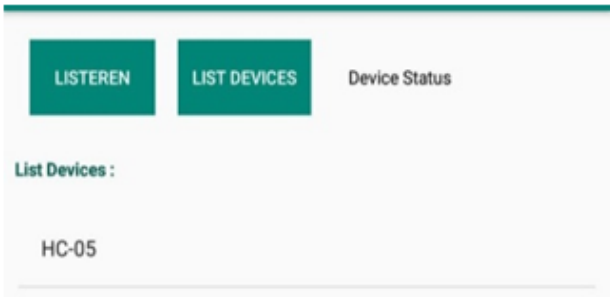


Fig.9 Software model of Proposed System

CONCLUSION

In this paper, Automatic crop protection control is implemented with the help of Arduino. We have structured and executed a framework to control natural factors in the harvest fields. Here the various sensors are used Live Monitoring of Temperature and Soil moisture which gives the look up of inputs to the Arduino for activating the protection layers. FARMI VOLT can minimize the loss due to heavy rain and other aspects like pest attacks, less supply of nutrients, even excess nutrients that can cause damage to both crop and field.There are products that are used to guard crops in normal weather

January-February 2020
ISSN: 0193-4120 Page No. 8235 - 8240

conditions but our model can protect crops in both normal and critical weather conditions. The FARMI VOLT application being projected via this paper can assist farmers in increasing the agriculture yield and reduction in the crop loss due to natural calamities and other adverse environmental conditions by adopting the preventive measures through automatic Control.

REFERENCES

1. Lee, M., Hwang, J., & Yoe, H. (2013, December). Agricultural production system based on IoT. In 2013 IEEE 16th International Conference on Computational Science and Engineering (pp. 833-837). IEEE.
2. Patil, V. C., Al-Gaadi, K. A., Biradar, D. P., & Rangaswamy, M. (2012). Internet of things (Iot) and cloud computing for agriculture: An overview. Proceedings of Agro-Informatics and Precision Agriculture (AIPA 2012), India, 292-296.
3. Pabitha, M. C., & Vanathi, B. Smart Farming and Machine Learning Techniques.
4. Gutiérrez, J., Villa-Medina, J. F., Nieto-Garibay, A., & Porta-Gándara, M. Á. (2013). Automated irrigation system using a wireless sensor network and GPRS module. IEEE transactions on instrumentation and measurement, 63(1), 166-176.
5. Nalajala, P., Rao, P. S., Sangeetha, Y., Balaji, O., & Navya, K. (2019). Design of a Smart Mobile Case Framework Based on the Internet of Things. In First International Conference on Artificial Intelligence and Cognitive Computing (pp. 657-666). Springer, Singapore.
6. Muangprathub, J., Boonnam, N., Kajornkasirat, S., Lekbangpong, N., Wanichsombat, A., & Nillaor, P. (2019). IoT and agriculture data analysis for smart farm. Computers and electronics in agriculture, 156, 467-474.
7. Doshi, J., Patel, T., & kumar Bharti, S. (2019). Smart Farming using IoT, a solution for optimally monitoring farming conditions. Procedia Computer Science, 160, 746-751.
8. Nayyar, A., & Puri, E. V. (2016, November). Smart Farming: IoT Based Smart Sensors Agriculture Stick for Live Temprature and Moisture Monitoring using Arduino Cloud Computing & Solar Technology. In Conference: The International Conference on Communication and Computing Systems (ICCCS-2016).
9. Gorli, R. Future of Smart Farming with Internet of Things. Journal of Agriculture and Water Works Engineering, 1(1).
10. Jegadeesan, S., & Venkatesan, G. P. (2016). Smart cow health monitoring, farm environmental monitoring and control system using wireless sensor networks. Int J Adv Engg Tech/Vol. VII/Issue I/Jan.-March, 334, 339.
11. Muangprathub, J., Boonnam, N., Kajornkasirat, S., Lekbangpong, N., Wanichsombat, A., & Nillaor, P. (2019). IoT and agriculture data analysis for smart farm. Computers and electronics in agriculture, 156, 467-474.
12. Mohanraj, I., Ashokumar, K., & Naren, J. (2016). Field monitoring and automation using IOT in agriculture domain. Procedia Computer Science, 93, 931-939.
13. Doshi, J., Patel, T., & kumar Bharti, S. (2019). Smart Farming using IoT, a solution for optimally monitoring farming conditions. Procedia Computer Science, 160, 746-751.
14. Jayaraman, P., Yavari, A., Georgakopoulos, D., Morshed, A., & Zaslavsky, A. (2016). Internet of things platform for smart farming: Experiences and lessons learnt. Sensors, 16(11), 1884.
15. Huuskonen, J., & Oksanen, T. (2018). Soil sampling with drones and augmented reality in precision agriculture. Computers and electronics in agriculture, 154, 25-35.