iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** V **Month of publication:** May 2021

DOI: https://doi.org/10.22214/ijraset.2021.34628

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue V May 2021- Available at www.ijraset.com

Real Time Rainwater Risk Management System for Agriculture Fields

Nagesh K N[1], Monisha Y P[2], Rashika A[3], Rohit Kishan[4], Shamad Ali Sayyed[5]
[1]*Professor & HOD, Department of Electronics and Communication Engineering, Nagarjuna College of Engineering and Technology, Bangalore, India*
[2, 3, 4, 5]*B.E. Students, Department of Electronics and Communication Engineering, Nagarjuna College of Engineering and Technology, Bangalore, India*

Abstract: ***Climate risk factor in agriculture sector gives the probability of a defined hydro-related hazardaffecting the livelihood of farmers, crops, livestock herders, fishermen and forest dwellers. According to the World Meteorological Organization (WMO), the amount of loss to the GDP due to destruction of crops in India mainly due to unwanted rain or no rain is more than any other country. Excessive rainfall causes damage to crops all over India. There are various pre-existing methods from saving the farm from flood but they are not very efficient and require lot of manual labour. The proposed system deals with the ongoing or during the problem, of either underflow or overflow of rainwater in agriculture fields. The system is based on Microcontroller which takes inputs from various sensors from the fields, which later sends signals to various others electro-mechanical devices which provide aid to the farmers for minimizing their losses. The system also keeps the concerned person well aware about the actions happening in the field through text messages on his/her cellular device.***
Keyword: Arduino-Uno, HC-SR04, LM393, SIM800a, Water Pump Module, L293d.

I. INTRODUCTION

Farmers in developing countries have always been exposed to rainwater risks, and for a long time have developed ways of reducing, mitigating and coping with these risks. Traditional risk management covers actions take both before and after the risky event occurs. But our system will provide the aid to farmers from either underflow or overflow of water while the event has occurred providing crucial help at the time of need and reducing their loss with huge margins. Climate risk factor in agriculture sector gives the probability of a defined hydro-related hazard affecting the livelihood of farmers, crops, livestock herders, fishermen and forest dwellers. Both risks and uncertainties add up to selection of appropriate saving management methods by the decision-makers or owners in agriculture.

All pre-existing methods are either done before the rain occurs or after the heavy rain has already done the destruction. So most of the methods are just disaster management done after the calamity

The proposed system is fully automated and requires very minimal human labour. Once the system is installed in a particular field, it regulates the flow of rainwater using motors and pumps. These pumps work on the basis on the inputs taken from the ground and water level in the field. Not only water regulation but the system will also keep the owner of the farm or the farmer aware of the conditions of field using GSM. Whenever any problem occurs in field the farmers will get text-messages on their cellular device keepingthem aware of the condition of the agriculture field.

This paper discusses thoroughly the main constraints of existing systems such as automaticity, protection and problems related to risk identification and their solutions. Consequently, the main goal is to give the reader a complete discussion on an automated aid which will be provided to the farmers from rain.

II. BACKGROUND

A system which provides the aid to farmers from either underflow or overflow of water while the disasters due to rainfall or drought occurs is very much needed to reduce their loss with huge margins. The proposed system is fully automated and requires very minimal human labour. Once the system is installed in a particular field, it regulates the flow of rainwater using motors and pumps. Once the system is installed in a particular field, it regulates the flow of rainwater using motors and pumps. These pumps work on the basis on the inputs taken from the ground and water level in the field. Not only water regulation but the system will also keep the owner of the farm or the farmer aware of the conditions of field using GSM. Whenever any problem occurs in field the farmers will get text-messages on their cellular device keeping them aware of the condition of the agriculture field.

In order to design and develop Real time rainwater risk management system for agriculture field's extensive research on the microcontrollers, sensors, motors and pumps need to be fulfilled. This section will discuss previous studies that have been accomplished by other researchers in the same area.

"Aggarwal P K. Global climate changes and Indian agriculture: impacts, adaptations and mitigations. Indian Journal of Agricultural Sciences **78**[1]: 911.2008" helped us to get more insights on the impact of rainfall or no rainfall on the agricultural fields in India, and in what way things can be improved to minimize the loss.

"Chandran K M and Surendran U. Studies on factor influencing the adoptions of drip irrigation by farmer in humid tropical Kerala, India. International Journal of Plant Production **10**[3]. 2012" helped us to collect information on the previous existing systems and problems related to it which can be implemented later.

"Asha L.K.V, Gopinath, Mand Bhat A.R.S. Automated rainfed agriculture in India. International Environmental Science and Development Journal **3**[3]: 68-71. 2012"**,** has mentioned regarding that various methods have been tested and reviewed with their advantages and disadvantages under various operation and function strategies.

"Kumar D S, Barah B C, Ranganathan C R, Venkatram R, Gurunathan S and Thirumoorthy S. An analysis of farmer's perception, dilemma and awareness towards crops saving as a technique for risk management in Maharashtra. Agricultural Economics Research Review **24**[4]: 37–46. 2011". This helped us toget information from a farmer's point of view. We collected lots of data from this regarding the actual problems faced by the farmers and what are their needs and requirements.

"Ali J., Adoption of diverse risk management for vegetable cultivation. International Journal of Vegetable Science **21**[5]: 9–20.2015", helped us in getting exact facts and figures of the implemented system about the water leveling on the ground and getting the reading from the sensors on which the pumps would function. This system hadlots of glitches which will be cleared in our system.

III. PROPOSED SYSTEM

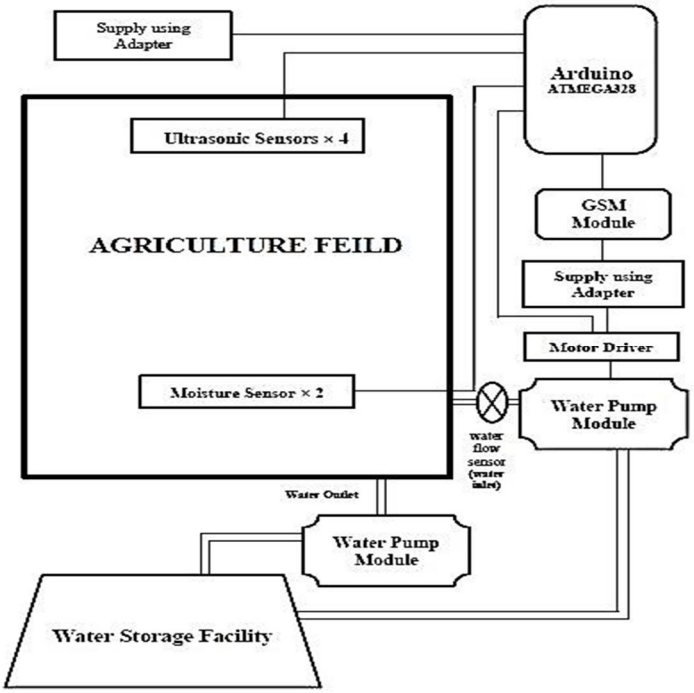


Fig 1: Block Diagram of the System

The proposed system entitled "Real time rainwater risk management system for agriculture fields" works mainly on Arduino ATMEGA328, Ultrasonic sensor HC-S04 eight in number, inculcated inside PVC pipes and placed throughout the borders of the agriculture field which will measure the level of rainwater in the field, moisture sensors four in number, placed throughout the borders of the field, which will measure the moisture in the field when having shortage of water, the GSM module which will send text-messages on the cellular device of the concerned person about the activities happening in his/her field. The system will also have water pumps and motors that will work on the basis of values provided by the sensors mentioned above.

The water-pumps will pump the water inside the field, and will also provide a way for the water to exit the field. There are various pre-existing methods from saving the farm from flood but they are not very efficient and require lot of manual labour. On the top, all pre-existing methods are either done before the rain occurs or after the heavy rain has already done the destruction. So most of these methods are just disaster management processes done after the calamity. The proposed system is fully automated and requires very minimal human labour. Once the system is installed in a particular field, it regulates the flow of rainwater using motors and pumps. These pumps work on the basis on the inputs taken from the ground and water level in the field. Not only water regulation but the system will also keep the owner of the farm or the farmer aware of the conditions of field using GSM. Whenever any problem occurs in field the farmers will get text-messages on their cellular device keeping them aware of the condition of the agriculture field. The main objective of this project is to deals with the ongoing or during the problem, of either underflow or overflow of rainwater in agriculture fields. The system is based on Microcontroller which takes inputs from various sensors from the fields, which later sends signals to various others electro- mechanical devices which provide aid to the farmers for minimizing their losses. The system also keeps the concerned person well aware about the actions happening in the field through text messages on his/her cellular device.

IV. METHODOLOGY

The proposed system entitled “Real time rainwater risk management system for agriculture fields” works mainly on Arduino ATMEGA328, Ultrasonic sensor HC-S04 eight in number, inculcated inside PVC pipes and placed throughout the borders of the agriculture field which will measure the level of rainwater in the field, moisture sensors four in number, placed throughout the borders of the field, which will measure the moisture in the field when having shortage of water, the GSM module which will send text-messages on the cellular device of the concerned person about the activities happening in his/her field. The system will also have water pumps and motors that will work on the basis of values provided by the sensors mentioned above. The water-pumps will pump the water inside the field, and will also provide a way for the water to exit the field.

If the water level in the field rises to a certain limit to which the crops are getting affected then it will be detected by the ultrasonic sensors, then these sensors will send input to the Arduino, and the Arduino will further send the signal to the motor driver and pump which will start the procedure of removal of excess water from the field through the pipelines. The Arduino will also send inputs to the GSM module, which will further send text message to the concerned person regarding the issue on their cellular device. The excess water will be flown to a nearest water-storage facility.

Now if there is scarcity of water in the field, which is detected by the moisture sensors, these sensors will send signal to the Arduino which further sends signal to the water pump, which will pump water from the water-storage facility to the field. If the pump starts the procedure of pumping water in the field and there is no water in the water storage facility then that will be detected by the water flow sensor and it send a signal to the GSM module which sends text message to the concerned person regarding the situation. The Arduino will also send inputs to the GSM module which informs the concerned person regarding the activities through text message. The above proposed system is a prototype so it is being powered by AC current using power adapter, which can be replaced by solar electricity to cut down the power consumption. All the observations made by the Ultrasonic sensors and the moisture sensors and taken down the observation table mentioned in table 1. Based on the inputs received by the entire four ultrasonic sensors which give the level of water in the field, the average value is taken which is further processed in our algorithm on which the system performs the needed action. The same procedure is also performed for the moisture sensor i.e. the average value is processed in the algorithm on which the system performs the needed action. The correspondent table is 2.

Obs	US-1	US-2	US-3	US-4
1	Value 1	Value 2	Value 3	Value 4

Table 1: Values taken from 4 Ultrasonic sensors

Obs	MS-1	MS-2
1	Value 1	Value 2

Table 1: Values taken from 2 moisture sensors

The Algorithm on which the values are being calculated is:

1) *Ultrasonic sensor value* = Σ**US (i) /4** ; i ranging from 1 to 4.
2) *Moisture sensor value* = Σ**MS (i) /2** ; i ranging from 1 to 2.

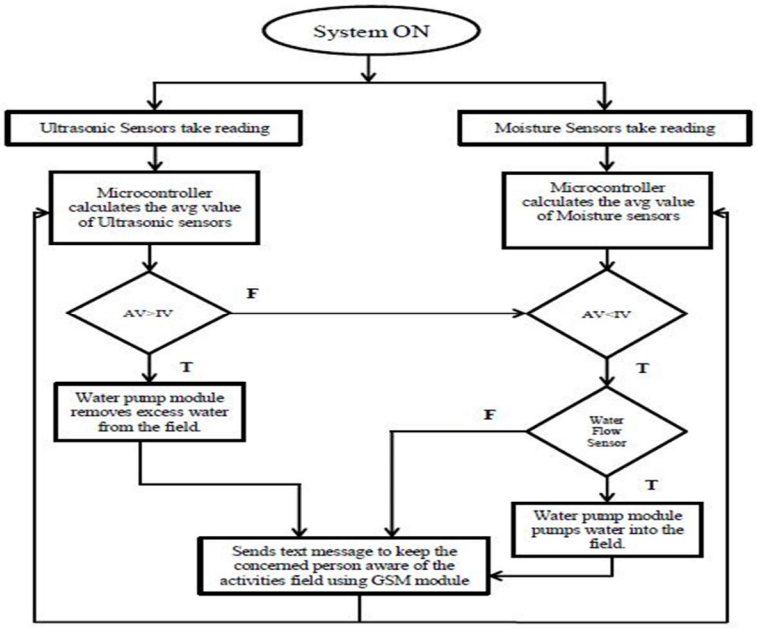


Fig 2: Flowchart of the System Functionality

The above figure shows the system functionality in which AV represents Average value calculated from various sensors ad IV represents Ideal value needed for the crops.

The algorithm which has been developed for the prototype is based on Arduino C language from which the main functions and libraries are mentioned below:

```
#include<NewPing.h>
#include <Wire.h>
#include <SoftwareSerial.h>
SoftwareSerial mySerial(8, 9); // RX, TX
#define TRIGGER_PIN 6
#define ECHO_PIN 7
#define MAX_DISTANCE 200
NewPing sonar(TRIGGER_PIN, ECHO_PIN, MAX_DISTANCE);
void loop()
  lev=level();
  mos=mositure();
  Serial.println(lev);
  Serial.println(mos);
 int mositure()
{
    int moisture = analogRead(A1);
    return moisture;
}
void sendmessage()
void sendmessage1()
void sendmessagep()
void sendmessagep1()
void sendmessagewf()
```

V. RESULT & CONCLUSION

A. Result

Once the system is installed in a particular field, it regulates the flow of rainwater using motors and pumps, and is working with 98% efficiency ignoring any damage caused by human intervention. The main processing unit of the microcontroller i.e. Arduino ATMEGA328 which takes the values from the Ultrasonic sensor HC-S04, inculcated inside PVC pipes and placed throughout the borders of the agriculture field which will measure the level of rainwater in the field and it will also have Moisture sensors, placed throughout the borders of the field, which will measure the moisture in the field. If the water level in the field rises to a certain limit to which the crops are getting affected then it will be detected by the ultrasonic sensors, then these sensors will send input to the arduino, and the Arduino will further send the signal to the motor driver and pumps which will start the procedure of removal of excess water from the field through the pipelines. The Arduino will also send inputs to the GSM module, which will further send text message to the concerned person regarding the issue on their cellular device. The excess water will be flown to a nearest water-storage facility. Now if there is scarcity of water in the field, which will be detected by the moisture sensors and the ultrasonic sensors, these sensors will send signal to the Arduino which further sends signal to the water pump, which will pump water from the water-storage facility to the field. The Arduino also sends inputs to the GSM module which informs the concerned person regarding the activities through text message.

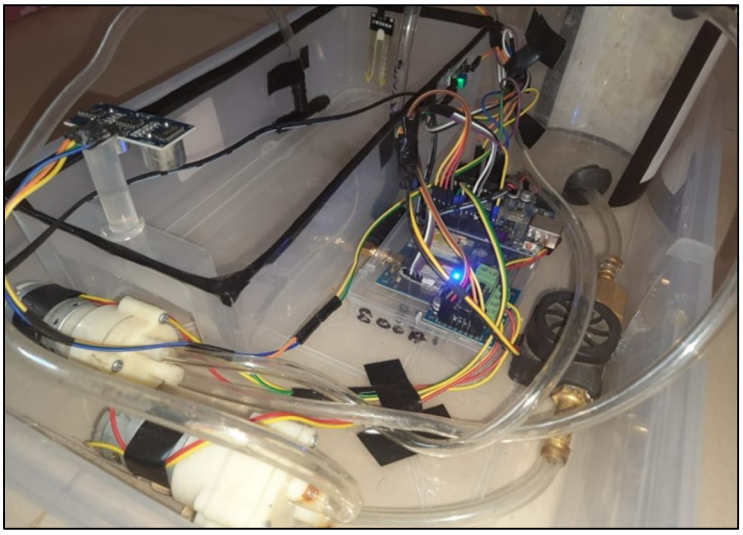


Fig 3: Implemented Connections of the system

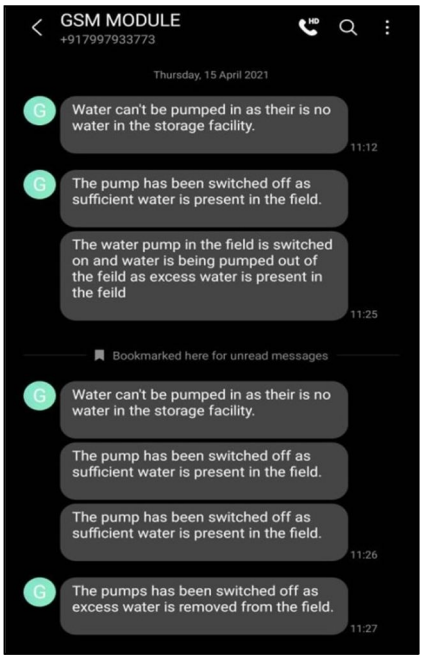


Fig 4: Text-messages received from GSM module

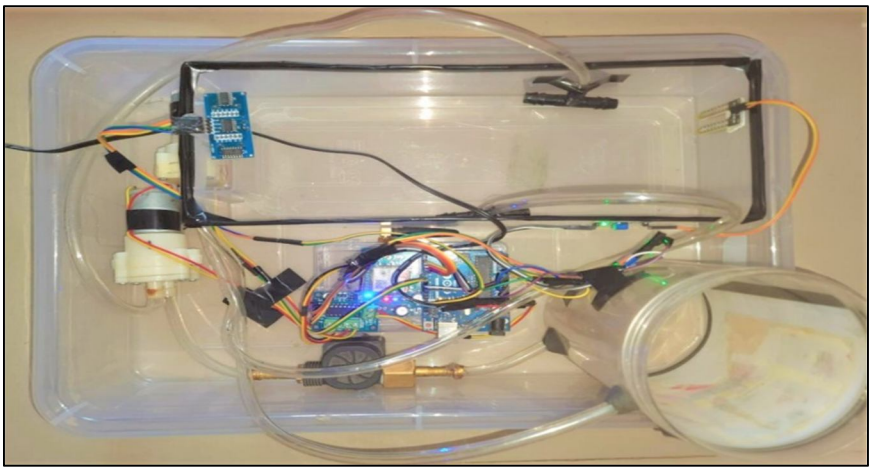


Fig 5: Assembled Prototype

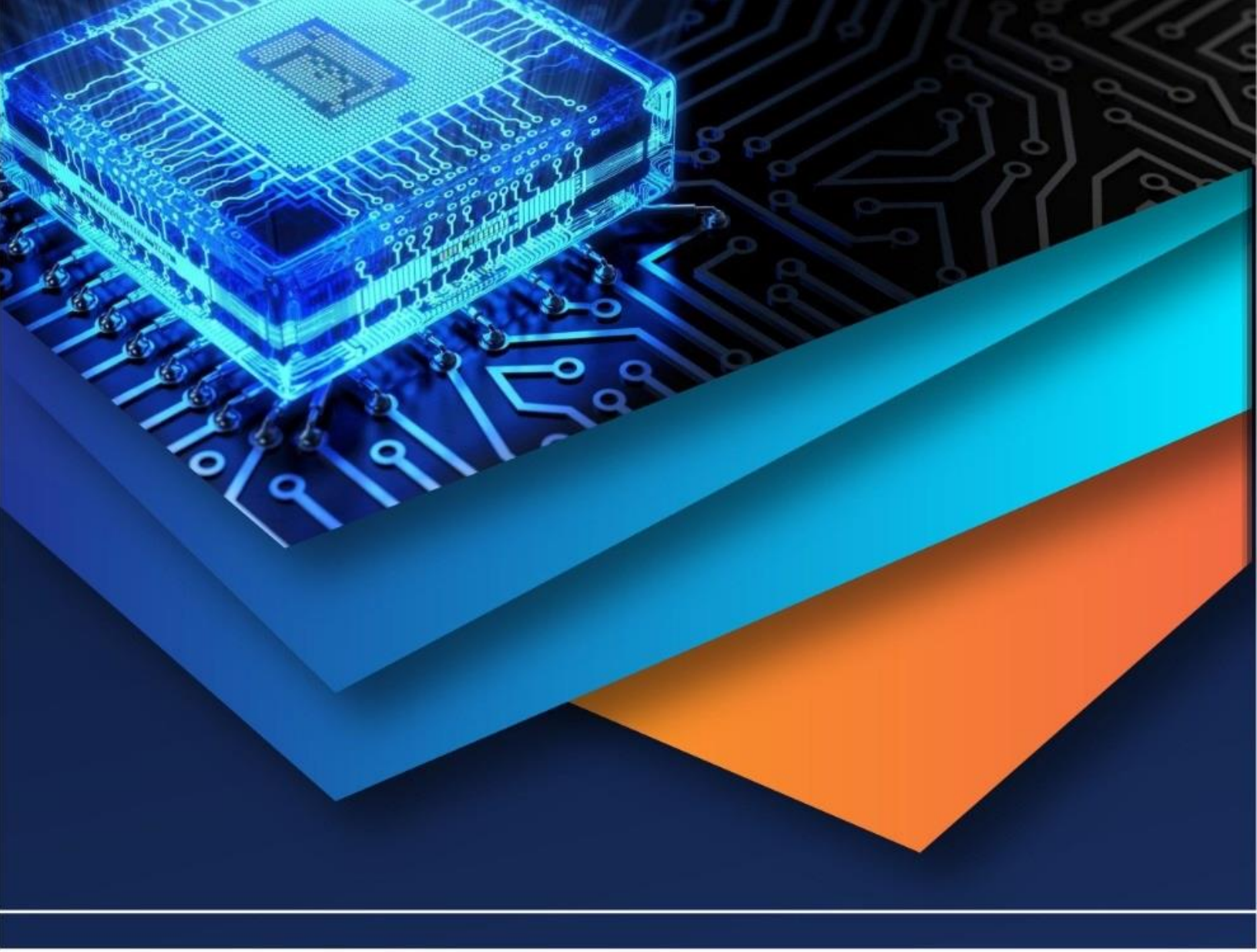
B. Conclusion

The project entitled "Real time rainwater risk management system in agricultural fields" is working efficiently on successful implementation. It has been developed by integrated features of all the hardware components used. In the initial phases of the development extensive research and study was done on various journals and publications to get the required information. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit.

The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is goes to be below the desired and limited level or if the ultrasonic sensor measures the water level of the field more than limited level, the moisture sensor or the ultrasonic sensor sends the signal to the Arduino board which triggers the Water Pump to turn on and supply the water to the field, If the water level is more than the desired level then, the Arduino will send signal to the servo motor which will provide the water outlet gateway. When the desired moisture level is reached, the system halts on its own and the water Pump is turned off or the water outlet pump is closed. Thus, the functionality of the entire system has been tested practically and it is expected to function successfully.

REFERENCES

[1] Aggarwal P K. "Global climate change and Indian agriculture: impacts, Adaptation and mitigation". Indian Journal of Agricultural Sciences Vol **78**[1], pp: 9-11.2008.
[2] Asha L.K.V, Gopinath, Mand Bhat A.R.S. "Automated rainfed agriculture in India". International Journal of Environmental Science Vol **3**[2], pp: 36-71.2012
[3] Chandran K M and Surendran U. "Study on factors influencing the adoption of automated drip irrigation by farmers in humid tropical Kerala". International Journal of PlantProduction. Vol **30**[3] pp: 8-14.2016
[4] Kalinda T, Tembo G, KuntashulaE and Lusaka Z. "Adoption of improved maize seed varieties in Southern Zambia". Asian Journal of Agricultural Sciences, Vol **6**[4], pp: 3-19.2014.
[5] Kumar D S, Barah B C, Ranganathan C R, Venkatram R, Gurunathan S and Thirumoorthy S. "An analysis of farmers' perception and awareness towards crop insurance as a tool for risk management in Tamil Nadu". Agricultural EconomicsResearch Review Vol **24**[5], pp: 37–46.2011
[6] Suresh A, Raju S S, Chauhan S and Chaudhary K R. "Rainfed agriculture in India: An analysis of performance and implications". Indian Journal of Agricultural Sciences Vol **84**[6], pp: 15-18. 2014
[7] Koshti N R and Mankar D M. "Factors influencing farmers' adoption of adaptation measures towards climate change and variability in distress prone districts of Vidarbha". Journal of Agricultural Sciences Vol **86**[7], pp: 3–6. 2016.
[8] Ali J. Adoption of diversification for risk management in vegetable cultivation."International Journal of Vegetable Science" Vol **21**[8], pp: 9–20.2015.
[9] Rajesh K M and Rajkumar U. Study on the adoption of electro-mechanical rainfall Aiding system for farmers, India. "International Journal of Plant Production", Vol **46**[9], pp: 73–78.2019.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY