

# AUTOMATIC IRRIGATION AND HARMFUL GAS DETECTION IN AGRICULTURE USING EMBEDDED SYSTEM

Deeptha P. R<sup>1</sup>, Divakar Kumar Yadav<sup>2</sup>, Gopikrishna B. N<sup>3</sup>,

Jeffy Ruth Abraham<sup>4</sup>, S. Sowndeswari<sup>5</sup>

<sup>1,2,3,4</sup> Student, Dept. of ECE, Sambhram Institute of Technology, Bangalore, Karnataka, India

<sup>5</sup> Assistant Professor, Dept. of ECE, Sambhram Institute of Technology, Bangalore, Karnataka, India

## ABSTRACT

The production of good quality agricultural yield is declining over time, due to lack of technological influence in the methods used for cultivation of crops. The crops are prone to early destruction due to lack of water, emission of harmful gases and also by unauthorized human or animal entry to the field. To overcome these problems, crops have to be protected so that productivity is increased. This paper presents the implementation of an automatic irrigation system that can monitor the field parameters like temperature, harmful gas concentration and soil moisture level. As a result, excess water consumption and crop loss will be reduced and the production of the crops will be increased.

**Keywords:** Irrigation, CO sensor, GSM module, Soil moisture, Temperature, PIR sensor, Electric Fence, Motor Pump

## I. INTRODUCTION

In many countries, Agriculture is one of the primary occupations and India is one among them. In India, around 60-70% of the total population directly or indirectly depends on agriculture. This sector contributes around 16-17% of total GDP according to an estimate in 2017. The agriculture sector's contribution has decreased from more than 50% of GDP in 1950's to 17% in 2016-17. In the recent time, there is a gradual decline in this sector due to many factors like climatic changes and Industrialization which thereby lead people to migrate towards cities.

One of the basic needs for Agriculture is water. Out of the total amount of water on Earth, saline water in oceans and seas constitute 97% of it. Only 2.5-2.7% is fresh water, of which 1.75-2% is from frozen glaciers, ice and snow, 0.5-0.75% forms fresh groundwater and less than 0.01% of it is available as surface water in lakes, ponds and rivers. Fresh water is a renewable resource but is very scarce. Fresh water can be replenished only through natural process. But the quantity of fresh water is lowering, due to over exploitation, pollution and unplanned

usage of water resources. Many areas of the world, especially dry and arid areas are already experiencing stress on water availability. This may result in reduced fresh water availability from surface and underground sources and can cause serious damage to surrounding and associated environments. Hence, effective measures have to be undertaken to save water for the present and future usage. In terms of agriculture, smart or intelligent irrigation is one of the efficient techniques to save water. Providing necessary amount of water to the crops with controlled measures and without human intervention is known as smart irrigation. Therefore, water is supplied only when needed reducing wastage. In conditions like heavy rainfall, the smart irrigation system can shut itself down until the soil turns dry again. The farm land is continuously monitored for any variations in temperature, harmful gas level, soil moisture level, so that necessary action can be taken when these values exceed critical state. All these activities are informed to the farmer immediately. Hence, water is provided only when it is necessary preventing wastage and monitoring the farm prevents crop losses. This system can be used especially in areas with low availability of water.

## II. PROPOSEDSYSTEM

This work mainly focuses on advancement in agriculture by the method known as automatic irrigation system. Here two types of irrigation system are used for the controlled water flow. They are,

1. Drip irrigation system
2. Sprinkler irrigation system

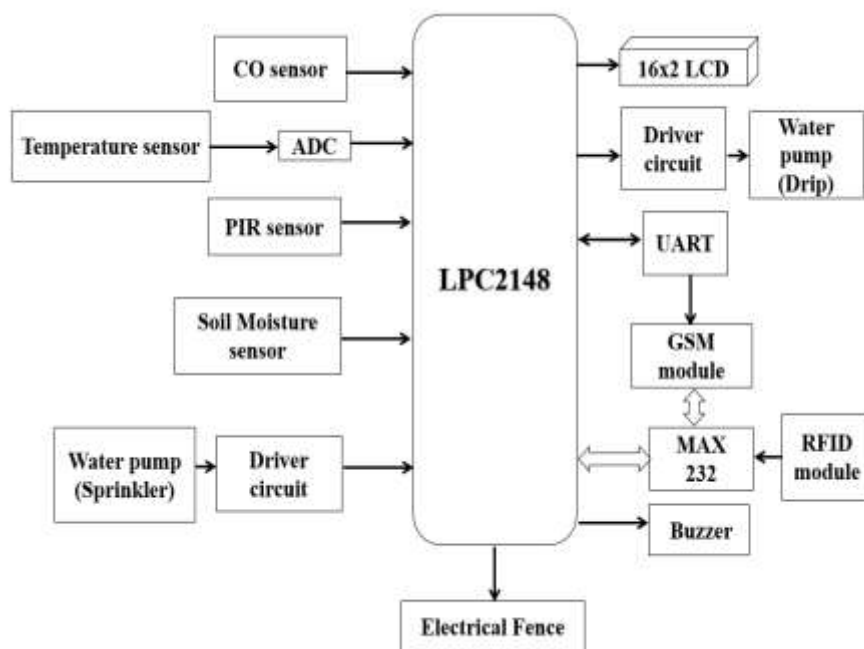


Fig.2.1: Block diagram of the proposed System

### 1. Drip irrigation system

An Automatic irrigation system is used for watering the plants which activates it based on soil conditions and temperature. Drip irrigation system is used to provide water to the root level. Firstly, activate all the components in the system. Temperature and soil moisture level is taken into consideration for this system. The soil moisture sensor is placed near root zone of plants. When the moisture level in the soil and temperature in the environment is above the threshold level, this makes the soil dry. That is, the soil is dry and no short circuit is formed between the two electrodes. In this both condition, controller enables the motor pump enabling the drip irrigation system. If both the conditions are not satisfied then the soil is wet, this wet soil acts as a conductor between the two electrodes of soil moisture sensor. Hence a short circuit is formed between the two electrodes. During this condition, controller disables the drip irrigation system.

### 2. Sprinkler irrigation system

A sprinkler system is used not only to irrigate agricultural crops, but also for cooling, spraying pesticides and also for controlling of airborne dust. Sprinkler irrigation is a technique of applying irrigation that is similar to natural rainfall. Water is evenly distributed through the farm land using a system of pipes usually by pumping.

Temperature sensor (LM35) is used to evaluate the temperature continuously and displays it on the LCD screen. When the temperature goes beyond a critical level, the sprinkler activates itself thereby cooling the crops. Farmlands are prone to catching fires during harvesting which releases harmful gases leading wilting of plant or in worst cases crop destruction. Such harmful gases like CO are detected using MQ-7 sensors. When the concentration of harmful gases like CO or methane increases above the minimal level, the controller immediately activates sprinkler system and also the buzzer. The sprinkler liquefies the gases by sprinkling water over the gas affected field area preventing crop damages. This system is also effective for spraying pesticides, when the crops are affected by diseases. These activities are informed to the farmer through GSM module.

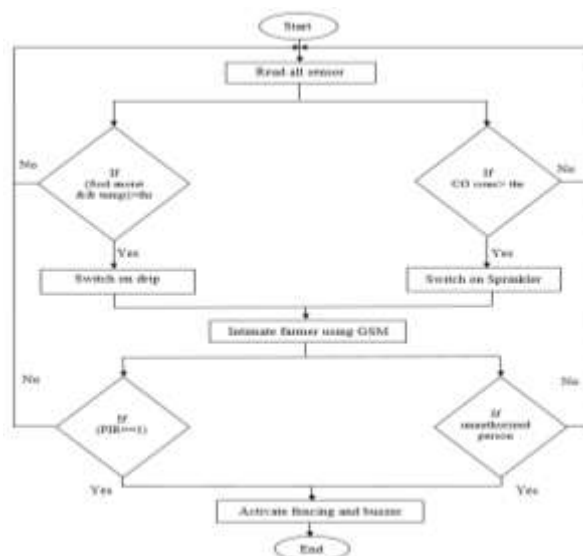


Fig 2.2: Flow diagram of Automatic irrigation system

As per the flow diagram, all the sensors start to read the values continuously. If the value of sensors goes beyond the threshold level, immediate action is being taken by the system. Consider the situation where the soil moisture value and temperature value exceeds the threshold level, then drip irrigation is activated else it continues to read the values again. And when CO concentration increases above the threshold level, drip irrigation will be switched to sprinkler irrigation. If any intruder or unauthorized persons are detected, fencing current and buzzer are activated. Farmer will be intimated about every action in the field using GSM module. Iterations will be performed continuously.

### **III. CONCLUSION**

Agriculture, being one of the oldest and most widely practiced occupations in India but it is still suffering loss economically and quality wise. Farmers are unaware about the various methods in which technology can be incorporated into agriculture which can result in increased production of yield. The crops become more vulnerable to diseases, intruders and other factors which can reduce its growth rate or even leading to its destruction. The usage of an automatic irrigation system can considerably reduce the amount of water consumed in the agricultural practice. Monitoring the field continuously can reduce the possibility of crop destruction due to harmful gas concentration, diseases, intruders etc. This improved system evaluates and monitors various conditions of the agricultural field and takes necessary actions to function according to the crop growth requirements.

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