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DESIGN AND DEVELOPMENT OF AN AUTOMATED IRRIGATION SYSTEM FOR AGRICULTURAL APPLICATION

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Abstract: Indian farmers are mainly depending on the monsoons for irrigation, which are not a reliable source of water. There are many regions where water availability is very less than the required one. So in such regions Irrigation of farm is major concern. There are several Irrigation System available but the main drawback of traditional system is that it is time based system i.e. the water applied is for particular time period irrespective of whether plant require water or not. This paper discusses design of an automated Irrigation system that allows intelligent control of the water applied to the four different field, according to the priority of crop, at right amounts and at right time using Artificial Neural Network(ANN). The system has the capabilities to measure the water content in the soil so water can be applied as needed. The soil moisture sensor based on the measurement of the soil tension will provide the measurement of the water content. The system measures the soil tension, soil temperature and other parameters and records the data in a database for future reference. It will apply water to field if a certain level of soil water content is reached. The system can be used to study the water requirements for crops so irrigation can be scheduled efficiently.

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INTRODUCTION

Irrigation may be defined as the science of artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Irrigation in India to maximum extent is dependent on the monsoons, which are not a reliable source of water hence Indian farmers have to face many difficulties because of improper or less supply of water resulting in poor irrigation. Irrigation too little can cause bad or weak yields; on the other hand, irrigation too frequently can cause water run off and leaching of nitrates and fertilization materials bellow the root zone. So, proper Irrigation mechanism is an essential component for farming. As proper irrigation mechanism not only leads to high crop production but also pave a way for water saving techniques. Automation of irrigation system has the potential to provide maximum water usage efficiency by monitoring soil moistures. To irrigate large areas of plants is an onerous job. In order to overcome this problem many irrigation scheduling techniques have been developed which are mainly based on time based system. Irrigation scheduling engrosses when to irrigate and how much water to be applied. Currently most of the irrigation scheduling systems and their

corresponding automated hardware are fixed rate. Variable rate irrigation is very essential not only for the improvement of irrigation system but also to reduce the irrigation cost and to increase crop yield. The heart of automatic irrigation system (fixed rate or variable rate) is its control unit: as it controls irrigation time and water flow. The control unit is the pivotal block of entire irrigation system. Using this control unit certain factors like temperature, type of the soil and crops, air humidity, radiation in the ground were estimated and this will help to control the flow of water to acquire optimized results. Intelligent control based irrigation is necessitated to maximize the efficiency and production.

2. METHODOLOGY:

The design consist of four different crops having different environmental, growth and other conditions. Our objective is to generate optimized decision making system through ANN which will decide the priority of the parameters as well as priority of the crop to be watered. The Irrigation using soil moisture sensors and Microcontroller is an exclusive instrument that can automatically feed plants with water according to their need without farmer's interference. So an intelligent irrigation system will manage flow of water into the field uniformly in the desired ratio deserved by the plants automatically, hence maintain turf. The system comprises of Soil moisture sensors to know the status of the water level in the farm; Solenoid valves for

controlling water flow to the farm; Sprinklers for spraying of the water; and a controller for the data processing and to control all the operations.

3. DESIGN OF A SYSTEM:
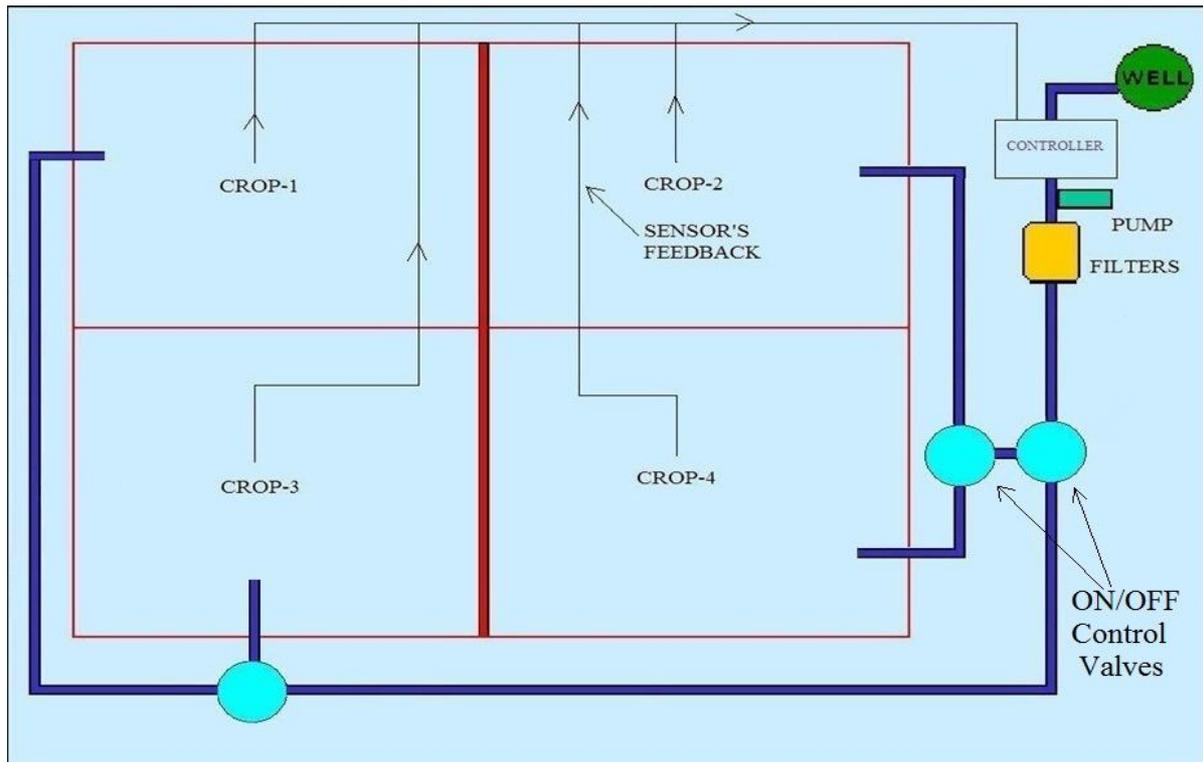
System design is shown in figure 1.

Figure 1 : Design of a System

The operation of the system is discussed as below;

The moisture sensor will give signal or feedback, the amount of moisture available in the soil, to the controller. Then the controller will decide the amount of water required accordingly motor will start. According to controller's signal control valves are controlled as on/off. As shown in figure, the water flows through the pipes to their respective fields. When a field obtains its required moisture level, then the particular control valve will be made to close the flow to the particular field and if watering is required again the valve is made open. Simultaneously water content in the soil is monitored. When all the fields acquire sufficient water levels, then the system is programmed to shut off the main motor.

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4. COMPONENTS OF SYSTEM:-

The components of Irrigation system are as follows

4.1. Micro-Controller

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Microcontrollers are used in automatically controlled products and devices

4.2 LCD Display

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