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AUTOMATIC IRRIGATION SYSTEM ON SENSING SOIL MOISTURE CONTENT

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ABSTRACT

The modern challenge for improving plant growth and reducing costs justifies the development of an automated irrigation system that will minimize the waste of water and reduce labor and monitoring overhead. Feedback-based approaches enable more efficient handling of resources than open loop system, at the expense of complexity and stability issues.soil moistures are difficult to measure, and their target levels cannot be maintained very successfully. A design is proposed for a residential environment. It is made of reliable parts and has a relatively low cost.

KEYWORDS: Irrigation; Tensiometre; Soil Moisture Sensor; Automated Irrigation Mechanism;

I. INTRODUCTION

The continuous increasing demand of food requires therapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources. Now days, water shortage is becoming one of the biggest problem in the world. Many different methods are developed for conservation of water. We need water in each and every field. In our day to day life also water is essential. Water is considered to be basic need of human. Agriculture is one of the fields where water is required in tremendous quantity. Wastage of water major problem in agriculture .Every time excess of water is given to the fields.

II. IRRIGATION

Irrigation is the artificial application of water to the soil usually for assisting in growing crops. In crop production it is mainly used in dry areas and in periods of rainfall shortfalls, but also to protect plants against frost.

Types of Irrigation

- Surface irrigation
- Drip Irrigation
- Sprinkler irrigation

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Surface Irrigation:

In this method water flows and spreads over the surface of the land. Varied quantities of water are allowed on the fields at different times. Hence, flow of water under surface irrigation comes under unsteady flow as shown in Fig1.

FIG.1 SURFACE IRRIGATION

Sprinkler Irrigation:

In this method an attempt is made to simulate natural rainfall. Irrigation water is applied to the land in the form of a spray. This method is also known as sprinkler irrigation. Sprinklers can be used on all soil types of any topography as shown in Fig.2.

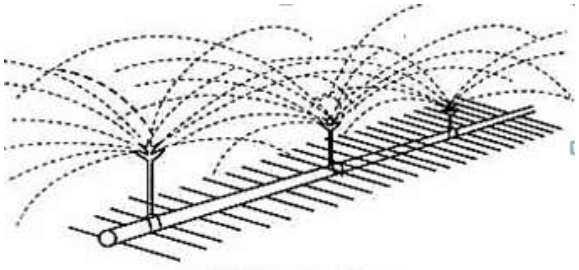

FIG.2 SPRINKLER IRRIGATION

Drip Irrigation:

In this method irrigation water is conveyed on the surface in 12 to 16 mm diameter tubing's fed from large feeder pipes as shown in Fig.3. The water is allowed to drip or trickle slowly through the nozzle or orifices at

practically zero pressure. Drip irrigation saves water because only the plant's root zone receives moisture. By using this method crops can be grown successfully over the saline lands also.

FIG.3 DRIP IRRIGATION

Soil moisture requirements differ with the crop and stage of crop development. Soil moisture availability varies with the amount of water in the soil and the type of soil. Soil type is very important in planning for and using an irrigation system. Various vegetable crops are listed in Table 1 as to the critical stage and irrigation needs.

TABLE 1.Vegetable Irrigation Needs, Critical Moisture Periods

crop	Preferred Irrigation Minimum Soil Moisture		Irrigation critical Moisture Period	Preferrd Irrigation method
	Bars	ASM		
Potato	-.35	70%	After flowering	Sprinkler, Big Gun
Onion	-.25	70%	Bulbing& bulb Expansion	Sprinkler, Big Gun
Peas green	-.70	40%	Flowering	Sprinkler
Watermel on	-.2	40%	Fruit expansion	Sprinkler, Big Gun,Drip
Pumpkin	-.70	40%	Fruiting	Sprinkler, Big Gun
Radish	-.25	70%	Continuous	Sprinkler

ASM (Available Soil Moisture): Percent of soil water between field capacity (-0.1 bar) and permanent wilting point (-15 bars).

The target soil water status is usually set in terms of soil tension or matric potential (expressed in kPa or cbar, 1 kPa=1 cbar), or volumetric moisture (expressed in percent of water volume in a volume of undisturbed soil).

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III. NEED OF AUTOMATIC IRRIGATION SYSTEM

Automatic irrigation systems are convenient, especially for those who travel. If installed and programmed properly, automatic irrigation systems can even save you money and help in water conservation. Dead lawn grass and plants need to be replaced, and that can be expensive.Automatic irrigation systems can be programmed to discharge more precise amounts of water in a targeted area, which promotes water conservation.[2]

The title itself indicates that the system checks the moisture content in the soil, based on that pumping motor will automatically pumps the water into the field. Here we are using soil moisture sensor. By using this sensor, we can find whether the soil is wet or dry. If it is dry, pumping motor will pump the water. In this system, the main controlling device is microcontroller. Here soil sensor will give the status of the soil to the microcontroller, based on that microcontroller will display the status of the soil on the LCD and switch on or off the pumping motor through relay. The pumping motor will pump the water into the field by using drip water system until the field is wet which is continuously monitor by the microcontroller. In irrigation process, most parameter of monitoring is soil, so we have to monitor the soil condition, whether the soil is dry or wet. If it is dry, then by using pumping motor, water has to be pumped automatically. The main aim of our system presenting here is to monitor the moisture content in the soil in cultivating field. Based on soil moisture, pumping motor will be automatically switch on or off through relay. This saves the water at the same time and on the other hand the plant can get optimum level of water, so increasing productivity of crop.

IV. BLOCK DIAGRAM

From the Fig.4 bock diagram of system shows Microcontroller based irrigation system proves to be a real time feedback control system which monitors and controls all the activities of drip irrigation system efficiently. The present proposal is a model to modernize the agriculture industries on a small scale with optimum expenditure. Using this system, one can save manpower, water to improve production and ultimately profit.

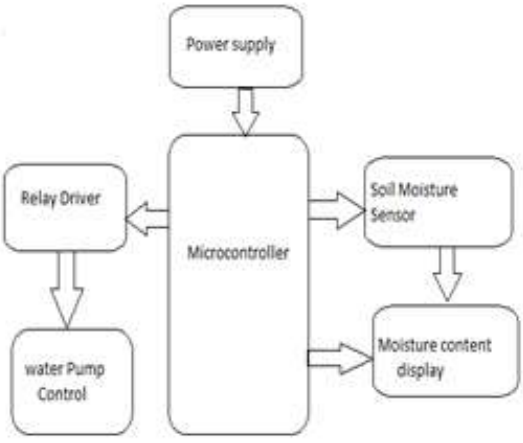

FIG.4 BIOCK DIAGRAM OF SYSTEM

V. TENSIOMETER (SOIL MOISTURE SENSOR)

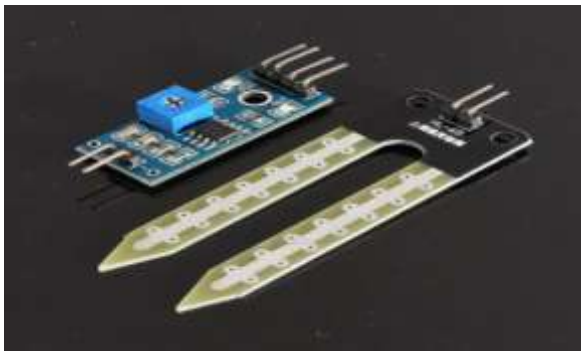

FIG.5 TENSIOMETER

The humidity sensor just senses the humidity or the moisture of the soil as in Fig.5. The change in humidity is proportional to theamount of current flowing through the soil. The humidity sensors available in market are too costly to be used for such small household applications. So for domestic purpose, we have designed a simple humidity sensor which works on the principle of conductivity of the soil. Whenever the soil is drythe conductivity of soil is less and vice-versa. Our humidity sensor consists of two metal rods and 9V battery. The two conducting metal rod used are of Aluminium. These two rods are separated by wooden block for supporting the two rods and keeping the spacing between them constant. The two rods are inserted in soil. The 9V battery is connected in series with these rods. So, the current flows from the rods through the soil. Here, if soil is dry, current flowing is negligible. And if soil is wet, current is sensed. This current is then converted in to voltage using I to V converter.

VI. RESULTS AND OBSERVATION

Fig.6 LCD indication when the soil pot is dry

The above Fig.6 shows the condition when the area to be irrigated is dry and needs supply of water for the irrigation. Initially sensor will sense if the soil is moisturized or dry. The LCD indicator will indicate Pump ON. Hence, according to the indication of the indicator that very area will get the water supply.

Fig.7 LCD indication when the soil pot 2 is dry

The shown in above Fig.7 the condition when the area to be irrigated is dry and needs supply of water for the irrigation. Initially sensor will sense if the soil is moisturized or dry. The LCD indicator will indicate Pump ON. Hence, according to the indication of the indicator that very area will get the water supply

Fig.8 LCD indication when the soil pot 3 is wet

The above Fig.8 shows the condition when the area to be irrigated is already moist and needs not to be irrigated supply. Initially sensor will sense if the soil is moisturized or dry. The LCD indicator will indicate Pump OFF. Hence, according to the indication of the indicator the water supply will cut off and this leads to the conservation of water.

VI. CONCLUSION

The system provides with several benefits and can operate with less manpower. Salient features of the system are: Closed loop automatic irrigation system and Temperature & water usage monitoring. User can easily preset the levels of the Moisture and is regularly updated about current value of all Parameters on LCD display. The system supplies water only when the humidity in the soil goes below the reference. Due to the direct transfer of water to the roots water conservation takes place and also helps to maintain the moisture to soil ratio at the root zone constant to some extent. Thus the system is efficient and compatible to changing environment. In future, other important soil parameters namely soil pH, and soil electrical conductivity will also be incorporated in the system.

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