

RESEARCH ARTICLE

Effect of auto-irrigation system on crop yields

■ Sumitra Goswami and Ashok Dangi

SUMMARY

The vast majority of Indians live in villages and depend on farming to live on. Today the most popular social interaction and time consuming mission are planning or farming watering exercises. Regardless of the season, whether it is sunny, droughty, shady or damp, the amount of water the plants receive must be controlled. Currently in operation, water systems can be used for water plants effectively when necessary. However, two main considerations need to be taken into account where and how much water is needed for this manual watering scheme. To reduce handling tasks and make work simpler, a programmed automatic irrigation system (Automatic Irrigation System) is developed. It utilises output to naturally assess the soil and water dampness of the plant when no humidity in the dirt has been observed. This instrument can also be used on big farms.

Key Words : Arduino uno, Automatic, Bluetooth, Irrigation, Soil moisture sensor

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The use of regulated proportions of water to plants at required ranges is referred to as irrigation. In dry regions and during periods of surprising precipitation, water structures aid the advancement of scenes and the revegetation of upset soils. Water structure is additionally valuable for expanding yield, smothering weed development in grain fields and

forestalling soil association. Water structure frameworks of this sort are likewise utilized for cooling animals, dust disguise, sewage ejection, and mining. This proposed plot depends on the dampness substance of the dirt. A dirt dampness sensor is a gadget that actions the dampness substance of the dirt. On the off chance that the dirt dampness falls under a specific level, the water system will start consequently. In the event that the dirt dampness level transcends the setpoint, the water system will be killed naturally. Through bluetooth, the client can handle and screen the entire machine. Arduino is joined to a bluetooth module. The arduino board is associated with the LCD. In which the damp substance of the dirt appears. This framework is easy to utilize, trustworthy, and reasonable. This forefront innovation can significantly improve monetary development. This type of innovation

MEMBERS OF THE RESEARCH FORUM

Author to be contacted :

Sumitra Goswami, Engineering and Technology Center for Animal Sciences, RAJUAS, Bikaner (Rajasthan) India
Email : summy_15@yahoo.co.in

Address of the Co-authors:

Ashok Dangi, Engineering and Technology Center for Animal Sciences, Rajasthan University of Veterinary and Animal Sciences, Bikaner (Rajasthan) India
(Email: drashokdangi@gmail.com)

can upgrade both effectiveness and quality.

Various types of automatic irrigation systems:

Drip irrigation system:

A drip water system is a kind of small water system that allows water to drip slowly to the foundations of plants, either saving water or supplementing it. The principle point is to bring water straight forwardly into the root zone while restricting scattering. On the off chance that appropriately worked, this dribble water framework has productivity and viability of 80-90 per cent.

Micro irrigation system:

A micro water system is an advanced water system technique in which water is inundated through drippers, sprinklers, foggers and other producers on the land's surface or subsurface.

Sprinkler irrigation system:

Water is channeled to at least one central space inside the area and scattered by overhead hard-hitting sprinklers in a sprinkler or overhead water gadget.

MATERIAL AND METHODS

An automatic irrigation system is shown as a block diagram. This is a system for irrigation and irrigation of plants. This system does not specify the irrigation time period. The soil controls irrigation. When the field gets dry, irrigation/watering starts. This kit has two samples. One sensor is used to feel soil moisture, while the other is used to turn the relay on the basis of the fundamental value for dryness. These relays can be wired to any device for watering or fogging any farm shed so that the system is automatically turned on and the plants can be watered. In Fig. A. A Block diagram of this system is showing. The system sensor checks soil humidity and transmits the data to the board of the arduino. The arduino board controls the whole system. The sensor senses the moisture value and it is sent to Arduino, the relay module unlocks the water pump when it falls below a certain level. As a consequence, a certain quantity of water is supplied to the plants. If a certain threshold exceeds the moisture rate. The arduino sends a further signal to the relay module, in order to avoid watering. Soil moisture displays are mostly seen on an arduino-mounted LCD panel. The user can detect or set a soil-moisture threshold value with an Android app on a mobile

device. The arduino board is connected to the bluetooth module.

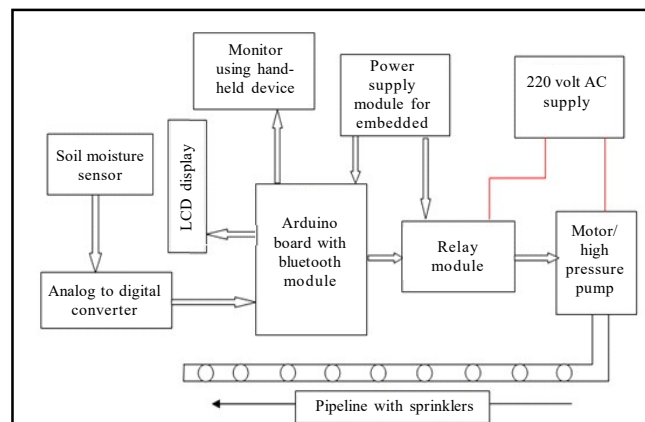


Fig. A: Block diagram of proposed automatic irrigation system

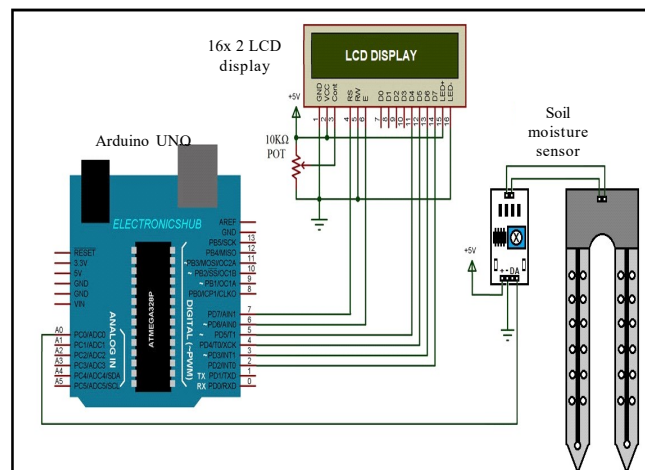


Fig. B : Circuit diagram

Main components of this system:

Soil moisture sensor:

In this system, a hygrometer type soil humidity sensor is used for measuring the dryness and moisture of the soil. The sensor consists of two parts, or this sensor design may be suggested to consist of two bits. The first is an automated board, and the second consists of a series of fork-formed samples using a driver for soil moisture detection. This bifurcated probe is compatible with a variable resistor. The tolerance of these samples depends on the quantity of water in the soil. Soil humidity is related to resistance differently. If the soil contains much water, it causes high conductivity and less resistance. When the amount of water in the soil is low, it results in poor

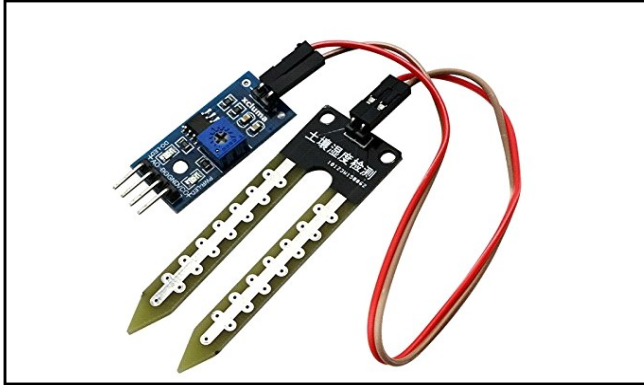


Fig. C : Soil moisture sensor

conductivity and high resistance. We can calculate the moisture level using the voltage output from this sensor, which is based on the resistance.

This sensor, which connects the probe to arduino, is also attached to this electronic module. This electronics module produces the O/P voltage. In addition to an analogue output voltage to a digital output voltage, a comparator is used in this electronic module. This digital quality can be high or low depending on the amount of water in the soil. The threshold value can be set using a potentiometer. When the soil humidity exceeds this

threshold value, productivity is low. If the soil moisture is less than the threshold value, output is high.

Arduino :

Arduino is made up of a physical programmable board as well as software. It's a free and open-source electronic circuit board. We can upload the code here. It's essentially a microcontroller package. This is a combination of analog and digital I/P and O/P. The electronic module of the soil moisture sensor is connected to Arduino in this device.

RESULTS AND DISCUSSION

Table 1 is showing suitable crops for an automatic irrigation system. We observed approx 10-12 crops for few months. This automatic irrigation is used to reduce water wastage. Table 2 is showing the effect of automatic irrigation on some crops. It showing how much water is saved and also showing improvement in yields of crops. This system is specially designed for farmers and gardeners who don't have sufficient time to watering. We had also discussed few previous research works. As compared to other seasons, a large amount of rain falls during one single time of the year (Hassan *et al.*

Table 1: Crops suitable for automatic irrigation system

Sr. No.	Crop types	Example
1.	Plantation	Tea, rubber, coffee, coconut etc.
2.	Vegetables	Tomato, chilly, capsicum, cabbage, onion, pumpkin etc.
3.	Forest crops	Teakwood, bamboo, etc.
4.	Spices	Tumeric, cloves, mint etc,
5.	Flowers	Rose, carnation, gerbera, orchids, jasmine etc.
6.	Cash crops	Sugarcane, cotton, strawberry
7.	Oil seed	Sunflower, oil palm, groundnut, etc.
8.	Orchard crops	Grapes, orange, mango, lemon, etc.

Table 2: Effect of automatic irrigation system on crops

Sr. No.	Crops	Water-saving through irrigation (%)	Improvement in yield (%)
1.	Onion	35	95
2.	Groundnut	40	152
3.	Gram	68	59
4.	Chilly	65	32
5.	Cotton	36	50
6.	Wheat	35	25
7.	Jowar	55	34
8.	Sunflower	40	52
9.	Sweet lime	61	50

2018). Plants that can only thrive in extremely wet soils can succumb to a dry spell. This issue can be settled by the water system framework. The executives of the water system decide about the amount of water that must be siphoned. Water machine booking determines when and how much water is delivered. We have several types of water system frameworks, such as sprinkler and dribble water networks. The trickle water method relies on precise water delivery to plant roots. Sprinkler water system framework is put between the plants and it sprinkles water to all the plants around it. Working on the sprinkler framework involves agreeing on the wetting style, application rate and sprinkler decrease. Sprinkler framework is of two kinds: splash type and rotor type. This system is based on the L8051F microcontroller and operating system (Li *et al.*, 2011). They are using a handheld water system detection device to establish the specifications of the saving water system for the harvests planted close to the karst slant zone. The provincial climate in this region is characterized by rapid shifts and tremendous contrasts. This device has a few advantages, such as basic operation, ease of setup, low cost, remote control and so on. The entanglements can be coordinated between manual and programmed control using this system. The entanglements can be coordinated between manual and programmed control by using this system. The mobile phone is an example of a portable device. Human demands for materialistic assets grow as we grow (Mat *et al.*, 2018). One such asset is water. It is the most widely utilized asset. There is a need to take a step toward water conservation by implementing a compact water system management structure. The goal of micro water system control framework is to supply water for a specific time span relying on the distance through which water needs to go through the line, sort of soil, crop and so on execution of this can help locales that have scant water and needs quick help with water preservation methods. This research on “Research of automatic monitoring system of reservoir based on embedded system”, (Wen *et al.*, 2011). This system is built on top of an embedded system. This device provides automated reservoir control. There are three sub-systems in this system. Data collection, transmission, data management. This system handles data storage, processing and maintenance across all three levels of management. It maintains efficiency, low cost. This research work is on “Water saving irrigation control system based on STC89 C52MC (Zhang *et al.*, 2008). This device avoids water waste by using switches and valves to communicate

between the PC and the microcontroller. To connect with MCUs and controllers, a serial port is used. MCU’s software receives the signal PC as soil moisture levels increase or fall in this device. Then, after obtaining the irrigation period, begin irrigation. When the moisture value exceeds a predetermined level, irrigation is turned off. This system involves saving water and accuracy.

Advantages of water irrigation system:

Decrease weed development :

Only zones that need water will acquire it in the event that you present a water system structure explicitly worked for your scene. Thus, you’ll have the option to precisely anticipate your future weed development. Spill water structure frameworks are particularly compelling at this: rather than sprinkling water over the whole land, the framework coordinates water explicitly to each plant’s fundamental foundations.

Save time and water :

Models with sprinklers and dribbles may be arranged daily or weekly of watering week and throughout the day or night for particular hours. The unit will also switch off the water while the water gadget technology is finished. If you use a robotic frame to spread the water flexibly, you can not make a physical gift for the aquifer to flourish. The scheduled shutdown would decrease your water consumption and cut the prices when much water is being consumed.

Plant development :

Plants can grow quicker and greener if watered over a longer time with fewer quantities of water, which is exactly what water framework systems are designed to do. Presenting a system of water boosts the plant’s growth significantly.

Hold soil supplements :

Watering by hand means that a great deal of water is absorbed in the soil every day. Waterflood absorbs and re-directs nutrients from the earth to the plants. The water network device saves your soil and also prevents flood water absorption for your plants.

Conclusion:

The use of an automated irrigation method reduces water waste. Mainly this system is designed for farmers and gardeners who have lean time to water their crops.

This system is user-friendly. This system can contribute to the economic development of India by reducing water waste throughout irrigation. The main objective of this automatic irrigation system is to make it more efficient more reliable, user friendly than the previously existing systems. In this irrigation system, water is directly transferred to the roots of crops or plants; it maintains the soil moisture ratio. Therefore, this method is additionally economical and reliable to the setting. This method reduces the manual work of the farmer. Improve agricultural quality.

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