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REVIEW PAPER ON SMART IRRIGATION SYSTEM

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ABSTRACT As the population grows, so do the demands of human beings; simultaneously, the material needs for food are also increasing. In order to meet these demands, crop production efficiency has to be improved in manpower- and water-constrained scenarios. It is important that manpower, water, and fertilizers are utilized efficiently to optimize crop production costs. Fortunately, today's technologies and techniques can ensure that this goal can be achieved, and that quality is also maintained. In this review paper, we present a cost-effective automatic smart irrigation system that allows farmers to save water, reduce human effort, and increase crop production. The proposed system combines a simple smart phone application that enables farmers to schedule irrigation and fertilization accordingly. The experimental setup in the farm admeasuring 1 acre of sugarcane crop showed that the water requirement is reduced by 56%, manpower expenses for irrigation are reduced by 90%, and electricity usage is also reduced by 75% compared to conventional methods. This system provides a win-win situation for farmers as well as government agencies that provide water and power to our country.

KEY WORDS Soil moisture water sensor, Arduino, GSM module, Relay.

NEED OF STUDY: -People's requirements are increasing day by day as a result of the high population, as well as the demand for food material. In order to meet the food demands, it is essential to improve crop productivity in the cases of manpower and water scarcity. A more efficient crop production system is of paramount importance.

OBJECTS OF STUDY: -

- Optimal utilization of available manpower, water and fertilizers can optimize crop production costs
- A smart irrigation system that saves both water and human labour while maintaining desired crop quality and quantity.
- A simple smart phone application that allows farmers to execute irrigation and fertilizer schedules.

I. INTRODUCTION: -

a) Traditional Irrigation system

Sugarcane is the main commercial crop in many parts of India. However, there are many problems in the areas with abundant water as well as in the areas with scarcity of water the traditional mechanism for irrigating sugarcane field's results in more water waste. Farmers usually use a lot of water, electricity, time, and effort to irrigate their fields. They personally need to visit the field and based on soil moisture they supply water. They must also switch on the motor and then turn it off after irrigating the field. Also, the electricity supply in time is not guaranteed and there are a number of other problems which impede the irrigation process. In a nutshell, traditional irrigation takes more energy to operate along with other side effects that lead to conversion of farmland into baron land.

b) Drip irrigation

Drizzle irrigation for sugarcane has increased in popularity since it was introduced in the 1970s. Today drip irrigation is considered to be the most accurate, efficient and practical way to deliver water and nutrients to crops. Irrigation systems with drippers water plants directly at their roots, reducing the need for irrigation systems. With a drip irrigation system, you can save time by watering a large area of plants at the same time. It allows you to

increase productivity and reduce the use of resources, resulting in a much higher quality of incentives than any other irrigation method. Using drip irrigation significantly increases sugarcane yield with a higher sucrose content, contributes to more ratoons from each planting cycle, reduces water use, reduces labor costs, saves in fertilizer, etc. However, most people will start out with a less expensive drip irrigation system. Watering tough areas, such as slopes, where runoff and erosion can happen from other watering methods, can be achieved with drip irrigation. Drip irrigation can be set to give these areas a slow soak, or it can be set to deliver water in bursts, so each burst can soak in before the next one. Most problems with drip irrigation come from improper installation or not using the right kind of drip irrigation for the site.

c) Proposed Automatic Drip Irrigation System

The proposed automatic drip irrigation system has all sorts of special solutions for drip irrigation problems.

- It has timers that can be set so even if you're away, you can trust that your plants have been watered.
- It has different nozzles that can control water flow so that sugarcane plants can get less water, while plants with higher water needs can get more.
- It has sensors that tell the system if it's raining out so it will not run.

By switching to smart irrigation system, all the problems associated with traditional drip irrigation can be avoided as it is based on automation. The farmer can supply water to the field by sitting at home using an android phone. Based on the level of water or fertilizers, the valve will automatically shut off and the next valve will turn on. This way, water will be supplied to the field at the end the motor will turn off automatically depending on the level. All of this can be managed using a smart phone application. The farmer can do other simultaneous tasks.

II. METHODOLOGY:-

The proposed system is designed by keeping in mind the low-cost devices readily available in the local market.
Below listed hardware components are used for the experimental setup.
Hardware components for Experimental Setup

1. Arduino

The Arduino is a microcontroller board based on the AT mega 328. Arduino is an open-source platform that uses an I/O board and a development environment based on the Processing programming languages. There are 14 digital input/output pins (six of which can be used as PWM outputs), six analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything you need to connect it to a computer or power it with an AC-to-DC adapter.

2. Electromagnetic valve

The solenoid is an electromagnetic component of a valve that consists of a coil, core tube, core, and enclosure. There are 2-way, 3-way and 4-way solenoid valves designed to handle the most demanding fluid control applications. Water enters the valve from the main line and exerts a force against its diaphragm. There is a small orifice in the diaphragm that allows water to pass through to the upper chamber .When the valve is closed, the solenoid's piston covers the inlet port hole because the surface area that the water comes into contact with on top of the diaphragm is greater than the surface area on the bottom of the diaphragm, which means the valve stays closed until the water in the upper chamber is released. (Pressure x area = force)

3. GSM Module.

The GSM means Global System for Mobile Communication. Mobile is used to for remote control (e.g., Gate Control, Temperature Control etc.). It contains a GSM/GPRS modem as well as a power supply circuit and computer communication (like RS-232, USB, etc.) The MODEM is the core of such modules. It generates, transmits, or decodes data from a cellular network in ordered to establish a connection between the cellular network and the computer. These are manufactured for a specific cellular network (GSM/UMTS/CDMA) or specific cellular.

4. Water Timer

Manually pre-set the run time and frequency of watering and the water timer will automatically switch on and off after serving water to your plants through a drip irrigation line.
This package includes only one Greenage water timer with single outlet used for automatic drip irrigation. Also included the following items: 1) 3/4 to1/2" size Converter/Reducer 2) 16mm female Compression adapter to connect the timer with your 16mm Drip irrigation polyethylene hose 3) PTFE thread sealing tape to tighten the threaded fittings.

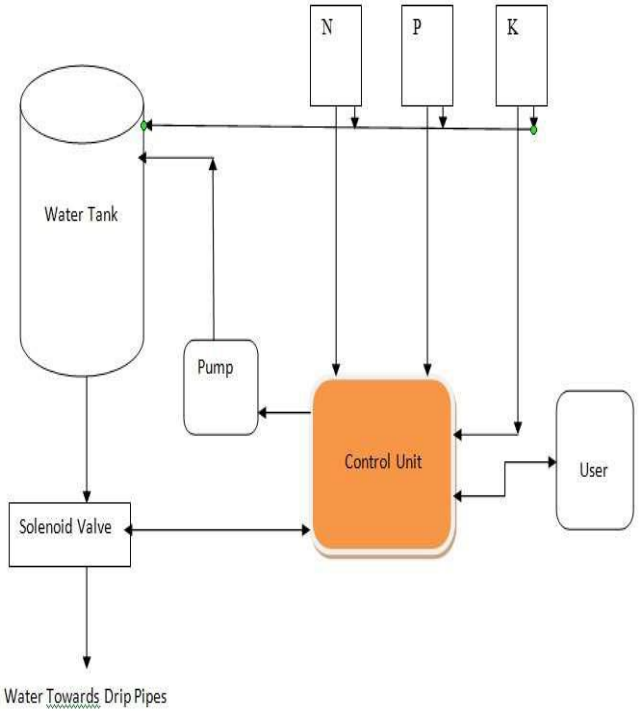

Fig 1: Design of the proposed system

The main menu in the application includes

- Know the level / status of water in the water tank
- Know the level / status Water Soluble fertilizers
- Prepare the schedule of fertilizers
- Add the fertilizers in the water
- Prepare the schedule of water supply
- Switch ON / OFF Water supply

So, as suggested in the main menu, you can receive the status of water or fertilizers According to the status, you can prepare the schedule of fertilizers and water based on the season and temperature The system is automatic in the sense that it is based on a schedule of irrigation in the evening, except in rainy season.

An Arduino board is programmed carefully to perform all the tasks of the user without any ambiguity, and the SIM card in the phone and the GSM module in the control unit are used to execute the menu in the application.

III. EXPERIMENTAL SETUP

The experimental setup takes place on the good quality farming land, admeasuring one acre, which is planted with 5000 high-quality sugarcane plants. The experimental setup is as shown in Figure 1. The full term of sugarcane crop is assumed to be of 15 months (450 days) as an average case.

The raining period is also assumed to last 150 days, during which watering by traditional, or drip irrigation system is avoided. Fertilizers are provided by using manpower at a rate of Rs. 50 per bag, and a total of 40 bags are used during the rainy season.

An android based smart phone application is designed to handle the supply of water- and water-soluble fertilizers. The functions that can be managed by the app include the following.

1. Decide the amount of water per turn
2. Decide the amount of fertilizer to mix in the water tank
3. Schedule of the water supply and feeding fertilizer
4. ON / OFF the power supply of electric motor to fill the water tank and send the status via short message system (SMS)
5. Read the water/fertilizer level sensor, and send the status via SMS

CONCLUSION: -

- In drip irrigation, the water, electricity, and manpower can be reduced significantly. However, due to the manual work involved in the actual farm, the drip irrigation is only used by a few farmers.
- With the smart mobile phone based automatic drip irrigation system, many more farmers can install and use the drip irrigation system to extend their productivity at a lower price.
- Experiments have shown that the proposed system can save water, electricity, and manpower greatly. The one-time setup is also affordable, and the system is easy to maintain.
- To automate further irrigation and fertilization, additional sensors can be integrated into the system to monitor moisture levels and temperature levels in the farm.

REFERENCES:

[1] International journal of engineering sciences & research technology (IJESRT) survey of smart irrigation system H. N. Kamalaskar* Dr. P. H. Zope, ISSN: 2277-9655

[2] Karan Kanasura, VishalZaveri, Sensor Based Automated Irrigation System With Iot: A Technical Review, Babu Madhav Institute of Technology, UkaTasadia University, Bardoli, and Gujarat, India.

[3] Rafael Muñoz-Carpena and Michael D. Dukes, Automatic Irrigation Based on Soil Moisture for Vegetable Crops, IFAS Extension, 2005.

[4] VeenaDivya K. Member IACSIT1, 2,3,4,5. A real time implementation of a GSM based automated
irrigation control system using drip irrigation methology. Department of Instrumentation Technology,
R. V. College of Engineering, Bengaluru, Karnata.2013; 4(5). ISSN: 2229-5518 [5] R. Suresh, S.

Gopinath, K. Govindaraju, T. Devika, N. Suthanthira Vanitha, GSM based Automated Irrigation Control using Raingun Irrigation System, International Journal of Advanced Research in Computer and Communication Engineering,Vol. 3, Issue 2, February 2014.

[5] Narayanamoorthy, A., Economic Viability of Drip Irrigation: An Empirical Analysis from Maharashtra, Indian Journal of Agricultural Economics, Vol.52, No.4, October-December, pp.728-739.

[6] INCID, Drip Irrigation in India. Indian National Committee on Irrigation and Drainage, New Delhi, 1994.

[7] Kulkarni, S. A. Looking Beyond Eight Sprinklers. National Conference on Micro-Irrigation. G. B. Pant University of Agriculture and Technology, Pantnagar, India, June 3-5, 2005.

[8] Tahar Boutraa, Abdellah Akhkha, Abdulkhaliq Alshuaibi, Ragheid Atta, "Evaluation of the effectiveness of an automated irrigation system using wheat crops." Agriculture and Biology.

[9] Jia Wenjun and He Xinlin, "The Study of Influence on Water-Salt Transportation under Saline Drip Irrigation", ICAE, 27-29 May 2011.

[10] KoushikAnand, C. Jayakumar,MohanaMuthu, and Sridhar Amirneni, "Automatic Drip Irrigation System Using Fuzzy Logic and Mobile Technology," TIAR, 10-12 July 2015.

[11] Drashti Divani, Pallavi Patil, and Sunil K, "Automated Plant Watering System," ICCPEIC, 2021 April 2016