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# Irrigation System Based on Weather Forecasting Soil Moisture Monitoring System Using IOT

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**ABSTRACT:** In an advanced agriculture the consumption of water is very high. An automated irrigation system for efficient water management and intruder detection system has been proposed. In this paper, a wireless sensor based networking system is proposed to address water pumping system to crop and feed nutrients to crop. Temperature and humidity sensor are used to monitor the temperature in order to initiate the water pumping system, while soil moisture sensors are used for sensing the water level and initiate the process of pumping the water to the crops in the garden. Rain sensor is used to check the rain, if rain is coming it is going to stop all the motors. River Formation Dynamics based data collection is applied to collect and store the information in server for further processing. NPK sensor is suitable for detecting the content of nitrogen, phosphorus, and potassium in the soil, and judging the fertility of the soil by detecting the content of N, P, and K in the soil.

**KEYWORDS:** Soil moisture & NPK sensor, Pump, Internet of Things, Wireless Sensor Networks, Data Collection, Temperature & Humidity sensor, Soil moisture sensor & rain sensor.

## I. INTRODUCTION

At present, the requirement of water is growing at more than twice the rate of population increases. Due to the shortage of water resources, there is a need for water saving irrigation technology for agriculture. Sensor-based Irrigation System with IOT mentioned using sensor-based irrigation in which the irrigation will take place whenever there is a change in temperature and humidity of the surroundings. The flow of water is managed by a solenoid valve. The opening and closing of the valve are done when a signal is sent through the micro controller. The water to the root of the plant is done drop by drop using a rain gun and when the moisture level again becomes normal the sensor senses it and sends a signal to the micro controller and the valve is then closed. The rainwater is used for agriculture in rainy seasons and the well or bore well water is used for other times. The soil NPK sensor is suitable for detecting the content of nitrogen, phosphorus, and potassium in the soil, and judging the fertility of the soil. thereby facilitating the systematic evaluation of the soil condition. The whole sensor network has analyzed by the micro controller and sends the sensors information to irrigation control centre (ICC). In ICC, the entire drip irrigation is controlled by the electromagnetic actuators. The ICC has technologies one is global system for mobile communication. This GSM facility serves as an important part for controlling the drip irrigation which sending the information to the cultivator using SMS to a mobile device. Then the user controls the entire agriculture irrigation system through SMS.

- To reduce water wastage in agriculture using soil moisture sensor, rain sensor, temperature & humidity sensors.

### 1.1 MOTIVATION

- Irrigation system based on weather forecasting and soil moisture monitoring using IOT can be outlined from various perspectives, including environmental conservation, resource efficiency, economic benefits, and technological advancements.

- **Water Conservation**
- **Crop Yield Optimization**
- **Cost Reduction**

### 1.2 OBJECTIVES

- To Optimize Water Usage: Utilize accurate weather forecasts to adjust irrigation schedules, conserving water by avoiding unnecessary irrigation.
- To Maximize Crop Yield: Ensure crops receive optimal moisture levels based on upcoming weather conditions, enhancing overall yield and quality.
- To Integrate weather data for precise irrigation management, enhancing efficiency through informed decision-making.

### I.3 CONTRIBUTION

Conduct research on innovative sensor technologies for measuring soil moisture accurately and efficiently. Explore advanced weather forecasting algorithms and techniques to improve the accuracy of weather predictions Investigate optimization methods for decision-making algorithms to enhance irrigation scheduling.

## II. LITERATURE SURVEY

### **M. Benedict Tephila; R. Aarthi Sri; R. Abinaya; J. Aiswarya Lakshmi; V. Divya Automated Smart Irrigation System using IoT with Sensor Parameter**

In the field of agriculture, precision agriculture is one of the most crucial aspects of countries with enormous populations, fertile land and water resources. Incorporation of smart irrigation will go a long way in enabling the countries to effectively and efficiently use the available water, further using the extra water for the barren lands. In this paper, an IOT-based smart irrigation system is used for building a smart Management device that efficiently uses the available water. The purpose of this Management device is to automatically manage time, avoid under-irrigation and over-irrigation issues, streamline water consumption, distribution and manage the water reserves. This device also employs the open-source clouds, fusion centers, sinks and field-deployed sensors for smart irrigation purposes

### **S. Gnanavel; M. Sreekrishna; N DuraiMurugan; M Jaeyalakshmi; S Loksharan The Smart IoT based Automated Irrigation System using Arduino UNO and Soil Moisture Sensor**

Agriculture is the important job in India. It needs water for irrigation. The main job of the farmer is to irrigate the field. In this research, the irrigation system is automated using the Internet of Things technology. Therefore, it reduces the need for human intervention. This study will find the best crops suitable for the particular soil. When water is needed, the field is irrigated with sufficient water. When the water level in the field reaches a certain height or the water level in the well reaches the minimum level, the system sensor detects it and automatically shuts off the pump motor. From this, a physical exertion is reduced and the field is watered effectively. Moreover the working life of the pump motor is extended.

### **Emmanuel Adetiba; Ayodele Hephzibah Ifijeh; Victoria Oguntosin; Toluwani Odunuga Development of an IoT Based Data Acquisition and Automatic Irrigation System for Precision Agriculture**

Agriculture has benefited greatly from improvements in Internet of Things based technology. Farm data can be sent to farmers in real-time through the advent of Internet of Things based technology which integrates data collection, transmission, storage and other essential components that provide for great user experience. This work involves the development of a system that enable the transmission of sensor field data to the Internet, via a micro controller, a transceiver and a Wi-Fi module. In this work, an Internet of Things based data acquisition and automatic irrigation system for precision agriculture was designed and implemented using arduino uno, Soil Moisture and Temperature sensors, Proteus design suite, and the Arduino integrated development environment software.

**N. Divya; E. Aswin Das; R. Hari Prasath IoT Based Smart Irrigation System**

Agriculture production is a significant role in Indian Economy. Traditional methods of farming needs vital human process of monitoring and measuring of parameters like soil moisture level, pH value, temperature and water level. Modern Technology has improved a lot for smart way of irrigation system. This paper introduces the concept of smart irrigation system with measurement of humidity and temperature using soil moisture sensors and ARDUINO micro controller. Humidity and temperature are measured and analyzed using an Arduino-Uno micro controller with a humidity measuring sensor and a temperature measuring senso.

**rKumud A. Gujar; Santosh Jagtap Intelligent Irrigation System for Agriculture using IoT**

Agriculture plays vital role in development of social and economic condition of the all countries in the world. Water is the source of life and also a precious source for agriculture. Emerging trends in agriculture aims at ensuring more productivity, less damage to the land and helpful for the concept of Sustainable Agriculture (12). Crop productivity is mainly dependent on soil moisture level, less moisture result in loss of yield and plants dying. Excess water causes water wastage and root diseases. To maximize crop production the adequate water quantity at right time is required. In the proposed study IoT and Machine Learning based automated irrigation system developed.

**III. EXISTING SYSTEM**

The soil moisture sensor is used to sense the moisture content in the soil and it will display the moisture level of the soil in LCD. The motor is operated through manual by pressing the button in the mobile or by using push button in the field.

**IV. PROPESED METHOD**

1) BLOCK DRIGRAM

In the Proposed System the user can sufficiently use the technology in the agricultural sector. Here in this system, the Moisture Sensor is used to identify the moisture content in soil and the DHT11 sensor to monitor the Humidity and Temperature levels in the Fields. The Data of these Sensors are directly displayed on the LCD. The user can easily have the Climatic, Moisture Conditions in the Fields.

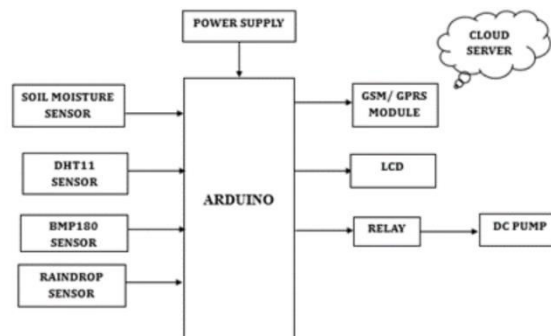


FIG:1 Block diagram of proposed system

2) CRICUIT DIAGRAM

Methodology Our approach to developing the "Smart Irrigation System Using Weather Forecasting" encompasses a holistic integration of hardware components, cutting - edge sensors, and advanced IoT technologies, all orchestrated through an intuitive user - friendly application. The primary objective of this system is to revolutionize crop irrigation practices by leveraging real - time weather data and environmental parameters for precise water management.

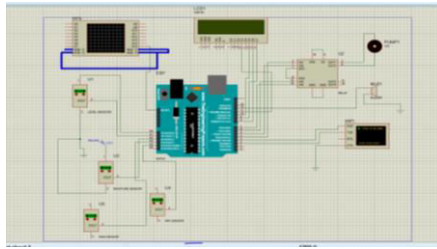


FIG:2 Circuit diagram of proposed system

#### 4.2.1 ARDUINO.

Overview The Arduino Uno is a micro controller board based on the ATmega328 (data sheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the micro controller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features:

- 1.0 pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.

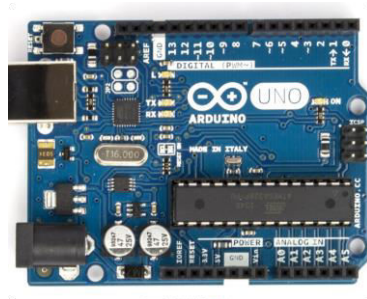


Figure 3:Arduino of system

### ARDUINO

Micro controller ATmega328

Operating Voltage 5V

Input Voltage (recommended) 7-12V

Input Voltage (limits) 6-20V

Digital I/O Pins 14 (of which 6 provide PWM output)

Analog Input Pins 6

DC Current per I/O Pin 40 MA

DC Current for 3.3V Pin 50 MA

Flash Memory 32 KB (ATmega328) of which 0.5 KB used by boot loader

SRAM 2 KB (ATmega328)

EEPROM 1 KB (ATmega328)

**4.2.2 POWER SUPPLY**

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant d.c voltage.

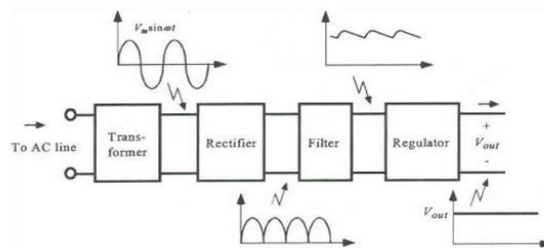


Figure 4: Block Diagram of Power supply

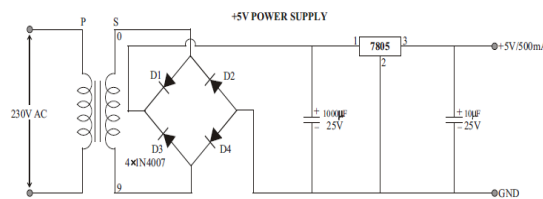


Figure 5: Circuit Diagram of Power supply

**4.2.3LCD/DISPLAY**

Liquid Crystal Display also called as LCD is very helpful in providing user interface as well as for debugging purpose. The most commonly used Character based LCD's are based on Hitachi's HD44780 controller or other which are compatible with HD44580. The most commonly used LCD's found in the market today are 1 Line, 2 Line or 4 Line LCD's which have only 1 controller and support at most of 80 characters, whereas LCD's supporting more than 80 characters make use of 2 HD44780 controllers

**Pin Description:**

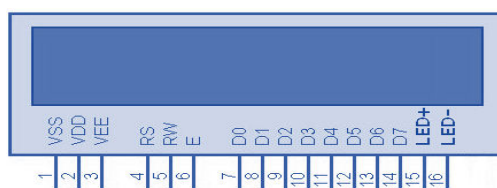


Figure 6: Pin Diagram of LCD

Laptops combine all the input/output components and capabilities of a desktop computer, including the display screen, small speakers, a keyboard, data storage device, optical disc drive, pointing devices (such as a touchpad or track pad), a processor, and memory into a single unit. Most modern laptops feature integrated webcams and built-in microphones, while many also have touchscreens. Laptops can be powered either from an internal battery or by an external power supply from an AC adapter. Hardware specifications, such as the processor speed and memory capacity, significantly vary between different types, makes, models and price points.

#### 4.2.4.MOISTURE SENSOR

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. One common type of soil moisture sensors in commercial use is a Frequency domain sensor such as a capacitance sensor. Another sensor, the neutron moisture gauge, utilize the moderator properties of water for neutrons. Cheaper sensors -often for home use- are based on two electrodes measuring the resistance of the soil. Sometimes this simply consists of two bare (galvanized) wires, but there are also probes with wires embedded in gypsum



Figure 7: Moisture sensor

#### 4.2.5.RAIN SENSOR

Nowadays, conserving water as well as its proper usage is essential in everyone's life. Here is a sensor namely rain sensor which is used to detect the rain and generate an alarm. So, we can conserve water to use it later for different purposes. There are several methods available for conserving water like harvesting, etc Using this method we can increase the level of underground water. These sensors are mainly used in the field like automation, irrigation, automobiles, communication, etc. This article discusses a simple as well as reliable sensor module which can be available at low cost in the market.

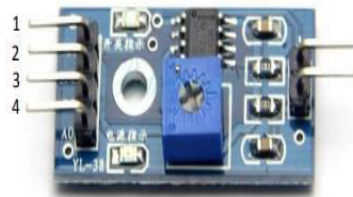


Figure 8: Rain sensor

This module is similar to the LM393 IC because it includes the electronic module as well as a PCB. Here PCB is used to collect the raindrops. When the rain falls on the board, then it creates a parallel resistance path to calculate through the operational amplifier.

This sensor is a resistive dipole, and based on the moisture only it shows the resistance. For example, it shows more resistance when it is dry and shows less resistance when it is wet.

#### Pin Configuration

The pin configuration of this sensor is shown below. This sensor includes four pins which include the following.

- Pin1 (VCC): It is a 5V DC pin
- Pin2 (GND): it is a GND (ground) pin
- Pin3 (DO): It is a low/ high output pin
- Pin4 (AO): It is an analog output pin

#### 4.2.6.PUMP

The second drawing is the **loading diagram** with the reaction values given without the calculations shown or what most people call a free body **diagram**. The third drawing is the shear force **diagram** and the fourth drawing is the bending moment **diagram**. For the bending moment **diagram** the normal sign convention was used.

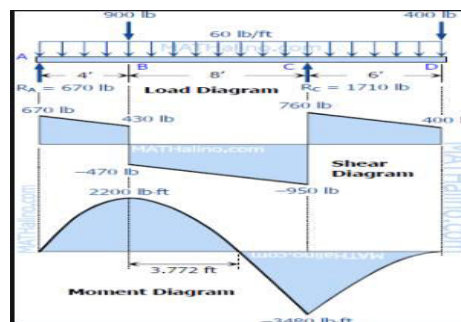


Figure 10: Pump load graph

In general, there are two kinds of *loads*: front-end loads and back-end loads. A front-end load is a fee paid to purchase an investment, and a back-end load is a fee paid to sell an investment (it may also be called a contingent deferred sales charge, an exit fee, or a redemption charge). A no-load fund is one that does not charge any fees of this type.

Let's assume you are interested in making a \$10,000 investment in the Company XYZ mutual fund. If the fund has a 4% front-end load, then of the \$10,000 investment, \$400 ( $\$10,000 \times .04$ ) is paid to the fund company and \$9,600 is actually invested in the fund as a result. Ideally, the earnings from the investment should more than make up for the front-end load. In this example, the front-end loaded fund must return 14.6% in one year to reach \$11,000 in value after the fee.

If the fund instead has a 4% back-end load, then you must pay a \$400 fee upon the sale of the investment ( $\$10,000 \times .04$ ). Again, the earnings from the investment should ideally more than make up for the back-end load. In this example, the back-end loaded fund must therefore return 14% in one year to reach \$11,000 in value after the fee.

#### 4.2.7WIFI

A wireless network uses radio waves, just like cell phones, televisions and radios do. In fact, communication across a wireless network is a lot like two-way radio communication.

#### 4.2.8. LEVEL SENSOR

##### Level Sensor Classification

Level Sensors can be broken into two classifications;

- Point level measurement
- Continuous level measurement



Point level measurement indicates when a product is present at a certain point and continuous level measuring indicates the continuous level of a product as it rises and falls.

The sensors for point level indication are:

- Capacitance
- Optical
- Conductivity
- Vibrating (Tuning fork)
- Float Switch



Figure 11: Level sensor

#### 4.2.9.NPK sensor

NPK sensors employ various techniques to measure nutrient levels in the soil. Common methods include electro chemical sensing, optical spectroscopy, and ion-selective electrodes. These sensors detect specific ions or molecules associated with nitrogen, phosphorus, and potassium and provide quantitative measurements of their concentrations in the soil.



Figure 12: NPK sensor

## V. RESULTS AND DISCUSSIONS

This project is for developing the “Irrigation System Based on Weather Forecasting Soil Moisture & Nutrition Monitoring System Using IOT “ encompasses a holistic integration of hardware components , cutting-edge sensors, and advanced IOT technologies , all orchestrated through an intuitive user - friendly application . The primary objective of this system is to revolutionize crop irrigation practices by leveraging real-time weather data and environmental parameters for precise water management.

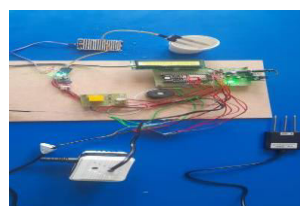


Figure 13: Final output of Proposed system

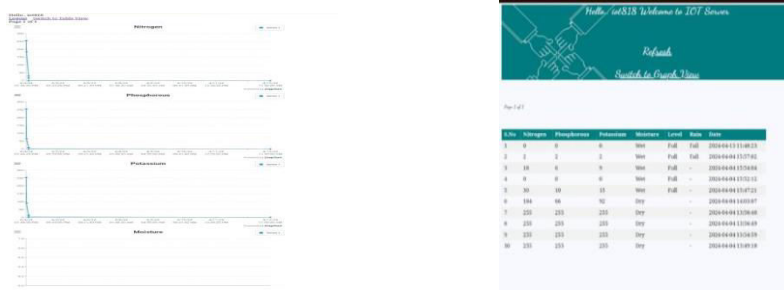


Figure 14 : Final output of system in form Graph and Table column

**VI. CONCLUSIONS**

This project model considers an alternate source of electric power, automatic control, reliability and low cost. As the system is automatic, it will help the operator to properly irrigate their fields. Also, in this model the water level indicator is used to avoid the dry running of the motor which is helpful for the safety of the motor and saving water. The proposed methodology can be a suitable alternative to overcome the necessity of electricity and the irrigation system for our farmers.

**VII. AUTHOR’S CONTRIBUTION**

- Conceptualization:**Dr.S.Srinivasan,N.Nishanth
- Methodology:**N.VenuBabu ,Dr.S.Srinivasan
- Investigation:** Pravalika,,N Venu Babu
- Discussionofresults:**Dr.S.Srinivasan,N.Nishanth ,Pravalika,,N Venu Babu
- Writing – Original Draft:**N.Venu Babu
- Writing – Review and Editing::**Dr.S.Srinivasan,N.Venu
- Resources:**,N.Nishanth ,Pravalika
- Supervision:** :Dr.S.Srinivasan, Pravalika
- Approval of the final text:** Dr.S.Srinivasan.

**VIII. ACKNOWLEDGMENTS**

If necessary, quote entities that supported the development of the research.

**REFERENCES**

- 1].S Srinivasan, S Muthubalaji, G Devadasu, R Anand, "Bat Algorithm based Selective Harmonic Elimination PW for an 11 level Inverter", Int. Journal of Recent Technology in Engg, 2019, Vol.8, pp.1164-1169.
- [2]. Rajalakshmi.P, Mrs.S.Devi Mahalakshmi "IOT Based Crop-Field Monitoring And Irrigation Automation” 10th International conference on Intelligent systems and control (ISCO), 7-8 Jan 2016 published in IEEE Xplore Nov 2016.
- [3]. Prof. K. A. Patil And Prof N. R. Kale proposes “A Model For Smart Agriculture Using IOT” 2016 International Conference on Global Trends in signal Processing, Information Computing And Communication.
- [4]. Dr.N.Suma, Sandra Rhea Samson, S. Saranya, G. Shanmugapriya, R. Subhashri „IOT Based Smart Agriculture Monitoring System” 2017 International Journal on Recent and Innovation Trends in Computing and Communication.
- [5]. Mahammad shareef Mekala, Dr.P.Viswanathan „A Survey: Smart agriculture IoT with cloud Computing “ 978-1-5386-1716-8/17/\$31.00 ©2017 IEEE
- [6]. Prathibha S R1, Anupama Hongal 2, Jyothi M P3” IOT BASED MONITORING SYSTEM IN SMART AGRICULTURE” 2017 International Conference on Recent Advances in Electronics and Communication Technology



- [7]. Ibrahim Mat, Mohamed Rawidean Mohd Kassim, Ahmad Nizar Harun, Ismail Mat Yusoff "IOT in Precision Agriculture Applications Using Wireless Moisture Sensor Network" 2016 IEEE Conference on Open Systems (ICOS), October 10-12- 2016, Langkaw, Malaysia.
- [8]. Zhaochan Li, Jinlong Wang, Russell Higgs, Li Zhou Wenbin Yuan "Design of an Intelligent Management System for Agricultural Green houses based on the Internet of Things" IEEE International Conference on Embedded and Ubiquitous Computing (EUC) 2017.
- [9] G Devadasu, M Sushama, "A novel multiple fault identification with fast fourier transform analysis", International Conference on Emerging Trends in Engineering, IEEE Technology and Science (ICETETS), IEEE, pp.1-5,
- [10] R Kannan, C Kalaivani, G Devadasu, "Energy Management in Plug in Hybrid Electric Vehicles with Hybrid Energy Storage System Using Hybrid Approach", Energy Technology, 2022/08/11, Issue.10, Vol



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