# Precision Farming Solutions: Enhancing Crop Care with Smart Agriculture Monitoring

R.harishragul[1],M.Rajesh [2], S.Ashok kumar[3], T.Harikrishnan[4],T.Inbarasan[5]
[1,3,4,5] *Students,* [2] *Assistant Professor, Department of Electronics and Communication Engineering, AVS Engineering College, Salem, TamilNadu.*

**ABSTRACT-Mature Indians derive their income from agriculture, which also has a significant impact on the nation's economy. The aim of our design is to optimize the use of water for agrarian crops by reducing the amount of hand labor required from the planter through the use of an automated irrigation system. The design and implementation of a wireless sensor network that measures air temperature and moisture in a crop field as well as from remote locations are presented in this study. The main challenges faced by farmers are external crop raiding and ineffective crop management, particularly the conflict between humans and wildlife. A comprehensive strategy that combines the use of the "Internet of Things" with conventional farming practices and strategies to prevent crop damage has been thoroughly described by approach to interconnected systems. Therefore, the goal of this proposed module is to make agriculture smarter by introducing a device that uses ultrasonic sensing to detect the presence of any living thing, particularly animals, in the area that is to be farmed. It also includes real-time data analysis, smart irrigation control, and smart warehouse management features like moisture measurement. One option for visualizing this data is to use the webpage. The suggested solution includes a laser security system and animal detection to reduce the disturbance that animals produce. An attempt has been made to assist the farmer in resolving several problems at once.**

***Keywords: Internet of things (IOT), Arduino, Soil moisture sensor, Ultrasonic sensor, motor, Color sensor***

## 1.INTRODUCTION

The Indian economy is among the world's major developing economies. The Indian economy's major contributor is the agricultural sector. The upgrading of colorful engineering methods currently in use is necessary to get maximum manpower utilization and maximum profit in a particular query. Thus, one of the requirements to harvest a productive crop that can be a source of diverse forms of nutrients, whether micro or macro, for their appropriate growth is to keep a proper quantum of water position in the soil. Growers in India are particularly affected by shortages that arise from crop failures based on variable failure reasons. Rain is essential.participation in determining these crops' futures as well as the growers' every time. During the past 15 years, excessive use of groundwater has significantly decreased its position.Therefore, it is imperative that we use every last drop of water responsibly so that future generations can benefit from it as well. Additionally, we ought to create some fresh looks that make utilization of renewable energy sources. The creation of these new methods will help us achieve sustainable development goals and reduce the amount of hothouse feasts that are being exported. As suggested by the name of our design, the AUTOMATIC IRRIGATION SYSTEM powered by solar energy is a step toward using some novel approaches in engineering. This style will undoubtedly be a fantastic choice for small and medium-sized farmers that consistently suffer due to crop loss. In the near future, the use of this technology will be widespread.

## 2.LITERATURE SURVEY

2.1 V.Swathi, A. Krishnamurthy- This study describes the planning and implementation of a wireless sensor network that can monitor the agricultural field's air temperature, moisture content, and light intensity from a distance. The system is made up of bumps that have radio frequency modules and small size operation-specific sensor installed in them. The detector data is sent to the centrally located computer outstation for data logging and processing via a radio frequency link. By uploading the data to the internet, this data can be examined from remote locations. Additionally, detector bumps can be programmed from the computer outstation to meet the evolving needs of growers, eliminating the need to redeploy the wireless detector network whenever adjustments are needed. Given the energy is the primary operational constraint, and the core element's sleep mode is used

2.2 B.Prabhushankar, R.Jayavadivel - The majority of Indians make their living from agriculture, which also has a significant impact on the national economy. Irrigation becomes challenging in arid areas or when there is not enough rainfall. Therefore, remote management and automation are necessary for optimal output and farmer safety. In this paper, we propose an embedded-based wireless sensor network technology to regulate the water flow level in a sectored irrigation system that uses either the sprinkler or drip method. In terms of labor costs, power consumption, and hardware costs, this system will be very cost-effective. There must always be a need to keep an eye on the water level in areas like agricultural land.domain. In locations where coconuts, bananas, and certain vegetable plants are grown with drip irrigation, water is delivered straight to each field via pipes. It is necessary to periodically check the water level with great attention. His work becomes more challenging at night and during frequent blackouts. Sometimes the formers have a difficult job, and other times there is carelessness resulting in the waste of electricity and water. This doesn't require any changes to the agricultural

land, but it is quite useful in locations like drip irrigation systems where there are many of flow pipes. The fields are automatically irrigated without the need for human labor when the motor is turned on and the sensors are triggered. When the water level hits a specific level, which This system takes the necessary actions to control or even stop the water flow, however it can take several hours.

2.3R.suresh,S.Gopinath,K.Govindaraju- Modern agriculture companies built on greenhouses are now necessary for all aspects of Indian agriculture. Plant temperature and humidity are properly managed with this method. It can be exceedingly challenging to manually maintain consistency throughout the entire farmhouse because to the occasionally changeable air conditions that differ from place to place in huge farmhouses. The suggested system was put into practice. The information regarding irrigation is reported using GSM. The Android mobile is used to transmit the GSM report. The outcome is simulated using the Keil software.

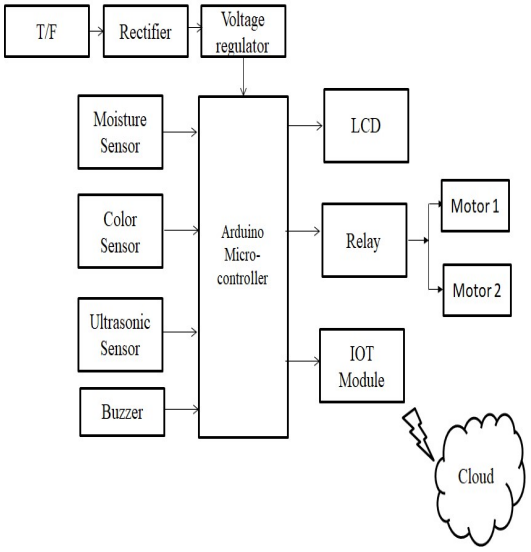
## 3.EXISTING SYSTEM

In our nation, the majority of crop conservation methods are operated manually. In order to conserve fields and irrigate crops, farmers remain in the rural areas for extended periods of time. We don't know the precise values for crop stuffiness, PH, growth position, or soil humidity position. There are currently disputes amongst water druggies and a growing worldwide water crisis, making it difficult to manage water supply. Currently, there is a limit on food production and a decline in the ecology due to mortality rates and water resource contamination. The CWSI, or crop water stress indicator, was almost thirty times older.Measures of the ambient air temperature, infrared cover temperature, and crop water stress indicator were also incorporated.values of the atmospheric vapor pressure to decide when to use drip irrigation for washing. The management of these glasshouse-grown grapevines will require data access points in each hothouse as well as the control room, which houses the control units. The product area is divided by these. Currently, field machine—a wired communication method—is used to transport data. The control room and glasshouse exchange this data. The CAN and ZigBee protocols are used to present all of the issues associated with that.

## 4.PROPOSED SYSTEM

Farmers would be able to maintain crop development by knowing when and how much water and nutrients to apply through an automated crop monitoring system. With a color sensor, a farmer can monitor crop development anywhere. In agricultural land, these variables are measured by the use of sensors. It also helps the farmer keep the crop healthy. Ultrasonic sensors, particularly those located near the area to be farmed, intelligent irrigation control, and real-time data processing that includes intelligent warehouse management features like moisture measurement.With the modifications, the system uses wireless sensor networks to aggregate data from disparate sensors placed at different nodes and transmit it over wireless protocol. The extras include moisture YL-69 sensor, as well as DC motor. When the Internet of Things-based agriculture monitoring system is turned on, it measures the water level, humidity, and moisture content in addition to looking for signs of life nearby. It notifies the user of the levels via phone alert. When the water level drops, sensors detect it and activate the water pump. The fan turns on when the temperature rises above the threshold. The LCD (16x2) display module shows all of this. In order to help the operator with data visualization, the data may also be stored on the webpage via IOT, open platform cloud-based services.

### 4.1 BLOCK DIAGRAM




## 5. SYSTEM REQUIREMENTS

## HARDWARE DESCRIPTION

### 5.1 NODE MCU

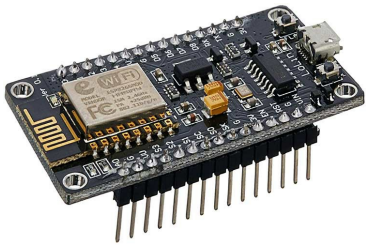


Fig 5.1 Node MCU

NodeMCU is an open-source Lua based firmware and improvement board uniquely focused on for IoT based Applications. It remembers firmware that runs for the ESP8266 Wi-Fi SoC from Espressif Systems, and equipment which depends on the ESP-12 module.

5.2 LCD Display


Fig 5.2 LCD

LCD displays characters, numbers, and designs. The microcontroller's (P0.0–P0.7) I/O port is interfaced with the showcase. Multiplexed mode is used for the presentation. The next showcase flashes on in 1/tenth of a second. Because of Vision's diligence, the show will result in a continuous display of tally.

5.3 MOTOR

Any rotary electrical motor that transforms electrical energy from direct current into mechanical energy is referred to as a DC motor. The most often used kinds depend on the forces generated by magnetic fields. Almost all varieties of DC motors contain an internal mechanism—electromechanical or electronic—that allows the motor's portion of the current to be periodically reversed.

5.5 Ultrasonic Sensor


Fig 5.5 Ultrasonic Sensor

Ultrasonic sensors, also called transceivers when they can send and receive, operate on a similar principle to sonar or radar, which measure a target's characteristics by deciphering the echoes of sound or radio waves, respectively. High frequency sound waves are produced by ultrasonic sensors, which then analyze the echo they get back. In order to compute the distance to an object, sensors measure the time elapsed between transmitting a signal and getting an echo.

5.5 Power Supply

The 12V advanced step-down transformer is powered by an AC source. The 12V AC transformer is rectified by means of a diode connection. A capacitor separates the 12V DC diode bridge yield.

5.6 ARDUINO UNO R3 MICROCONTROLLER

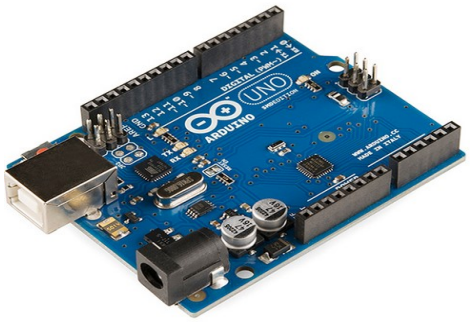



Fig 5.6 Arduino Board

A microcontroller board based on the ATmega328 IC is called the Arduino Uno R3. There were 6 analog inputs, a 16 MHz crystal oscillator, a USB port, 14 digital input/output pins (six of which may be utilized as PWM outputs), a power button for resetting, an ICSP header, and a jack. Everything required to support the microcontroller is included; all that's left to do is power it with a battery or an AC-to-DC adapter or connect it to a computer via a USB cable.

5.7 Soil Moisture Sensor

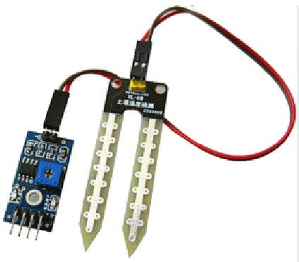


Fig .5.7 Soil Moisture sensor

Volumetric water content sensors are commonly referred to as soil moisture sensors. Tensiometers and gypsum blocks are examples of a different type of sensors that measure a different aspect of moisture in soils termed water potential. These sensors are typically referred to as soil water potential sensors. For agricultural applications, soil moisture measurement is crucial for better irrigation system management by farmers.

5.8 Buzzer

Fig 5.8 Buzzer

A buzzer or beeper is a sound flagging gadget, which might be mechanical,elecro mechanical or piezoelectric .Typical employments of ringers and beepers incorporate caution gadgets, clocks, and affirmation of client information

## 7.CONCLUSION

In agricultural factors, the IOT grounded crop field covering system is a dependable and efficient solution. One can take the necessary remedial action. In addition to lowering the mortal power, wireless field monitoring enables the user to see precise changes in the field. It is less expensive and uses less energy. In the agricultural sector, it is possible to raise GDP per capita. Since the dawn of human civilization, agriculture has been the foundation of human society. In order to support crop growth, man created a variety of crop monitoring techniques as the generation progressed. Water conservation has a major role in the current script. The current effort aims to preserve the natural resources accessible to humans. By consistently updating the status of the soil, we can regulate the water inflow and therefore lessen the damage. The goal of this evaluation is to provide strong support for intensive water management on agricultural land. The system's microcontroller, which operates at a lower power consumption, promises to extend the life of the system.

## REFERENCES


[1] Mile Mrinal and Lakade Priyanka, Mashayak Saniya, Katkar Poonam and A.B. Gavali," *Smart Home – Automation and Security System Based on Sensing Mechanism*" ISBN- .978-1- 5090-3239-6/17/$31.00©2017IEEE.

[2] Mallesham Yerragolla, Kamalakar pallela, Indira Priyadarshini Gera, "*Intelligent Security System for Residential and Industrial Automation*", 2016 IEEE Uttar Pradesh Section International Conference on Electrical, Computer and Electronics Engineering (UPCON) Indian Institute of Technology (Banaras Hindu University) Varanasi, India, Dec 9-11, 2016.

[3] S. Rajadurai, P. P. Nehru, R. Selvarasu," *Android Mobile Based Home Security and Device Control Using GSM"*, IEEE Sponsored 2nd International Conference on Innovations in Information, Embedded and Communication systems (ICIIECS)2015.

[4] C. Largo, Marie Antonette T. Latayan, Michael Gabat, "*DEVELOPMENT OF WI-FI- BASED SWITCH CONTROL SYSTEM FOR HOME APPLIANCES USING ANDROID PHONE*" 8th IEEE International Conference Humanoid, Nanotechnology, Information Technology Communication and Control, Environment and Management (HNICEM) The Institute of Electrical and Electronics Engineers Inc. (IEEE) – Philippine Section 9-12 December 2015 Water Front Hotel, Cebu, Philippines.

[5] D. Javale, M. Mohsin, S. Nandanwar, and M. Shingate. "Home automation and security system using android adk." International journal of electronics communication and computer technology (IJECCT)3, no. 2 (2013): 382-385.

[6] S. I. Azid, and S. Kumar. "Analysis and performance of a low-cost SMS based home security system. “International Journal of Smart Home5, no. 3 (2011): 15-24.

[7] D.M. Han, and J.H. Lim. "Design and implementation of smart home energy management systems based on ZigBee." IEEE Transactions on Consumer Electronics56, no. 3 (2010): 1417- 1425.

[8] T.L. Chein, K.L. Su, and J.H. Guo. "Intelligent home-automation security system."Int J Autom Technol3, no. 2 (2009): 123-129

[9] C. Suh, and Y.B. Ko. "Design and implementation of intelligent home control systems based on active sensor networks." IEEE Transactions on Consumer Electronics54, no. 3 (2008): 1177- 1184.

[10] J. Hou, C. Wu, Z. Yuan, J. Tan, Q. Wang, and Y. Zhou. "Research of intelligent home security surveillance system based on ZigBee." In Intelligent Information Technology Application Workshops, 2008. IITAW'08. International Symposium on, pp. 554-557. IEEE, 2008.

[11] Y. Zhao, and Z. Ye. "A low-cost GSM/GPRS based wireless home security system."IEEE Transactions on Consumer Electronics54.2 (2008): 567-572.

[12] P. Harmo, T. Taipalus, J. Knuuttila, J. Vallet, and A. Halme. "Needs and solutions-home automation and service robots for the elderly and disabled." In2005 IEEE/RSJ international conference on intelligent robots and systems, pp. 3201-3206. IEEE, 2005.

[13] I. Korhonen, J. Parkka, and M. Van Gils. "Health monitoring in the home of the future."IEEE Engineering in medicine and biology magazine22, no. 3 (2003): 66-73.

[14] C.Nagarajan and M.Madheswaran - ‘Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques’- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.

[15] C.Nagarajan and M.Madheswaran - ‘Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis’- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.

[16] Nagarajan C., Neelakrishnan G., Akila P., Fathima U., Sneha S. “Performance Analysis and Implementation of 89C51 Controller Based Solar Tracking System with Boost Converter” Journal of VLSI Design Tools & Technology. 2022; 12(2): 34–41p.

[17] C. Nagarajan, G.Neelakrishnan, R. Janani, S.Maithili, G. Ramya “Investigation on Fault Analysis for Power Transformers Using Adaptive Differential Relay” Asian Journal of Electrical Science, Vol.11 No.1, pp: 1-8, 2022.

[18] G.Neelakrishnan, K.Anandhakumar, A.Prathap, S.Prakash “Performance Estimation of cascaded h-bridge MLI for HEV using SVPWM” Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp:750-756

[19] G.Neelakrishnan, S.N.Pruthika, P.T.Shalini, S.Soniya, “Perfromance Investigation of T-Source Inverter fed with Solar Cell” Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp:744-749

[20] C.Nagarajan and M.Madheswaran, “Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation” has been presented in ICTES’08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007

[21] M Suganthi, N Ramesh, “Treatment of water using natural zeolite as membrane filter”, Journal of Environmental Protection and Ecology, Volume 23, Issue 2, pp: 520-530,2022

[22] M Suganthi, N Ramesh, CT Sivakumar, K Vidhya, “Physiochemical Analysis of Ground Water used for Domestic needs in the Area of Perundurai in Erode District”, International Research Journal of Multidisciplinary Technovation, pp: 630-635, 2019