



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 5, May 2024

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

[ijrset@gmail.com](mailto:ijrset@gmail.com)

[www.ijrset.com](http://www.ijrset.com)

# Fertilizer Spraying System Using Microcontroller

Anjali Yuvraj Jadhav, Rutika Suresh Bhoi, Rutuja Nandkumar Gaikwad, Sakshi Ashok Phadtare,  
Shalaka Subhash Dharmadhikari, Prof. A.A.Ranaware.

Department of Electronics and Telecommunication Engineering, PES's College of Engineering, Phaltan, India

**ABSTRACT** : Large-scale adjustments are required to modernize raspberry pi production since, in contrast to traditional modes of practice, today's watering systems are not designed to maximize plant productivity. It is suggested that web servers, fertilizer sprayers, and wireless sensors work together to provide smart agriculture. The field activity is controlled by the Raspberry Pi, which connects the sensors to the web server. The sensors detect every action taking place in the field and upload the data to the web server. The farmer will come to know about the field scenario through messages and can smartly do watering and spraying fertilizer to the field in very efficient manner without overdoing it and quality of the crops is saved.

## I. INTRODUCTION

Water is an essential element in the world. More than 70% of the world is covered with water. Out of those water only little more than 3% is pure water. So saving of water is important. The irrigation process of agriculture uses sometimes more water than needed. The accurate use of water in irrigated agriculture is very difficult process. More than 50% of the water is wasted. In previous years, with the help of sensors water pumping process in agriculture become more accurate with less wastage of water. With GSM technology and also with fuzzy logic field owner will come to know about their field condition. Henceforth, owner can monitor their field and control it automatically. But with GSM and fuzzy logic transmission of field condition to owner is not very fast. The owner will only know the information very late. The information from sensor will be transmitted from one block to others previous projects contains 3 to 4 blocks so if any block get damaged then the transmission will be stopped and identification of damaged block is difficult. In the proposed system of smart agriculture uses LAN technology by means of which sensors, controllers and computers are combined to connect people and things. So that it leads to higher production rate and to use the resources correctly. So this system is dedicated for the less wastage of water and automatic spraying of fertilizers and also transmits information to field owner easily.

## II. RELATED WORK

**F.Viani...**[1]The proposal of the paper is to design efficient and low cost decision support system which is to be used in agricultural process. So that the water usage can be reduced and improvising water source can be achieved. The fuzzy logic was taken for human work and crop condition. Thus, it paves the way for the smart irrigation system. MATERIALS AND METHODS.

**Mengzhen Kang...**[2] The proposal of this paper is to present 3 steps toward the parallel management of plant. This approach can update the expert system by adding learning ability and adaption of knowledge database according to descriptive and predictive model computational experiments can be conducted on different of QTLs on final yield. Such kind of theoretical study has which can give promising prescription that may guide real breeding

**Wanjong Song...**[3]proposes that by using temperature sensor with Time-Domain Delta-Sigma converter a higher resolution rate can be achieved. To obtain the accuracy a reference clock is used as an external source in place of temperature independent inverter cells. The result obtained from the delta-sigma modulator is immediately converted into digital result. Such that the high resolution difficulties can be overcome in the mobile applications.

**Alex Martinez-Agiree...**[4]roughness of the soil affects the microwave scattering. So this paper was proposed to find the roughness scale used for the soil in agriculture in back scattering process. Eight various types of roughness were processed and checked. As a result medium- frequency roughness components were observed as a needed one for the soil

**Francisco Yandun...**[5]to overcome the food demand in near future the agricultural production needs to be doubled. These goals are interrupted due to climate, cost, land degradation, no availability of land for farming etc. This paper

presents the estimation of phenotyping variables with respective measurements like plant structure identification, plant/fruit detection and plant physiology measurement.

**D.Herrera.,[6]**an autonomous vehicle was designed for agricultural task. Here emphasis was made in lateral and rotational dynamics. Quadricycle has been modified and adopted to work in independent manner. Simulation proofs and experimentation with real vehicle that allowing guaranteeing the performance of the model.

**Pratap Tokekar.,[7]**this paper focuses the use of robots in agricultural field. It predicts the crop condition by means of the data collected from sensors and ground. The time taken to collect information from ground can be reduced by using sampling TNSPV for measurements. Along with time deduction, energy limitation and nitrogen map of a plot can also be achieved.

**Ahmad Ashraf Abdul Halim.,[8]**Greenhouse is the main stone for the producing high-value vegetables and fruits. To maintain its growth and production it is necessary to monitor the requirement for each phase of plant. The system monitors and manages each phase of the plant cycle. In the past few years temperature, humidity and other requirements of the greenhouse is monitored through auto data collection or through manual source which may lead to same errors.

**Abdul Matin Howlader.,[9]**to overcome the energy demand in future smart grid is the only solution. In this a wind farm is combined with smart house. Fluctuations in wind turbine occur as output power. Surplus power obtained from smart house is transmitted again to power grid so that the extra power obtained can be exchanged for some profit.

**Joaquin Gutierrez.,[10]**In the water limited zones an automated agricultural process was designed to pave way for water usage in the plants. Here sensors and microcontroller based algorithm are being used to control water quantity. This system was tested and 90% result was obtained when compared to traditional agricultural in water conservative areas of the field agricultural system.

**Nicolas Baghdadi.,[11]**The surface roughness of the soil was analyzed in this paper by using the synthetic aperture radar(SAR) over bare agricultural areas. From that IEM model in polar metric version should be checked by using the database obtained. Though there may 2 different variations it can be detected easily.

**Suhinthan Maheshwararajah.,[12]**The disconnected orphaned nodes are identified in this paper. This occurs due to failure of receiving address from the parental node. It may affect the control system of automated irrigation system. In general it cannot be avoided due to the presence of noise. To compensate this issue optimal restoration is adopted to restore the disconnected nodes to the networks and by satisfying constraints in farming areas.

**Juan F.Posada.,[14]**describes an automated irrigation system to monitor the characteristics of various frequency response of the soil under different conditions. This system was proposed to overcome the issue of water scarcity among the increasing population. As a result empirical model for sensors is obtained from the measured data's.

### III. EXISTING SYSTEM

The usage of WSN system in agriculture were used by many researchers. After that sensors have been used to improve the environmental monitoring in agriculture and it supports farmers for the irrigation. The concentration of fresh water level management has been increased in the world. And with the help of WSN system and also with the sensors the irrigation system in agriculture has been improved. The sensors are mostly used for the measurement of soil matrix and volumetric level of the soil. Then updation has been made to sensors and with the combination of WSN system increased to help the irrigation system of agriculture. The Introduction of Wireless Sensor Network (WSN) and Wireless Sensor and Actuation Network (WSAN) technologies has been used along with the sensors to sense the water levels and to know about soil content level. The Usage of updated sensors in environmental monitoring have improved the management of fresh water level usage and because of WSAN based System in agriculture monitoring made this simple and cheapest one. The sensing technology with WSN systems gives changes in the agriculture monitoring.

### IV. PROPOSED SYSTEM DESIGN

The block diagram depicts a complete system that combines solar-powered cycle model, graphical user interface (GUI) for fertilizer spraying, and battery parameter monitoring. With the use of solar electricity, the system is made to automate agricultural chores, increasing sustainability and efficiency. The Node MCU (IoT), which keeps an eye on important battery metrics, is the central component of the Battery Parameter Monitoring section. It is coupled to a voltage sensor that monitors the battery's voltage, a DHT 11 sensor that measures temperature and humidity, and an I2C-LCD display that provides a visual output of these metrics. This configuration guarantees ongoing observation and effective battery health management Raspberry Pi 4 acts as the main controller for the spraying mechanism and oversees the GUI portion of fertilizer spraying. This module has an ultrasonic distance sensor, a gas sensor to detect



gas levels, a camera to take pictures or record videos, and a soil moisture sensor to keep an eye on the state of the soil. A buzzer for notifications and a touchscreen display for user interaction are the Raspberry Pi 4's interfaces. It facilitates accurate fertilizer application based on real-time data by controlling a 4-channel relay attached to a water spray nozzle and a 2-channel relay connected to a water pump. A solar panel on the Solar Operated Cycle Model transforms sunlight into electrical energy that is then stored in a battery. The technology is powered by this stored energy, encouraging environmentally responsible operation. The carriage of the mechanical type of the cycle has tanks for water, fertilizer, and mixing.

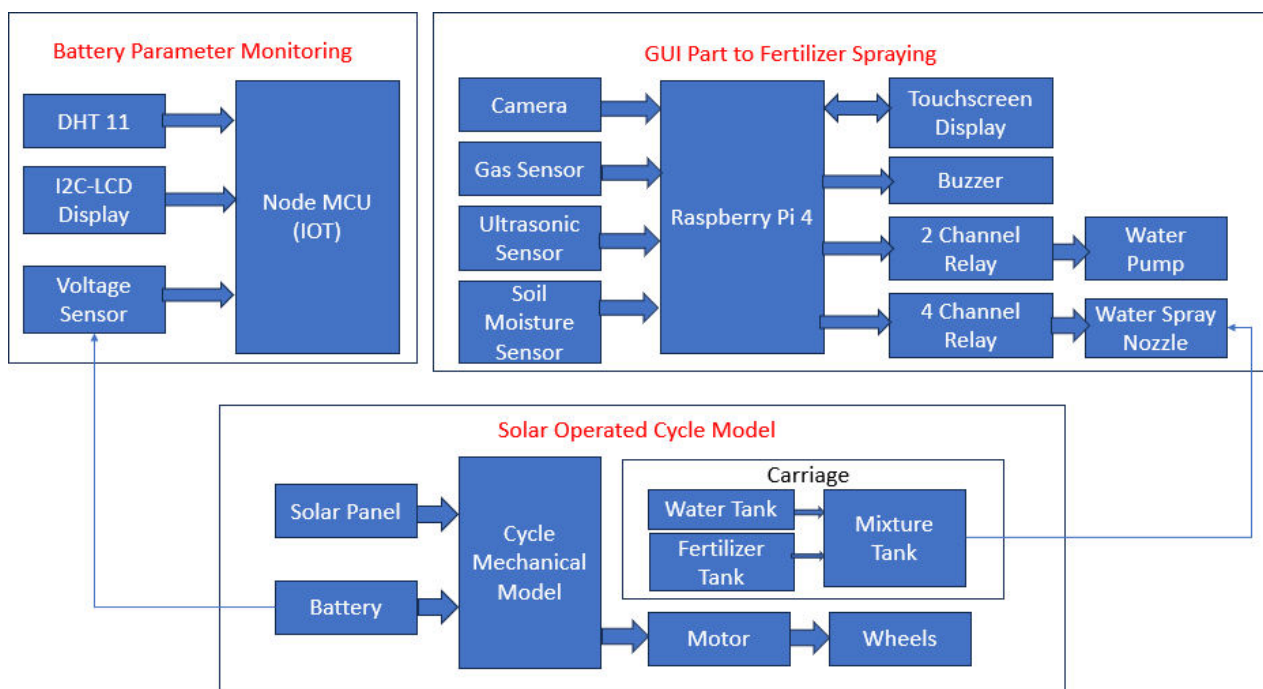


Fig -1: Block Diagram

### V. CONCLUSION

An important step forward in the automation of agricultural processes is the combination of solar-operated cycle model, GUI for fertilizer spraying, and battery parameter monitoring. This creative approach improves the accuracy and efficiency of fertilizer application by utilizing IoT technologies and sustainable energy sources. The system's objective is to enhance crop yields and encourage environmentally sustainable agricultural methods by constantly monitoring environmental conditions and optimizing resource consumption. But there are certain difficulties in putting this proposal into action. Notable drawbacks include the setup expenses and technical know-how needed at first, the necessity for continuous maintenance, and the reliance on internet connectivity and weather. The scalability of the system and the effect of electronic components on the environment also require careful thought. Notwithstanding these difficulties, this project has a lot of promise to improve agricultural sustainability and productivity. By tackling the noted drawbacks with meticulous design, consistent upkeep, and thoughtful assessment of regional circumstances, the system's feasibility and efficiency can be improved. This project has the potential to be a useful tool for the modernization and sustainability of agricultural methods with continued adjustments and enhancements.

### REFERENCES

- [1] F.Viani, M.Bertolli, M.Salucci and A. Polo "Low-Cost Wireless Monitoring and Decision Support for Water Saving in Agriculture," IEEE Sensor Journal, vol,0,Mar. 2017
- [2] Mengzhen Kang, and Fei-Yue Wang , "From Parallel Plants to Smart Plants: Intelligent Control and Management for Plant Growth" IEEE/CAA Journal of Automatica , vol.4, no.2, April 2012.

- [3] Wonjong Song, Student Member, IEEE, Junan Lee, Nayeon Cho, and Jinwook Burm, Member, IEEE “An Ultralow Power Time-Domain Temperature Sensor With Time-Domain Delta–Sigma TDC,” IEEE Transaction on Circuits and Systems—II: Briefs, vol. 64, no.10, October 2017.
- [4] Alex Martinez-Agirre, Jesus Álvarez-Mozos, Hans Livens, and Niko E.C.Verhoest ”Influence of Surface Roughness Measurement “ IEEE transactions on geoscience and remote sensing, vol. 55,no.10, october 2017.
- [5] Francisco Yandun, Giulio Reina, Miguel Torres- Torriti, George Kantor, and Fernando Auat Cheein, “A Survey of Ranging and Imaging Techniques for Precision Agriculture Phenotyping” IEEE/ASME Transactions on Mechatronics, 2017.
- [6] D.Herrera, S.Tosetti and R.Carelli, Senior Member, IEEE “Dynamic Modeling and Identification of an Agriculture Autonomous Vehicle” IEEE Latin America transactions,vol.14,no.6,june2016.
- [7] Pratap Tokekar, Joshua Vander Hook, David Mulla, and Volkan Isler, “Sensor Planning for a Symbiotic UAV and UGV System for Precision Agriculture” IEEE Transactions on Robotics , 2016.
- [8] Ahmad Ashraf Abdul Halim, Najmuddin Mohd Hassan, Ammar Zakaria ,Latifah Munirah Kamaruddin , Asyraf Hakimi Abu Bakar , “Automated Scheduling Based on Plant Growth For Greenhouse Management System “2016 3rd International Conference on Electronic Design (ICED), August 11-12, 2016, Phuket, Thailand
- [9] Abdul Motin Howlader, Student Member, IEEE, Naomitsu Urasaki, Member, IEEE, and Ahmed Yousuf Saber, Senior Member, IEEE” IEEE transactions on industry applications,vol.50,no.5, September/October 2014
- [10] Joaquin Gutierrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Angel Porta- Gandara “Automated Irrigation System Using a Wireless Sensor Network and GPRS Module ” IEEE transactions on instrumentation and measurement, 2013.
- [11] Nicolas Baghdadi, Remi Cresson, Eric Pottier, Fellow, IEEE, Maelle Aubert, Mehrez Zribi, Andres Jacome, and Sihem Benabdallah “A Potential Use for the C-Band Polarimetric SAR Parameters to Characterize the Soil Surface “ IEEE transactions on geosciences and remote sensing,vol.50,no.10,october2012.
- [12] Suhinthan Maheswararajah, Saman K. Halgamuge, Member, IEEE, Kithsiri B. Dassanayake, and David Chapman ,”Management of Orphaned-Nodes in Wireless Sensor Networks for Smart Irrigation Systems” IEEE Transactions on signal processing, vol. 59, no. 10, October 2011.
- [13] Paul A. Hammond\*, Danish Ali, and David R. S. Cumming, Member, IEEE ,” A System-on-Chip Digital pH Meter for Use in a Wireless Diagnostic Capsule” IEEE transactions on biomedical engineering, vol. 52, no. 4, April 2005 .
- [14] Juan F. Posada, Member, IEEE, Juin J. Liou, Member, IEEE, and Richard N. Miller, Member, IEEE, “An Automated Data Acquisition the Characteristics of a Soil Moisture Sensor System for Modeling” IEEE transactions on instrumentation and measurements , vol.40, no. 5, October 1991.



INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  [ijirset@gmail.com](mailto:ijirset@gmail.com)



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details