



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

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

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

# Solar Powered Autonomous Multipurpose Agriculture Robot

Himali Patil<sup>1</sup>, Rachana Wakchaure<sup>2</sup>, Charushila More<sup>3</sup>, Prof. Sumitra Gaikwad<sup>5</sup>

Professor, Department of E&TC, Sinhgad Institute of Technology and Science (SITS), Narhe, Pune, India

Final Year Students, Department of E&TC, Sinhgad Institute of Technology and Science (SITS), Narhe, Pune, India

**ABSTRACT:** Our project, the "Solar Powered Autonomous Multipurpose Agriculture Robot," represents a significant step forward in modern farming. We're using clean, renewable energy from solar panels to keep the robot running, reducing our reliance on traditional power sources and minimizing harm to the environment. To make the robot move precisely and efficiently, we're using high-performance DC motors. These motors allow it to navigate different types of terrain smoothly. For planting seeds accurately, we've incorporated servo motors. We're also using a dedicated DC motor pump for precise pesticide application to protect crops. And for cutting grass effectively, we rely on a high-torque GC motor, making the robot versatile in various agricultural tasks. All of these components are controlled by an Arduino microcontroller, which acts as the robot's central brain. It manages interactions between the different parts, ensuring that tasks are carried out in real-time. To make the robot user friendly, we've developed an intuitive Android app. This app lets operators control and monitor the robot remotely. The connection between the app and the robot is established through Bluetooth, ensuring a reliable link between the mobile application and the agricultural machine. By combining clean energy, advanced motor technology, and a sophisticated microcontroller, our Solar Powered Autonomous Multipurpose Agriculture Robot is set to improve farming efficiency while minimizing harm to the environment. This abstract provides a glimpse of the critical components and functions we'll delve into in the following sections of our project report.

**KEYWORDS:** Solar Power, Autonomous robotics, Agriculture automation, Multipurpose farming robot

## I. INTRODUCTION

In the world, the primary occupation 42% of total population is Agriculture .It plays a significant role in the life of the people. For the betterment of the life and growth of world economy, mechanization of agriculture process especially agricultural autonomous vehicle is important in order to improve the overall productivity. In recent years, the development of autonomous vehicles in agriculture has experienced increased interest .This development has led many researchers to start developing more rational and adaptable vehicles. In the field of agricultural autonomous vehicles, a concept is being developed to investigate if multiple small autonomous machines would be more efficient than traditional large tractors and human force. These vehicles should be capable of working throughout out the day and year round, in most all weather conditions and have the intelligence embedded within them to behave sensibly in a semi- natural structured or unstructured environment over long periods of time(1). Applying robotics in plant production requires the integration of robot capabilities, plant culture, and the work environment. Commercial plant production requires certain cultural practices to be performed on the plants under certain environmental conditions. Agriculture's history dates back thousands of years, and its development was driven and defined by very different climates, cultures and technologies. So the agriculture system should be advanced to reduce the efforts of the farmers. The model developed automatically sows the seeds, spray the pesticides and also cut the grass. The prototype represents the advanced system for improving the agricultural processes such as seed sowing, grass cutting and pesticide spraying based on robotic assistance. The organization of the paper is as follows. Section II presents previously published related works.

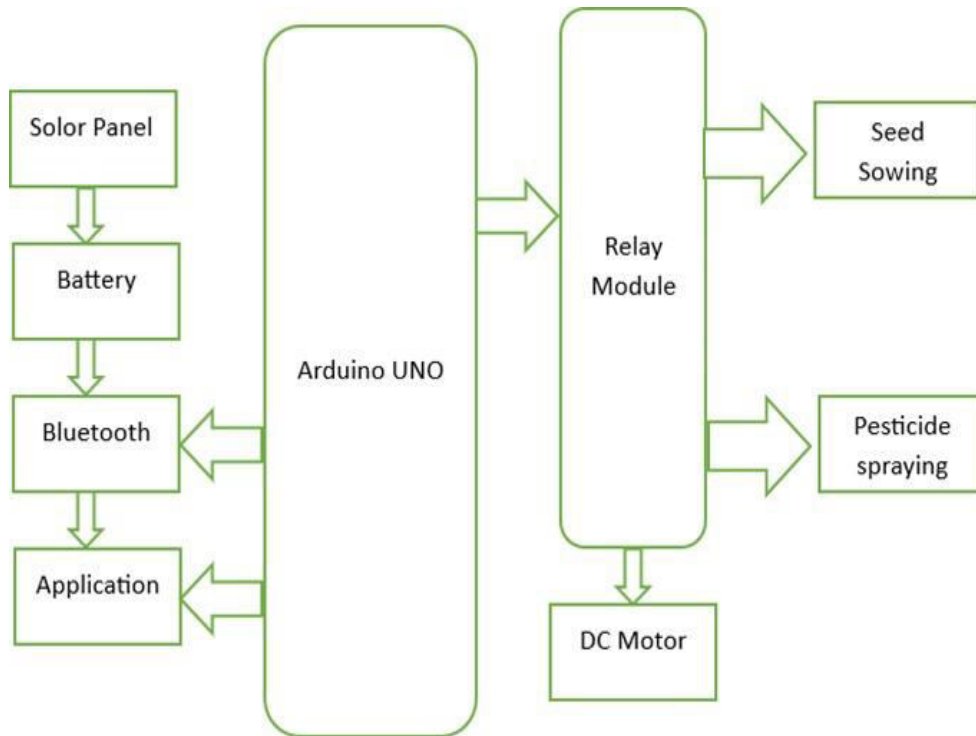


Fig 1. Block Diagram

## II. RELATED WORK

Iot based Smart Multipurpose agricultural robot. Was Proposed by Prof.S.B.Dhoble , Mrunmayee gahukar, Ankita rahate Roshni borkar, Dipali bansod this robotic system is named as agricultural robot, nothing but the machine which assembles with electronics equipment or components and performs specific operation as directed by instructor. This technology provides optimum and efficient solution for wide range of production in agriculture field. The robot is capable of performing operation like automatic ploughing, seed sowing and chemical spraying[2]. IOT based mechanized robot: an integrated process involving fulltime multipurpose control, automation and surveillance system proposed by abdullah all mamun anik, istiak habib , shuvodip adhikary, dr. Abdul gafur — the internet of things (IOT) is the next generation of wireless technology that automates routine tasks and reduces labor[3]. Software, sensors, and actuators are combined into a network of linked devices in the internet of things. The gadgets may exchange data and communicate over a network. Our laboratories have used this technology to make appliances more convenient and automated. One of the key reasons for this increase is its capacity to both secure and facilitate research. The IOT innovation can provide fantastic content for modern automation[4]. This study proposes an internet-based smart laboratory and laboratory machine automation, cloud storage data gathering, and monitoring system to efficiently operate types of machinery, online live data streaming, and monitor mechanical work devices[5]. The iot microcontroller devices are connected to the robot to gather different sensors data, control and monitor the types of machinery and lab appliances in a smart lab environment. Any android phone, laptop, or computer may operate the robot wirelessly[6]. All sensors data and parameters can be collected from google's cloud storage platform blynk and used to operate all appliances and devices. It will supply us with live streaming video of the laboratories with a specific ip address, and we can monitor the laboratory using this robot[7]. A multipurpose agricultural robot for automatic ploughing , seeding and plant health monitoring chandanar, nisha m, pavithra b this approach is on the designing of agricultural robot for various tasks. Certainly robots are playing an important role in the field of agriculture for farming process autonomously. In agriculture, the opportunity for robot is enhancing the productivity and the robots are appearing in the field in large number[8]. The proposed system focuses on implementing all the farming process especially in the field of ploughing and seeding by using microcontroller, hc-05 and hc06 bluetooth models, various sensors etc., the robot detects the planning area by using sensors and seeds need to be planted in the corresponding field using gripper arrangement of the robot[9]. In a continuation, the rest of remaining process could be done automatically. In recent years the development of the autonomous vehicles in the agriculture has experienced more interest. This robot will help the farmers in doing the farming process more accurate[10].

### III. METHODOLOGY

The proposed solar-powered agricultural robot operates seamlessly through the integration and collaboration of its key components. The system begins with the solar panel, positioned at the core, capturing sunlight and converting it into electrical energy. This harvested energy is then directed to the battery, serving as the robot's energy reservoir during periods of sunlight. The rechargeable and long-life battery ensures the robot's sustained operation even in the absence of direct sunlight. At the heart of the robot's intelligence is the Arduino microcontroller, functioning as its central brain. The microcontroller receives commands from the user through the Android app, establishing a communication link via the Bluetooth module.

These commands are translated into precise actions, managing the timing, logic, and sequencing of the robot's tasks. The motor driver, a critical component, governs the DC motors responsible for the robot's movement and the operation of various agricultural implements. It regulates motor speed, direction, and safeguards against potential damage, providing the necessary precision for tasks like seeding, pesticide spraying, and grass cutting. The choice of high-torque DC motors ensures the robot can efficiently handle the physical demands of diverse agricultural operations. The adaptability and versatility of the robot are realized through agricultural implements, which act as attachments or tools for specific tasks. These implements, such as seeders, pesticide sprayers, and grass cutters, enable the robot to address a wide range of agricultural needs.

The ability to switch seamlessly between these implements enhances the robot's functionality and utility in different farming scenarios. The Bluetooth module serves as a vital communication gateway, connecting the robot with the user through the Android app. This allows users to remotely control the robot, directing its movement, switching between implements, and monitoring its status. Real-time information, including battery levels and GPS location, is accessible through the user-friendly app interface. In operation, the solar panel continuously captures sunlight, replenishing the battery's energy reserves. The Arduino microcontroller orchestrates the entire process, ensuring efficient use of energy and precise execution of tasks.

The motor driver regulates the DC motors, propelling the robot and activating agricultural implements as needed. The Bluetooth module maintains a seamless link with the Android app, enabling real-time control and monitoring. These solar-powered agricultural robots offer substantial benefits to modern farming practices. Their reduced reliance on fossil fuels makes them environmentally friendly, while their capacity to operate for extended periods without human intervention enhances efficiency and reduces labor costs. The robots' adaptability to various tasks positions them as invaluable tools, representing a harmonious fusion of technology and agriculture for a more sustainable and efficient future in farming.

V. HARDWARE DESCRIPTION

Image	Description
 <p>Fig 2. Solar Panel</p>	<p>A Solar panels (also known as "PV panels") is a device that converts light from the sun, which is composed of particles of energy called "photons", into electricity that can be used to power electrical loads. Solar panels can be used for a wide variety of applications including remote power systems for cabins, telecommunications equipment, remote sensing, and of course for the production of electricity by residential and commercial solar electric systems.</p>
 <p>Fig 3. Channel Relay Module</p>	<p>5V Relay Module 4 Channel is an indispensable tool for any electronics enthusiast or automation expert. This module provides seamless control over multiple devices, offering a reliable and efficient switching mechanism. Whether you're building home automation systems, robotics projects, IOT applications, or industrial setups, this 5V relay module delivers outstanding performance and versatility.</p>
 <p>Fig 4. Arduino Uno</p>	<p>Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.</p>

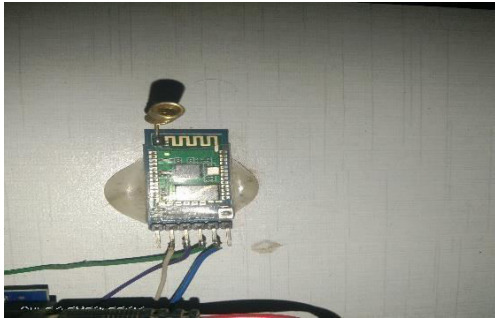


Fig 5. Bluetooth Module

It Combines many processes such as Seed Sowing, Pesticide Spraying and Moisture measurement in soil, and Pumps, Sprayers, an Arduino Uno, a Bluetooth Module. A Bluetooth Module controls the Robot.

### V. EXPERIMENTAL RESULT


Image	Description
	<p>It has Solar power it is connected to battery. It is also connected to relay module and Arduino which give instruction to robot. The process of robot does the seedsowing and pesticide and water spraying.</p>

Fig 6. Solar Power Robot



Fig 7. Solar Power Robot

The Robot designed to assist and simplify daily farming activities. It Combines many processes such as seed Planting , Pesticide Spraying, Pumps , Sprayers an Arduino Uno , a Bluetooth Module.

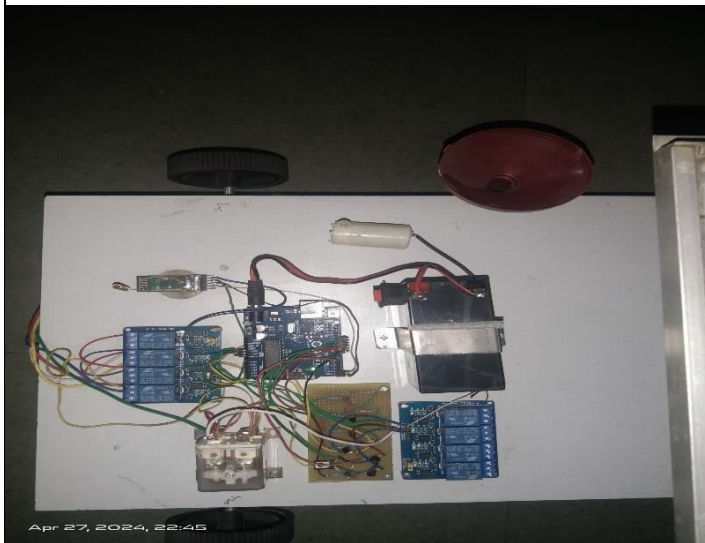


Fig 8. Seed Sowing

In Seed Sowing Mechanism, a Funnel is used to store the seeds. A slider with a hole is provided in order to sow the seeds in the ground at regular intervals.

## VI. ALGORITHM

**Step 1:**Start

**Step2:** Switching on the Robot.

**Step 3:** Pairing the Bluetooth device with the mobile Phone **Step 4:**Robot Should wait until it receives signal from the app**Step 5:**If it receives signal, robot works accordingly

**Step 6:**If the signal not received go to step 4 step.

**Step 7:**Universal Off Signal is used to deactivate.

## VI. CONCLUSION

The "Solar Powered Autonomous Multipurpose Agriculture Robot" project introduces a sustainable, efficient, and accessible solution for modern farming. By harnessing solar energy and employing advanced robotics, it addresses labor shortages, enhances productivity, and reduces environmental impact. The integration of mobile control via an Android app makes farming operations more convenient and technology-driven. This project exemplifies the potential of innovation in agriculture, promising a brighter, more efficient future for farming.

## REFERENCES

- [1]. Ranjitha, B., Nikhitha, M., Aruna, K., Afreen, & Murthy, B. T. V. (2019). Solar powered autonomous multipurpose agricultural robot using bluetooth/android app. 3rd International conference on Electronics, pp. 1-6.
- [2]. Didarul Islam Sujon, Rumman Nasir, Mahbube Mozammel Ibne Habib, Majedul Islam Nomaan, Jayasree Baidya, & Md. Rezaul Islam. (2018). Agribot: Arduino controlled autonomous multi-purpose farm machinery robot for small to medium scale cultivation. International Conference on Intelligent Autonomous Systems (ICoIAS), pp. 58-63.
- [3]. Konam, S., Srinivasa, R. N. N., & Mohan, K. K. (2014). Design encompassing mechanical aspects of ROTAAI: RObot to aid agricultural Industry. Soft Computing and Machine Intelligence(SCMA), pp. 1- 6.
- [4]. Saurabh Umkar & Anil R. Karwankar. (2016). Automated seed sowing agribot using arduino. International Conference on Communication and Signal Processing (ICCSP), pp. 1-6.
- [5]. A Survey on Solar Powered Autonomous Multipurpose Agricultural Robot. (2023). IEEE Xplore.
- [6]. Agarwal, B., Patel, V., Patel, A., & Pandya, S. (2020). Design and development of solar powered autonomous multipurpose agricultural robot. International Journal of Advanced Engineering Research and Science, 7(12), 1-9.
- [7]. Kumar, P. S., & Reddy, K. M. (2020). Development of a solar powered autonomous multipurpose agricultural robot using Arduino microcontroller. International Journal of Innovative Technology and Engineering, 9(1), 1-6.
- [8]. Singh, V. K., & Kumar, R. (2021). Design and implementation of a solar powered autonomous multipurpose agricultural robot. International Journal of Control, Automation, and Systems, 19(11), 3628- 3637.
- [9]. Patel, H. P., Patel, J. A., & Patel, P. G. (2021). Development of a solar powered autonomous multipurpose agricultural robot using Raspberry Pi. International Journal of Engineering Research and Technology, 14(1), 247-252.
- [10]. Kumar, S., & Singh, K. K. (2022). Design and development of a solar powered autonomous multipurpose agricultural robot using ESP32 microcontroller. International Journal of Engineering and Technology, 14(1), 1-7





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