*International Research Journal of Innovations in Engineering and Technology (IRJIET)*

**ISSN (online): 2581-3048**

**Volume 7, Issue 5, pp 357-361, May-2023**

https://doi.org/10.47001/IRJIET/2023.705053

# Design and Development of Agriculture Robot

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***Abstract*** **- This research paper presents the design, development, and evaluation of a multipurpose agriculture robot aimed at revolutionizing farming practices. The robot is equipped with advanced sensing, actuation, and control capabilities to perform various tasks, including crop monitoring, precision spraying, harvesting, weeding, and soil analysis. By automating and assisting in these crucial agricultural operations, the multipurpose robot aims to increase efficiency, reduce labor requirements, minimize environmental impact, and optimize crop productivity. This paper describes the methodology, experimental setup, and findings of our research, along with discussions on the applications, benefits, challenges, and future directions of multipurpose agriculture robots.**

***Keywords:*** Agriculture robot, crop, monitoring, agriculture, harvesting, weeding, soil analysis, spraying, robots.

## I. INTRODUCTION

Agriculture is a fundamental pillar of global food production, and with the ever-increasing demand for food, it is essential to enhance farming efficiency and productivity. Traditional farming methods often involve manual labor, which can be time-consuming, labor intensive, and inefficient in managing large-scale agricultural operations. However, recent advancements in robotics and automation technologies have opened up new possibilities for transforming agriculture practices.

Multipurpose agriculture robots have emerged as a promising solution to address the challenges faced by modern farmers. These robots combine advanced sensors, actuators, and intelligent algorithms to perform a wide range of tasks in agricultural settings. By integrating multiple functionalities into a single robotic system, they offer versatility, adaptability, and increased operational efficiency.

The objective of this research paper is to present our work on the design and development of a multipurpose agriculture robot. Our research focuses on incorporating key functionalities required in agricultural operations, including crop monitoring and management, precision spraying, harvesting, weeding, and soil analysis. By developing a robot capable of performing these tasks, we aim to provide farmers with a comprehensive solution to optimize their farming processes, reduce costs, and improve crop yield.

In this paper, we will outline the methodology employed in designing and constructing the multipurpose agriculture robot. We will describe the key components, sensors, and actuators used in the robot, along with the control and navigation algorithms implemented. Furthermore, we will present the results of our experimental evaluations, including performance metrics and comparisons with traditional farming methods. We will also discuss the potential applications, benefits, and challenges associated with deploying multipurpose agriculture robots in real world farming scenarios.

Overall, this research paper aims to contribute to the growing body of knowledge on multipurpose agriculture robots and their role in transforming the agriculture industry. By presenting our findings and insights, we hope to inspire further advancements in this field and encourage the adoption of robotic technologies for sustainable and efficient farming practices.

Please note that this introduction is a general template, and you should modify it to align with your specific research objectives, methodology, and findings. Additionally, make sure to provide detailed information in the subsequent sections of your research paper, including methodology, results, discussions, and conclusions.

## II. LITERATURE SURVEY

Robotic Agriculture Machine, Gholap Dipak Dattatraya, More Vaibhav Mhatardev, Lokhande Manojkumar Shrihari, Prof. Joshi S.G BE [E & TC], Vishwabharati Academy's College of Engineering, Pune university, Ahmednagar, Maharashtra, India. 1,2,3 Assistant Professor, Dept of E & TC, Vishwabharati Academy's College Of Engineering, Pune university, Ahmednagar, Maharashtra, India. This presents a system with high speed of operation for an advanced agriculture process which includes cultivation based on robotic platform. The robotic system is an electromechanical (conveys a sense that it has agency of its own) and artificial agent which is steered by DC motor which has four wheels. The farm is cultivated by the machine, depending on the crop considering rows & specific columns. The infrared sensor detects the obstacles in the path and it also senses turning position of vehicle at end of land. The seed block can be detected and solved using water pressure. The machine can be controlled remotely and solar panel is used to charge DC

 

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battery. Assembly language is used in programming the microcontrollers. The NOD MCU is used to control and monitor the process of system motion of vehicle with the help of DC motor. The result of implemented unit is also presented. We studied various papers to develop our agriculture robot and idea to implement. Designing, employing, and analyzing an self-reliant multipurpose vehicle with safe, reliable, and economical. These agriculture vehicles goes through the crop rows of the agricultural field and does task that are unsafe to the user. Majorly, it is made for spraying purpose but with that other configurations are also designed like seeding system, plug system to reach notable area of a plant to execute different tasks.

Automatic robot is designed, developed and fabricated such that it can dig the field; put the seeds, level the ground and use sprayer to water, and whole assembly of automatic robot work together with supply of power through battery. Improvement in techniques of agriculture which are automatic seeding on ploughed land with use of automatic robot. An agriculture bot having four tires and DC motor is used to steering. The device of planting seed is fixed to the automobile for carry out seeding in even manner. By taking the image of the plant and collecting the databases of the cotton plant diseases it will give information of the plant disease.

## III. METHODOLOGY

Methodology is a systematic analysis of methods to be carried out to design the final product. The well implemented project needs a plan of action and specified steps for its completion. The work of this project started with the need analysis to collect the information about the existing problems and find the problem statement for the project. Based on the morphological chart the different design alternatives were found. The best alternative was chosen based on the evaluation matrix.

The main aim is to design and develop a system which can remotely control the agriculture functions such as seed sowing, Grass cutting, water spraying and measure the moisture level of soil by using soil moisture sensor. The system consists of Node mcu which will act as the heart of the system.

LDR circuit to check conditions for seed tank and field detection. Output is obtained through mechanical parts to perform seeding operation and movement of these parts controlled using DC motors. First, we must check moisture level in soil by using soil moisture sensor. Moisture level is then displayed. User can switch on the water motor as per their need. Seed sowing in proposed system is as follows: digging the soil at a crop specific depth, dropping of seeds in the hole, covering it by soil and then pouring water on it.

## IV. IMPLEMENTATION

### Mechanical Design Description:

We tried to make the basic design for our reference purpose only. With all dimensions that are 2 x 4 feet. Once you power on the bot the steps followed by the agriculture bot are as follows. We decided to design a system that can remotely control various operations. This project has huge scope in agriculture operations like automatic seed sowing, grass cutting, water, and pesticides spraying. It reduces human effort as well as saves time. We can further add several operations to reduce human efforts even more.

### Automatic seed sowing:

The automatic seed sowing module consists of a dc motor, a seed tank, a circular disk, and an LDR Circuit. The robot consists of a container to store seeds. The circular disk is connected to the dc motor. The teeth present on the disk allow it to pick up a limited quantity of seeds and pour them on the ground in a steady manner in adequate quantity. We can control the speed of the disk by controlling the speedof the dc motor. LDR circuit consists of a laser and a photo-resistor sensor which signals the farmer, with a buzzer when the tank gets empty. Dimensions of the tank (in feet):1.96 x 0.65 x 1.64.

### Pesticide and fertilizer spraying:

It consists of a tank, dc motor, dc gear motor, sprayer, LDR Circuit, ultrasonic sensor. Dimensions for tank are (in feet): 1.96 x 1.14 x 1.96. Fig 6 describes the CATIA design of the bot. When spraying pesticides and fertilizers, it is important to follow the instructions on the label carefully. This will help to ensure that the chemicals are applied safely and effectively. It is also important to wear personal protective equipment (PPE) when spraying, such as gloves, goggles, and a respirator. Pesticide and fertilizer spraying is a common practice in agriculture. It is used to control pests and weeds, and to provide nutrients to crops. There are a variety of methods for spraying pesticides and fertilizers, including:

- Hand-held sprayers: These are the most basic type of sprayer, and are typically used for small areas.
- Backpack sprayers: These are larger and more powerful than hand-held sprayers, and are typically used for medium-sized areas.
- Tractor-mounted sprayers: These are the largest and most powerful type of sprayer, and are typically used for large areas.

 

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## V. SYSTEM DESIGN

### 5.1 Flow chart:

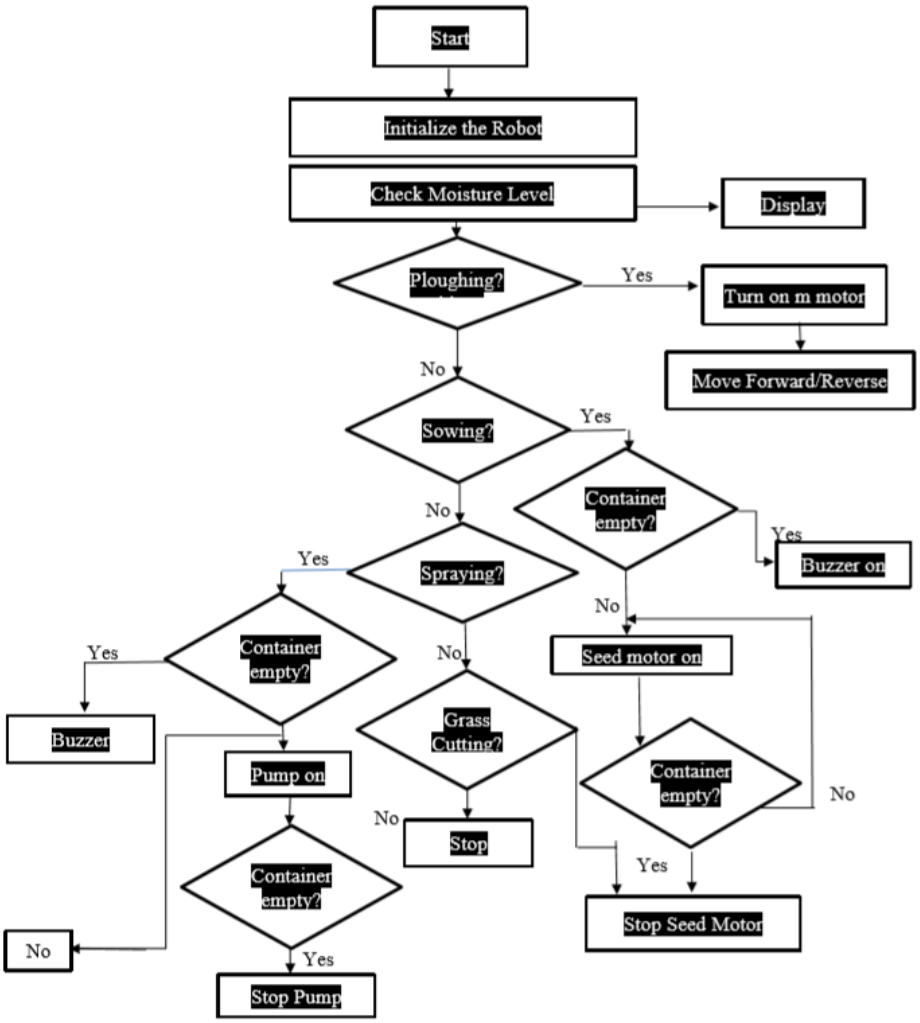


**Figure 1: System Flow Diagram**

## VI. RESULTS

Agricultural robots automate slow, repetitive, and dull tasks for farmers, allowing them to focus more on improving overall production yields. Some of the most common robots in the agriculture sector are used for: Harvesting and picking, weed control, autonomous mowing, pruning, seeding, spraying and thinning. This robot can perform various agricultural tasks, such as ploughing, sowing, weeding, and harvesting. It is controlled by a computer and can be programmed to perform specific tasks.

Here are some of the benefits of using a multipurpose agricultural system:

1) Increased productivity: Multipurpose agricultural systems can help farmers to increase their productivity by automating tasks that would otherwise be done manually.
2) Reduced labor costs: Multipurpose agricultural systems can help farmers to reduce their labor costs by automating tasks that would otherwise require manual labor.
3) Improved efficiency: Multipurpose agricultural systems can help farmers to improve their efficiency by automating tasks that would otherwise be time-consuming and labor-intensive.
4) Improved crop quality: Multipurpose agricultural systems can help farmers to improve the quality of their crops by automating tasks that can damage crops, such as weeding and harvesting.
5) Reduced environmental impact: Multipurpose agricultural systems can help farmers to reduce their

 

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environmental impact by reducing the need for pesticides and herbicides.

## VII. CONCLUSION

The smart Agri-bot has improved productivity in agriculture functions. Multitasker Agri Bot is successfully developed and all attachments are implemented. It helped to reduce human effort by doing automatic functions like automatic seed sowing, automatic pesticides and fertilizers sprayer, plant disease detection, etc. More innovation can be done on the charging system of battery, such as Solar energy can be used for the charging purpose which would significantly reduce maintenance as well as the cost of an electric bill. We can also identify how to increase the productivity of certain plants based upon the amount and type of fertilizer to be used. The plant disease detection can be done as per the requirement of the farmer. Precision in seed sowing and spraying can be improved by developing different nozzles as per size and requirements.

In conclusion, these systems have the potential to revolutionize the way we farm. By automating tasks that would otherwise be done manually, these systems can help farmers to increase their productivity, reduce their labor costs, and improve the quality of their crops. Additionally, multipurpose agricultural systems can help to reduce the environmental impact of farming by reducing the need for pesticides and herbicides. As the world's population continues to grow, the demand for food will also increase.

Multipurpose agricultural systems can help to meet this demand by making it possible to produce more food with less resource. As these systems continue to develop, they have the potential to make a significant impact on the future of agriculture. Here are some of the challenges that need to be addressed in order to make multipurpose agricultural systems more widely adopted:

- Cost: Multipurpose agricultural systems can be expensive, which can be a barrier for some farmers.
- Technology: Multipurpose agricultural systems are still in their early stages of development, and there is a need for further research and development to improve their reliability and efficiency.
- Regulation: There are several regulations that need to be considered when using multipurpose agricultural systems, such as those related to safety and environmental impact. Despite these challenges, the potential benefits of multipurpose agricultural systems are significant. As these systems continue to develop, they have the potential to make a major impact on the future of agriculture.

## VIII. FUTURE SCOPE

The specific future scope for this project will depend on the goals and objectives of the project, as well as the resources and capabilities of the team working on the project. However, the possibilities are endless, and the project could have a significant impact on the company, the industry, or even the world. Here are some specific examples of how this project could be used to create new products or services:

1) The project could be used to create a new software application that helps businesses manage their finances.
2) The project could be used to create a new medical device that helps doctors diagnose and treat diseases.
3) The project could be used to create a new educational tool that helps students learn new subjects.
4) The project could be used to create a new marketing campaign that helps businesses reach new customers.

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**ISSN (online): 2581-3048**
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https://doi.org/10.47001/IRJIET/2023.705053

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**Citation of this Article:**

Dr. Vaishali Raut, Hitesh Patil, Aniket Shidore, Rohit Gotefode, "Design and Development of Agriculture Robot" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 7, Issue 5, pp 357-361, May 2023. https://doi.org/10.47001/IRJIET/2023.705053

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