

# Multipurpose Agriculture

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**Abstract—** The design and fabrication of a multipurpose agricultural machine capable of performing pesticide spraying, seed sowing, and field ploughing operations. The machine incorporates components such as Arduino, motor driver, Bluetooth module, servo motor, FET driver, seed sowing, pesticide pump, gear motor, and battery. The aim is to provide farmers with a versatile and efficient solution to streamline agricultural tasks, optimize resource utilization, and enhance productivity. The machine offers advantages such as versatility, precision, remote control capabilities, and resource optimization. Future scope includes sensor integration, data analytics, autonomous operation, connectivity, energy efficiency, modular design, sustainability considerations, and integration with farm management systems.

## I. INTRODUCTION

A multipurpose agricultural machine is a versatile and innovative solution designed to perform various tasks in the agricultural sector. It combines multiple functionalities such as pesticide spraying, seed sowing, and field ploughing into a single, integrated system. By incorporating advanced technologies and automation, these machines aim to enhance efficiency, precision, and productivity in farming operations.

Traditional farming methods often require separate equipment for each specific task, leading to increased costs, labor, and storage requirements. Multipurpose agricultural machines address these challenges by offering a consolidated solution that can perform multiple functions, reducing the need for multiple devices and streamlining the farming process.

The design and development of multipurpose agricultural machines leverage advancements in technology, such as microcontrollers like Arduino, motor drivers, wireless communication modules, and various sensors. These components enable automation, control, and data integration, empowering

farmers to optimize their operations and achieve better results.

By integrating pesticide spraying capabilities, multipurpose agricultural machines can effectively control pests and diseases, ensuring crop health and minimizing yield losses. The seed sowing function allows for precise and uniform distribution of seeds, leading to improved crop establishment and higher yields. Additionally, the ploughing feature helps prepare the soil, facilitating optimal conditions for crop growth

## LITERATURE SURVEY

Nandeesh T V et, al More than 60 percent of the population in India do agriculture as the primary sector occupation. At present, due to increase in shortage of labor, interest has raised for the development of the autonomous vehicles like robots in the agriculture field. A robot called “Smart Multipurpose Agricultural Robot” has been designed to minimize the labor of farmers in addition to increasing the speed and accuracy of the work. The Proposed system is designed with the multipurpose autonomous agricultural robotic vehicle which can be controlled through IOT, for soil parameters measurement, spraying pesticide on leaves is dependent on the height of the plants but not in free space, sow the seed in desired depth and provide required spacing between the seeds, detection of blockage of a seed and live video streaming of the field. The project was tested on the field. The robot is successfully able to move in all the directions. Monitoring the soil parameters like humidity, luminosity and also sensor position adjustment for monitoring temperature and moisture content in the soil are updated to Blynk App continuously. The user is able to control camera in any direction wirelessly through IoT for the live video streaming of the field. In seed sowing unit the user is

capable of measuring the volume of the seeds in all the bins and also selecting size of the seeds for sowing. The seed sowing is capable to sow the seeds to the desired depth of 4 cm for the seeds whose diameter is < 4mm with the spacing of 5 inches and a desired depth of 5 cm for the seeds whose diameter is > 6mm with the spacing of 6 inches between the seeds. Pesticide spraying unit is capable of spraying pesticide only on the plant not in the free space with the maximum height of 4 feet.

M N Nikhitha et, al In India nearly about 70 percentage of people are depending on agriculture. Numerous operations are performed in the agricultural field like seed sowing, grass cutting, ploughing etc. The present methods of seed sowing, pesticide spraying and grass cutting are difficult. The equipment's used for above actions are expensive and inconvenient to handle. So the agricultural system in India should be encouraged by developing a system which will reduce the man power and time. This work aims to design, develop and design of the robot which can sow the seeds, cut the grass and spray the pesticides, this whole system is powered by solar energy. The designed robot gets energy from solar panel and is operated using Bluetooth/Android App which sends the signals to the robot for required mechanisms and movement of the robot. This increases the efficiency of seed sowing, pesticide spraying and grass cutting and also reduces the problem encountered in manual planting.

Shweta Madiwalar et, al Agriculture is considered as one of the most important economic activities in India. This paper deals with trade and development of low cost, low power and less human effort robot in the agronomic applications. Agricultural automata are widely used at the collecting phase, tunneling, cultivating and seeding. This robot is intended to reduce the farmer's effort. The designed Robotics techniques are efficient for achieving the tasks such as automatic cultivating, seed providing, water sprinkling, insecticide spraying and Grassland wounding with the help of solar energy. Seeds are spread in 4 rackets at a single instant. Initially, the robot digs the complete field concurrently providing seeds adjacent by side and finishes the required actions in a robotic mode with embedded programs. For a

labor-intensive control, the robot uses the remote controller as android app.

Ashok G Meti et, al In India, nearly 70% of people depend on agriculture. In the agricultural field, various operations such as seed sowing, grass cutting, pesticide spraying, ploughing are carried out. Automation of agricultural operations is a current demand to increase productivity through the use of tools and technology. At the moment seed sowing, pesticide spraying, and grass cutting are all difficult tasks. The equipment needed for the aforementioned actions is both expensive and inconvenient to use. As a result, India's agricultural system should be advanced through the development of a system that reduces reliance on human labour and time. The proposed agricultural robot is a user-friendly, Internet of Things (IoT)-based system that can be used in any type of soil. Users can use a web page to monitor the crop's condition as well as perform some specific operations. The objective of this project is to design, develop, and build a robot that can sow seeds, cut grass, spray pesticides, pluck fruit, and detect soil nutrition levels and irrigation. Solar energy is used to power the entire system. By connecting through wireless modules. the designed model can be controlled via a web page. The web page is used to control the robot's required mechanism and movement. This improves the efficiency of seed sowing, pesticide spraying, grass cutting, fruit plucking, soil nutrition level detection, and irrigation, as well as reducing the need for manual planting.

#### PROPOSED METHODOLOGY

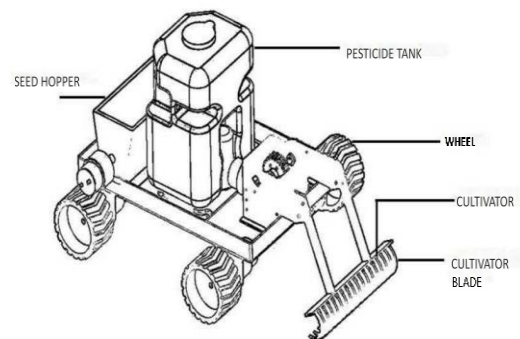


Fig 3.2: Line Diagram of the Proposed Work The proposed system aims to design and fabricate a multipurpose agricultural machine. This system will provide automation and control for pesticide spraying,

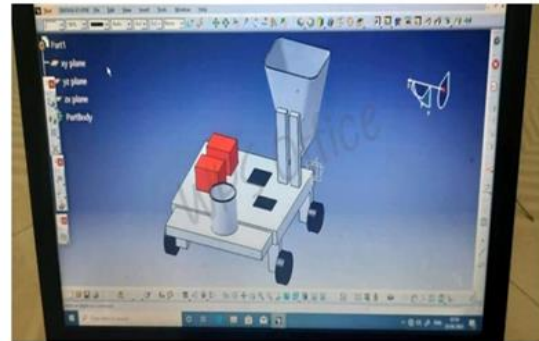
seed sowing, and field ploughing processes in agriculture. The Arduino board will serve as the main controller, responsible for receiving input signals, processing data, and controlling various components of the agricultural machine. Motor drivers will be used to control the different motors in the system, such as the gear motor for ploughing and the servo motor for precise seed sowing. The Bluetooth module will enable wireless communication between the agricultural machine and a mobile device or computer. It can be used for remote control, data monitoring, and configuring the machine's parameters.

The servo motor will control the seed sowing mechanism, allowing for precise and adjustable seed placement while sowing. The FET (Field-Effect Transistor) driver will be utilized to control the pesticide pump, regulating the flow and pressure of the pesticide during spraying operations. The seed sowing mechanism will be designed and integrated into the agricultural machine, enabling controlled and uniform seed distribution during sowing. The pesticide pump, controlled by the FET driver, will provide the necessary pressure to spray pesticides evenly on the crops. The gear motor will power the ploughing mechanism, facilitating efficient field ploughing operations. A suitable battery will provide power to the system, ensuring portability and continuous operation in the field.

The Arduino board will serve as the central processing unit, receiving input signals from sensors, user commands via Bluetooth, or pre-programmed instructions. It will control the motor drivers to operate the gear motor for ploughing and the servo motor for seed sowing. The Bluetooth module will enable wireless communication for remote control and data transmission. The FET driver will regulate the pesticide pump, allowing for adjustable and precise pesticide spraying based on user requirements. The seed sowing mechanism, driven by the servo motor, will enable controlled seed placement, optimizing crop yield. The system will be powered by a battery, providing the necessary energy for all the components to function. The design will prioritize portability, durability, and user-friendly controls to ensure ease of operation and maintenance in agricultural settings. Voltage and Current: Voltage and current are the most importance characteristics to look for in a

perfect motor driver. When working on a project, you should already know what amount of supply voltage and operating current your project requires. The driver you intend to use should abide by the necessary level of functionality.

## DESIGN



## COMPONENTS DESCRIPTION

### GEAR MOTOR

A gear motor is an electric motor and a power reducer combined into a single unit that reduces the number of revolutions but increases the torque of the operating shaft. Such gears for electric motors are often used in modern machines and mechanisms, it is universal for many types of equipment.

### ARDUINO UNO MICROCONTROLLER

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, 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 an AC-to-DC adapter or battery to get started.

### Digital Pins

In addition to the specific functions listed below, the digital pins on an Arduino board can be used for general purpose input and output via the `pinMode()`, `digitalRead()`, and `digitalWrite()` commands. Each pin has an internal pull-up resistor which can be turned on and off using `digitalWrite()` (w/ a value of HIGH or LOW, respectively) when the pin is configured as an input. The maximum current per pin is 40 mA.

#### SERVO MOTOR

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor.

#### PESTICIDE PUMP

A pesticide pump is a device used for spraying pesticides, herbicides, and other chemicals onto crops and other vegetation. It typically consists of a pump, tank, and nozzle, which work together to distribute the chemical evenly over the target area. In short, the hydraulic circuit of a sprayer consists of a tank, a pump and nozzles. The tank contains water or chemicals, the pump sucks from the tank, discharges through filters and hoses on the arms where the pressure is converted into speed in the jets, thus causing spraying

#### BLUETOOTH

Bluetooth is a short-range, low-power radio transmission technology. It consists of non-ionizing electromagnetic waves in the radio range between 2.402 GHz and 2.48 GHz. Being at the lower end of the range allows Bluetooth to be low-energy compared to other radio transmission devices. That's why it's easy to implement into small-size gadgets and smartphones without worrying too much about battery life.

#### BATTERY

In a typical lead-acid battery, the voltage is approximately 2 volts per cell, for a total of 12 volts. Electricity flows from the battery as soon as there is a circuit between the positive and negative terminals. This happens when any load that needs electricity, such as the radio, is connected to the battery.

#### RESULTS AND DISCUSSION

The multipurpose agricultural machine incorporating pesticide spraying, seed sowing, and field ploughing functions can enhance the overall efficiency of agricultural operations. Automation and precise control provided by the system can reduce manual

labor, save time, and optimize resource utilization. The use of servo motors and precise control mechanisms allows for accurate and consistent seed sowing and pesticide application. This precision can lead to better crop yields, uniform plant growth, and minimized wastage of seeds and pesticides. automation and versatility of the agricultural machine can increase productivity by reducing the time required for manual tasks. Farmers can cover larger areas in less time, resulting in higher crop production and potentially higher profits. The controlled and precise pesticide spraying facilitated by the system can contribute to improved crop health. Even distribution of pesticides can help manage pests and diseases effectively, reducing crop damage and increasing overall plant vitality. The incorporation of Arduino-based control and wireless communication through the Bluetooth module can make the machine user-friendly. Farmers can operate and monitor the machine remotely, adjust settings, and receive real-time data and feedback, enhancing convenience and ease of use. The design and fabrication of a multipurpose agricultural machine using the mentioned components can offer several advantages to farmers and agricultural practices. By integrating multiple functions into a single machine, farmers can reduce the need for separate equipment, saving costs and storage space. The use of Arduino as the central control system allows for flexibility and customization.

#### CONCLUSION

The design and fabrication of a multipurpose agricultural machine utilizing Arduino technology for pesticide spraying, seed sowing, and field ploughing offers numerous advantages and opportunities for farmers. By integrating these functions into a single machine, farmers can streamline their operations, reduce costs, and enhance overall efficiency. The use of Arduino as the central control system allows for automation, precise control, and adaptability to various crop types, field conditions, and farming practices. It provides a flexible platform for customization and optimization, enabling farmers to adjust parameters, monitor operations remotely, and receive real-time data insights. The incorporation of components such as motor drivers, Bluetooth modules, servo motors, FET drivers, and a battery

further enhances the machine's functionality and usability. Motor drivers ensure smooth and accurate operation of the gear motor for ploughing and the servo motor for seed sowing. The Bluetooth module enables wireless communication, facilitating remote control, data monitoring, and configuration. The FET driver regulates the pesticide pump, ensuring precise and controlled spraying, while the battery provides power for uninterrupted operation in the field. Through this multipurpose agricultural machine, farmers can achieve improved precision in seed sowing and pesticide application, leading to enhanced crop health and increased yields. Furthermore, the user-friendly nature of the machine, with intuitive controls and wireless communication, makes it accessible and convenient for farmers to operate and maintain. Real-time data integration and analysis capabilities provide valuable insights for decision-making, enabling farmers to optimize their farming practices and improve overall efficiency.

#### REFERENCE

- [1] Pratikkumar V. Patel\*1, Mukesh Ahuja\*2  
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India A Review Paper on “MULTIPURPOSE FARM  
MACHINE”, Sep-2016.
- [3]1Mysuru Venkataramaiah Achutha, The National  
Institute of Engineering, \*2Mysore Sharath Chandra  
Nagaraju, The National Institute of Engineering,  
Mysore Concept Design and Analysis of Multipurpose  
Farm Equipment February 2016.
- [4]R.M. Chandima Ratnayake University of Stavanger  
(UiS) Re-Design, Fabrication, and Performance  
Evaluation of Manual Conical Drum Seeder: A Case

Study Article in Applied Engineering in Agriculture  
March 2013.

[5]SHARATH T D1, SACHIN R K1, SUSHANT1,  
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REVIEW PAPER ON MULTIPURPOSE  
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Alva's Institute of Engineering & Technology,  
Moodbidri-574225, Karnataka, India 2019.

[6] Electro magnetic reflectors. *IEEE Trans.  
PlasmaSci.* [Online].21(3),pp. 876-880. Available:  
<http://www.halcyon.com/pub/journals/21ps03-vidmar>