

THE DEVELOPMENT AND MANUFACTURE OF SOLAR POWER SEED SPRAYER MACHINE

Prof. R.B. Khule*¹, Bhawar Ninawe*², Kundan Gahukar*³, Sourabh Balbudhe*⁴

*¹Professor, Department Of Electronics And Telecommunication Engineering, KDK College Of Engineering, Nagpur, Maharashtra, India.

*^{2,3,4}Student, Department Of Electronics And Telecommunication Engineering, KDK College Of Engineering, Nagpur, Maharashtra, India.

DOI : <https://www.doi.org/10.56726/IRJMETS50233>

ABSTRACT

The main benefit of using this smart multifunction agriculture robot to reduce the time of seed and pesticide spraying to the land and reduced human effort. It sounds like you're describing a solar-powered seed sowing machine designed to improve efficiency and productivity in agricultural fields. This type of innovation could indeed be very beneficial, especially in regions like India where manual and traditional methods may be time-consuming and less efficient. Using solar panels as a power source eliminates the need for additional energy sources, making the machine more sustainable and environmentally friendly. Additionally, automating the process reduces the manpower required, potentially increasing productivity and allowing farmers to focus on other tasks. If you're working on developing and manufacturing such a machine, it's important to consider factors such as reliability, durability, ease of use, and affordability. Field testing and feedback from farmers would also be crucial to ensure that the machine meets their needs and can effectively improve agricultural practices. In this technique seeds in a The hopper of the seed sowing machine is efficiently sprayed onto the land through a fan or blower mechanism, completely eliminating the need for human intervention. This automated process ensures that seeds are dispersed evenly and effectively across the agricultural field without requiring any manual effort. By harnessing the power of solar panels as a sustainable energy source, this system operates seamlessly, contributing to increased productivity and efficiency in seed sowing.

Keywords: Seed Sprayer Machine, Robot, Battery, Solar Panel, DC Motors, Etc.

I. INTRODUCTION

India is an agriculture based country in which, 70% of people depends on the outcome of farming. But if we observe that with increase in population the farm gets distributed among the family and because of this, farmer in India held averagely only two care farm. Farmers face significant economic challenges, often struggling with poverty that prevents them from investing in modern agricultural machinery like tractors and other expensive equipment. As a result, they are compelled to rely on traditional farming methods passed down through generations. These traditional methods may be labor-intensive and less efficient compared to modern techniques, leading to lower yields and perpetuating the cycle of poverty. Lack of access to credit, limited infrastructure, and volatile market conditions further exacerbate the economic hardships faced by farmers, making it difficult for them to break out of this cycle and improve their livelihoods. Efforts to address these economic barriers, such as providing access to affordable financing, training in modern farming techniques, and improving market access, are crucial for empowering farmers and fostering sustainable agricultural development. Basically, many farmers in India also use bullocks, horses and he-buffalo for farming operation. This approach not only boosts efficiency but also empowers farmers to compete on a global scale by increasing their output and quality. Moreover, it reduces dependency on unpredictable human and animal labor, ensuring consistent productivity regardless of external factors. we are developing this smart multifunction agribiont which will satisfy all this need and to solve labour problem.

Reason for selecting the problem

- Lack of mechanization in farming
- Required excess efforts for different process.
- Required more man power.
- Excess time consumption for performing individual process.

II. PROBLEM DEFINITION

The Problem At Hand Is The Development And Manufacturing Of A Solar-powered Seed Sprayer Machine. This Machine Is Intended To Assist In The Agricultural Sector By Efficiently And Sustainably Dispersing Seeds Onto Farmland.

- 1. Functionality:** The Machine Must Be Capable Of Accurately And Evenly Dispensing Seeds Onto The Soil. It Should Have Adjustable Settings To Accommodate Different Types Of Seeds And Crop Varieties.
- 2. Efficiency:** It Should Operate Efficiently, Minimizing Seed Wastage And Maximizing Coverage. This Efficiency Will Contribute To Cost-effectiveness For Farmers.
- 3. Durability:** The Machine Needs To Be Designed And Manufactured To Withstand Various Environmental Conditions, Including Exposure To Sunlight, Rain, And Dust. It Should Have A Long Lifespan To Make It A Worthwhile Investment For Farmers.
- 4. User-friendly:** It Should Be Easy To Operate And Maintain, Ensuring That Even Non-expert Users Can Effectively Use The Machine.

III. OBJECTIVES

- To investigation of various types of seed sowing and spraying machine.
- To development of solar powered seed sowing and seed spraying machine..
- To testing of development of solar powered seed sowing and seed spraying machine in actual agricultural farm.
- To extend the concept of solar PV-Technology on "solar sprayer" as "Energy Alternate Device".

IV. LITERATURE SURVEY

Prof. Yayati Shinde, Shantanu Chandani, Akash mandave, shweta nehete, Prerna vishe, International research journal may-2021. The seed sowing machine is a key component of agriculture field. Precision pneumatic planters have undergone significant advancements, catering to a diverse array of crops and accommodating a wide spectrum of seed sizes. These sophisticated systems ensure precise seed placement and uniform distribution along the planting path, optimizing crop establishment and yield potential.

Ghalib Ahmed Tahir, Chu Kiong Loo (Senior member ,IEEE) 20 March 2020. This study aimed to unravel the optimal combination of seeding methods and machinery for oilseed rape cultivation, along with determining the most effective rates of application for maximizing yield potential. By scrutinizing diverse approaches, the researcher sought to pinpoint strategies that could enhance seedling emergence, promote robust plant establishment, and ultimately boost grain yield.

Ammar A.M. Al- Talib , Yap Chee Xiam, Aim Atiq, Nor Fazilah Abdullah, UCSI University, 56000 Kuala Lumpur, Malaysiya , 9 Feb 2023. The agricultural researcher conducted a comprehensive study to assess how various seeding techniques, machinery options, and rates of oilseed rape application influence critical aspects of crop growth, including seeding emergence, plant establishment, and final grain yield.

Jeonghyeon Pak, Jeongeun Kim, Yonghyun Park, Hyoung IL Son (Senior Member, IEEE) 7 May 2022. The research concludes that bullock-drawn planters are increasingly essential for sowing, particularly due to the declining availability of skilled workers for manual sowing tasks. With the dwindling workforce, automated solutions like bullock-drawn planters offer a viable alternative for efficient and timely planting operations.

V. PROPOSED SYSTEM

1) In this machine, a solar panel harnesses solar energy from the sun. The solar panel captures sunlight and converts it into electrical energy through a process called photovoltaic conversion. This electrical energy can then be used to power various devices, appliances, or systems, providing a clean and renewable source of electricity.. The electrical energy is stored inside a 12V Battery of capacity 9 Amp Hour, which then gives the Necessary power to a DC motor. This power is then Transmitted to the Arduino.

2) The basic objective of sowing operation is to put the Seeds in rows at desired depth, to maintain seed to seed Spacing and to cover the seeds with soil and provide Proper compaction over the seed. The ideal spacing between rows, seed rate, seed-to-seed spacing, and seed placement depth can differ depending on the specific crop being grown and the prevailing agro-climatic conditions. These parameters are crucial factors in

optimizing crop growth and yield. Throughout the crop growth cycle, farmers monitor plant health, pest and disease incidence, and nutrient requirements, implementing appropriate management practices as needed to optimize yields and ensure crop health.

- 3) To put the soil back on the seeds, an adjuster is used which puts soil back on seeds.
- 4) After adjusting the soil, water is sprayed from the pipe for cultivation. Water Tank- Tap arrangement is used for irrigation purpose.
- 5) Tires of the machine are rotated with the help of app which gives command to L298D driver with help of bluetooth.
- 6) The sprayer is typically attached to spray water or fertilizer after the seed sowing process. Once the seeds have been sown and covered with soil, the sprayer is used to apply water or fertilizer to provide essential moisture and nutrients for germination and early plant growth.. The sprayer also going to work with help of app which gives command to Arduino and Arduino gives command to relay which turn on/off the sprayer.

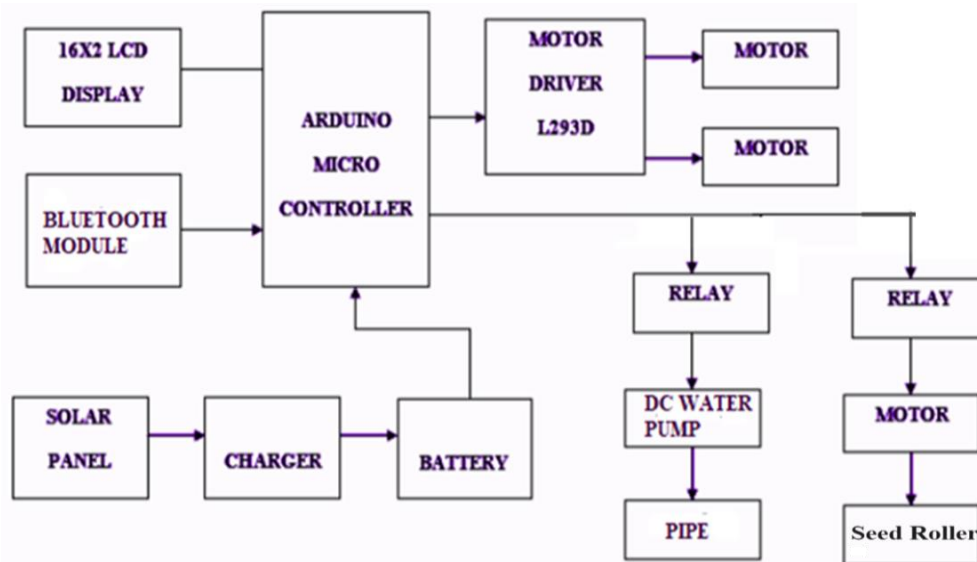


Fig 1: Block Diagram Of System

VI. COMPONENTS

1. Arduino Uno (12v):

The Arduino Uno is an open-source microcontroller board developed by Arduino.cc. It's built around the Microchip ATmega328P microcontroller and provides a versatile platform for electronics projects. With its digital and analog input/output (I/O) pins, users can connect various sensors, actuators, other components to create interactive devices and systems.



Fig 2: Arduino Uno (12v)

2. LCD Display (5v):

A liquid crystal display (LCD) is a thin, flat panel used for electronically displaying information such as text, images, and moving pictures. LCD stands for Liquid Crystal Display. LCDs can be more cost-effective, especially for larger displays, as the cost of manufacturing LCD panels has decreased over time.

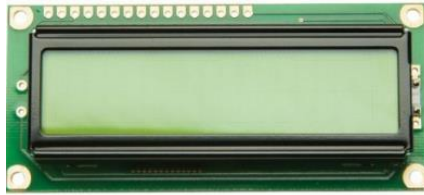


Fig 3: 16x2 (LCD) Display

3. RELAY Board (12v):

A relay functions as an electromechanical device activated by an electrical current. When current flows through one circuit, it triggers the opening or closing of another circuit. Essentially, relays act as remote-controlled switches and are widely employed across various applications due to their simplicity, durability, and well-established reliability over time.



Fig 4: Realy Board

4. DC Water Pump:

Operates on 12V supply, The Speed Control circuit technology is able to stabilize the voltage changes and load changes, water flow is very stable .In particular, it is suitable for users who have the demand for a steady flow .



Fig 5: DC Water Pump

5. 12 v Battery:

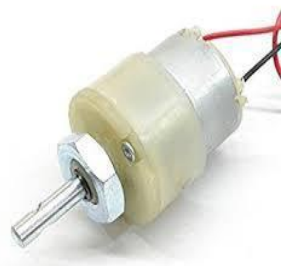
12 V , 2 Amp Battery is high power battery easily handle all the function. Main things are to collect electrical energy from solar panel and provide to various components For running specific function.



Fig 6: 12v Battery

6. DC motor:

A DC motor is an electrical device that converts electrical power into mechanical power output. Typically, this output manifests as rotational motion of the motor's shaft. Unlike some other types of motors that may accept either direct current (DC) or alternating current (AC) input, a DC motor specifically operates using direct current. This means that the electrical input supplied to the motor is in the form of direct current, resulting in the generation of rotational motion.

**Fig 7:** DC motor**7. Bluetooth module (HC-05):**

The HC-05 is an incredibly useful module that enhances projects by providing two-way (full-duplex) wireless capabilities. With this module, you can establish communication between two microcontrollers, such as Arduino boards, or interface with any device equipped with Bluetooth functionality, such as a phone or laptop. This versatility opens up a wide range of possibilities for creating interactive and connected systems, allowing seamless data exchange and control over wireless connections..

**Fig 8:** HC-05 Bluetooth module**8. Adapter (12v/2 ah):**

Adapter is used to provide the power to battery source. It can also used to provide power to operate whole system.

**Fig 9:** Adapter(12v/2ah)**9. Motor Driver IC (L293D):**

L293D is an integrated circuit (IC) that serves as a dual H-bridge motor driver. H-bridge motor drivers are crucial components in controlling the direction and speed of motors. They function as current amplifiers, taking low-current control signals and amplifying them to provide higher-current signals necessary to drive motors effectively.

**Fig 10:** Motor Driver IC (L293D)**10. Solar Panel:**

The solar energy that reaches the Earth in the form of radiation is a valuable resource utilized for various purposes, including heating and generating electrical energy. Among the non-conventional sources of energy,

solar energy stands out as one of the most promising due to its abundance and sustainability. Therefore, our project focuses on harnessing solar energy and converting it into electrical energy to power an agricultural robot, or "agribot."



Fig 11: SOLAR PANEL

11. Wheels:

It used to drive the whole machine. As the High torque motor attached to wheels, when button is pressed whole system runs automatically.



Fig 12: Wheels

VII. ADVANTAGES

1. Compact size and portable.
2. Free from Manmade pollution.
3. Robotic operation.
4. Automatic wireless communication
5. Operating principle is simple.
6. No wear and tear losses.
7. No maintenance cost.

VIII. APPLICATION

1. **Precision Agriculture:** Solar-powered seed sprayers can be used in precision agriculture to efficiently and accurately plant seeds in desired locations. This technology enables farmers to optimize seed placement, leading to improved crop yields and reduced resource wastage.
2. **Reforestation:** In efforts to combat deforestation and restore degraded lands, solar-powered seed sprayers can be deployed to efficiently sow seeds over large areas. This can aid in the establishment of new forests and promote biodiversity conservation.
3. **Erosion Control:** Solar-powered seed sprayers can be utilized to plant vegetation in erosion-prone areas, such as hillsides and riverbanks. By stabilizing the soil with vegetation, these machines can help prevent soil erosion and mitigate the risk of landslides.
4. **Land Rehabilitation:** In areas affected by land degradation due to factors like mining, urbanization, or improper land use, solar-powered seed sprayers can play a crucial role in restoring the fertility and ecological balance of the land by facilitating the growth of vegetation.
5. **Rangeland Management:** Solar-powered seed sprayers can assist in the management of rangelands by enabling the targeted planting of grasses and other forage crops. This can improve grazing conditions for livestock and support sustainable land management practices.

6. **Wildlife Habitat Restoration:** Solar-powered seed sprayers can aid in the restoration of wildlife habitats by planting native vegetation species that provide food and shelter for wildlife populations. This can contribute to biodiversity conservation efforts and ecosystem restoration.
7. **Urban Greening:** In urban areas, solar-powered seed sprayers can be used to green vacant lots, rooftops, and other urban spaces by planting trees, shrubs, and other vegetation. This can help mitigate the urban heat island effect, improve air quality, and enhance the overall aesthetics of urban environments.
8. **Disaster Recovery:** After natural disasters such as wildfires or hurricanes, solar-powered seed sprayers can be deployed to accelerate the natural regeneration of vegetation in affected areas, helping to stabilize soils, prevent erosion, and restore ecosystems.

IX. CONCLUSION

Innovative Seed sowing equipment has remarkable influence in agriculture. By using this innovative project of seed sowing equipment we can save more time required for sowing process and also it reduces lot of laborer cost.

It is very helpful for small scale formers. After comparing the different method of seed sowing and limitations of the existing machine, it is concluded that the this solar powered seed sowing machine can Maintain row spacing and controls seed rate.

Control the seed depth and proper utilization of seeds can be done with less loss. Perform the various simultaneous operations and hence saves labour requirement so as labour cost, labour time and also save lots of energy.

Hence it is easily affordable by farmers. So we feel that this project serves something good to this world and we would like to present it before this prosperous world.

X. REFERENCES

- [1] Sahay (1990), Principals of Agricultural Engineering (2005), Volume 1, Text book published by Jain brothers, New Delhi, India.
- [2] Horizontal seed metering machine in Rahuri Agriculture R and D department.
- [3] R. Joshua, V. Vasu and P. Vincent "Solar Sprayer - An Agriculture Implement", "International Journal of Sustainable Agriculture" 2 (1): 16-19, 2010 ISSN 2079-2107.
- [4] Mahesh. R. Pundkar and A. K.Mahd -Sowing Machine: Review International Journal of Engineering and Social SciencVolume3,Issue3, Pp-68-74.
- [5] Laukik P. Raut, Smit B. Jaiswal and NitinY. Mohite, Design, development, and fabrication of agricultural pesticides. With weeder, International Journal of Applied Research and Studies, 2013.
- [6] Ramesh and H. P. Girishkumar, Agriculture Seed Sowing Equipment: A Review, International Journal of Science, Engineering and Technology Research, 2014, Volume 3, Issue 7,Pp-1987-1992.
- [7] Pranil V. Sawalakhe, Amit Wandhare, Ashish Sontakke, BhushanPatil, Rakesh Bawanwade and SaurabhKurjekar, Solar Powered Seed Sowing Machine, Global Journal of Advanced Research, Vol-2, Issue-4, Pp-712-717.