“FABRICATION OF SOLAR POWERED REMOTE CONTROLLED SEED SOWING MACHINE”

A PROJECT REPORT

Submitted to Dr.Babasaheb Ambedkar Technological University, Lonere, Raigad in partial fulfillment of the requirements for the Degree of Bachelor in

MECHANICAL ENGINEERING

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CERTIFICATE

This is to certify that the project report entitled

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As a part of project work described by Dr.Babasaheb Ambedkar Technological University, Lonere, Raigad for the partial fulfillment of award of degree of Bachelor in Mechanical Engineering, is the result of students own work carried out under my supervision and guidance andthe same has not been submitted elsewhere for the award of any degree.

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DECLARATION

We hereby declare that the project entitled, **"FABRICATION OF SOLAR POWERED REMOTE CONTROLLED SEED SOWING MACHINE"** was carried out and written by us under the guidance of Prof.Manish Deshmukh sir (TPO), Department of Mechanical Engineering, Govt. College of Engineering, Yavatmal. This work has not been previously formed the basis for the award of any degree or diploma or certificate nor has been submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

Today's era is marching towards the rapid growth of all sectors including the agricultural sector. To meet the future food demands, the farmers have to implement the new techniques which will not affect the soil texture but will increase the overall crop production. The aim of this project is to design and develop a solar powered remote controlled fertilizer sprayer machine. The fertilizer sprayer machine is a key component of agricultural field. The various technique used in India for fertilizer sprayer and fertilizer placement are manual, ox and tractor operator. The manual and ox operator technique are time consuming and productivity is low. Tractor is running on fossil fuel which emits carbon dioxide and other pollution every second. This evident has led to widespread air, water and noise pollution and most importantly has led to a realistic energy crisis in the near future, in order to make the development of our farmer as well as nation sustainable and cause less harm to our environment. Nowthe approach of this project is to develop the fertilizer sprayer machine which is to minimize the working cost and the time for digging and fertilizing as well as operate on clean energy. In this machine solar panel is used to capture solar energy and then itis converted into electrical energy which in turn is used to charge 12V battery, which then gives the necessary power to a shunt wound DC motor. This power is then transmitted to the DC motor to drive the wheels. And to further reduction of labor dependency, IR sensors are used to maneuver robot in the field. Here 4 post sensors are used to define the territory and robot senses thetrack length and pitch for movement from line to line. Fertilizer sprayer and digging robot will move different ground contours and performs digging, sow the seed and water the ground after closing.

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CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

Agriculture is a cornerstone of human civilization, providing the food and resources essential for survival and economic stability. As the global population continues to rise, the demand for increased agricultural productivity and sustainability has never been higher. Traditional farming practices, while effective, often involve labor- intensive processes and dependency on non-renewable energy sources, contributing to environmental degradation.

In recent years, technological advancements have paved the way for innovative solutions in agriculture, aimed at enhancing efficiency, reducing labor costs, and minimizing environmental impact. One such innovation is the development of a solar-powered remote-controlled seed sowing machine. This cutting-edge device represents a significant leap forward in modern farming techniques, integrating renewable energy with automation to streamline the sowing process.

The solar-powered remote-controlled seed sowing machine harnesses the power of the sun to operate, ensuring a sustainable and eco-friendly energy source. Its remote-controlled functionality allows for precision and ease of operation, even in challenging terrains. This machine is designed to automate the seed sowing process, ensuring uniform distribution and optimal planting depth, which are crucial for maximizing crop yield.

By leveraging solar energy, this machine not only reduces the reliance on fossil fuels but also lowers operational costs, making it an economically viable option for farmers. Furthermore, the use of remote control technology enhances the efficiency and flexibility of farming operations, allowing for better resource management and increased productivity.

1.2 NEED

A solar-powered remote-controlled seed sowing machine is designed to address several agricultural needs and challenges

1. Energy Efficiency and Sustainability

- Reduced Energy Costs: Utilizing solar power reduces the dependency on conventional fuels, lowering operational costs and making the system more sustainable.
- Environmental Impact: Solar energy is clean and renewable, contributing to reduced carbon emissions and promoting eco-friendly farming practices.

2. Precision Agriculture

- Accurate Seed Placement: Remote control functionality allows for precise seed sowing, improving crop yield by ensuring optimal spacing and depth.
- Customization: Farmers can adjust settings for different crops and soil conditions, enhancing the adaptability of the machine.

3. Labor Efficiency

- Reduced Labor Requirements: Automation reduces the need for manual labor, which is particularly beneficial in areas facing labor shortages.
- Time Savings: Faster and more efficient sowing processes save time, allowing farmers to cover larger areas quickly.

4. Improved Crop Management

- Consistency: Ensures uniform seed distribution, leading to consistent crop growth and easier management of fields.
- Reduced Seed Wastage: Precise control minimizes seed wastage, optimizing resource use and reducing costs.

5. Accessibility and Convenience

- Remote Operation: Farmers can control the machine remotely, increasing convenience and allowing for operations in hard-to-reach or hazardous areas without physical presence.
- Ease of Use: Simplified operation and control systems make it accessible to farmers with varying levels of technical expertise.

6. Adaptation to Various Terrains

- Versatility: Can be designed to operate on different terrains and soil types, making it suitable for diverse agricultural environments.

7. Enhanced Productivity

- Continuous Operation: Solar power allows for continuous operation during daylight hours, potentially increasing productivity and efficiency.

1.3 OBJECTIVE

The development and utilization of a solar-powered remote-controlled seed sowing machine addresses several critical needs in modern agriculture. Here are the key reasons why such a machine is valuable:

1. Sustainability and Environmental Impact

- Renewable Energy Use: Utilizing solar power reduces dependence on fossil fuels, leading to lower greenhouse gas emissions and a smaller carbon footprint.
- Eco-friendly Operations: Solar energy is clean and renewable, making the machine environmentally sustainable.

2. Efficiency and Precision

- Precision Agriculture: Remote control and automation allow for precise seed placement, optimizing seed distribution and reducing wastage.
- Time-Saving: Automated seed sowing significantly reduces the time required for planting compared to manual methods.

3. Cost-Effectiveness

- Reduced Labor Costs: Automation reduces the need for manual labor, which can be a significant expense for farmers.
- Lower Operational Costs: Solar power eliminates fuel costs, leading to long-term savings.

4. Accessibility and Ease of Use

- Remote Operation: Farmers can control the machine from a distance, which is particularly useful in large fields or in conditions where direct manual operation is challenging.
- User-Friendly Interface: Modern remote-controlled machines are designed to be user-friendly, requiring minimal training to operate.

5. Scalability and Flexibility

- Scalability: These machines can be scaled for different sizes of farming operations, from small family farms to large agricultural enterprises.
- Adaptability: They can be programmed to handle various types of seeds and planting patterns, making them versatile for different crops and soilconditions.

6. Labor Shortages

- Addressing Labor Shortages: In regions where agricultural labor is scarce or expensive, automated seed sowing machines can fill the gap, ensuring timely planting.

7. Enhanced Productivity

- Increased Yields: Precision sowing leads to better crop stands and potentially higher yields due to optimal seed placement and depth.
- Reduced Fatigue: By automating labor-intensive tasks, farmers can focus on other critical aspects of farm management, potentially increasing overall productivity.

8. Technological Advancement

- Modernizing Agriculture: Incorporating advanced technology in farming practices helps modernize agriculture, making it more attractive to younger generations.
- Data Collection: Many remote-controlled machines can collect data on soil conditions, planting patterns, and other variables, aiding in better farm management decisions.

1.3 SCOPE

The project aims to deliver a functional prototype with the following functionalities:

- **Solar Power Generation:** A solar panel will be incorporated to harvest solar energy and convert it into electricity.
- **Energy Storage:** A rechargeable battery will store the generated electricity to power the machine's operations.
- **Seed Hopping and Metering:** A seed hopper will store and dispense seeds at a controlled rate using a dedicated metering mechanism.
- **Remote Control Operation:** A remote control unit will allow users to start/stop the machine, control forward/backward movement, and activate seed dispensing.

1.4 ORGANIZATION OF REPORT

To organize a report on a solar-powered remote-controlled seed sowing machine, begin with a title page that includes the title, authors, and date of submission. Follow this with an abstract summarizing the report's purpose, methodology, key findings, and conclusions. The table of contents should list all sections and sub-sections with their corresponding page numbers for easy navigation.

The introduction should provide background on traditional seed sowing methods and their limitations, define the problem the machine aims to solve, outline the objectives of the project, and set the scope of the report. In the literature review, analyze existing technologies and research related to seed sowing machines, discussing their advantages and limitations.

The system design and components section should offer an overview of the machine's design, detailing the mechanical and electrical components and the remote control system. Explain the working principle with a step-by-step operation guide, a flow diagram, and a description of the control algorithms used.

Detail the prototype development process, listing materials and tools, outlining the construction steps, and describing testing and calibration procedures. In the results and discussion section, analyze the machine’s performance, highlight its advantages, acknowledge any limitations, and suggest areas for future work.

Conclude the report with a summary of findings and final thoughts on the machine’s impact on agricultural practices. Include a references section for all cited sources and appendices for technical specifications, detailed diagrams, and additional data. Use figures, diagrams, and tables throughout the report to illustrate concepts and ensure consistent formatting and proofreading for clarity and accuracy. This comprehensive structure will effectively communicate the development and functionality of the solar-powered remote-controlled seed sowing machine.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTON

The intersection of renewable energy and automation in agriculture has garnered significant attention in recent years, driven by the need for sustainable and efficient farming practices. The development of a solar-powered remote-controlled seed sowing machine represents a convergence of these two pivotal trends. To understand the current state and potential of this innovative technology, it is essential to review the existing literature on related advancements in agricultural machinery, renewable energy applications in farming, and the integration of remote-controlled systems in agricultural operations.

2.2 LITERATURE STUDY

Singh (1971) revealed that by using a seed drill for wheat crop there was an increase in yield by 13.025 percent when compared with the conventional method, it also revealed that by using a seed drill for wheat crop, a saving of 69.96 per cent in man-hours and 55.17 percent in hulioc hours was achieved when compared, with the conventional method [4]

Umed Ali Soomro at in Pakistan has evaluated three sowing methods and seed rate ina four replicated RCBD method and concluded that drilling method of sowing at seed rate 125 kg/ha is optimal for yield and quality of wheat grains, because the said sowing method and seed rate distribute seed uniformly and desired depth which provide appropriate depth for seed germination and crop establishment.[4]

The main goal of M.A. As another agricultural researcher determined the effects of different seeding technique and machines and also different rates of oilseed rape application on seeding emergence plant establishment and final grain yield.[5]

Trupti A.Shinde. In fertilizer sprayer machine system, they are used battery powered wheels and dc motor inbuilt in these wheels. When the seeds are empty it detects the level of storage seed and indicates the alarm. When any obstacle comes in the in-front of machine or divert path the fertilizer sprayer machine can detect this obstacle very easily. In each complete rotation of rotating wheel there is seeds falls from this seed drum and the seed plantation process can take place smoothly as well as without wastage of seeds. The end of system machine reached and it create alarm.[3]

Kunal A. Dhande. Et.al In this work we replace complicated gear system by hall effect sensor for easier and costlier fertilizer sprayer and also reduce a need of labour. The Hall Effect sensor convert rotation into distance for which fertilizer sprayer at particular distance. Also, there is adjustable system for sowing at different distance. By using this machine, the sowing can be done row by row and distance will maintain. This research paper presents design modification in multipurpose sowing machine. In this they present that for sowing purpose we import the machinery which are bulk in size having more cost. To prevent this they design multipurpose sowing machine which consists of hopper, seed metering mechanism, ground wheel, power transmission system, seed distributor, and tiller. In this they design model on PRO-E software. Actually the working is very simple as the tiller rotates it directly transmit motion to ground wheel which directly connected through main shaft. A main shaft has a disc with scoops inside the hopper. When the ground wheel rotates the main shaft also rotates with the help of power transmission system. The scoops collect the seed from hopper and leave it inside the seed distributor. The tiller is having very good contact with ground.[7]

Mahesh R. Pundkar (2018) : The researcher stated that the fertilizer sprayer machine is a key component of agriculture field. High precision pneumatic planters have been developed for many verities of crops, for a wide range of seed sizes, resulting to uniform seeds distribution along the travel path, in seed spacing.[1]

Nivash et al (2018)The researcher states that the agriculture plays an important role in the life of economy. It is the backbone of our economy system. Sowing is one of the basic and best operations needed to get better revenue from agriculture. In Manual sowing has the problem of not giving acceptable spacing between row to row and plant to plant. It also leading to less population of crops than recommended by the agriculture. In this project work they focused on fertilizer sprayer processes and tried to solve the problem. In fertilizer sprayer machine system they are used wheels.[2]

Swapnil Thorat . (2017) The researchers made sowing machine which is operated manually but reduces the efforts of farmers thus increasing the efficiency of planting also reduces the problem encountered in manual planting. For this machine a farmer can plant different types and different sizes of seeds also we can vary the space between two seeds while planting. This also increased the planting efficiency and accuracy.[4]

D Ramesh This research paper present “Agriculture fertilizer sprayer Equipment: A Review”. The present review provides brief information about the various types of innovations done in fertilizer sprayer equipment. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. In this multipurpose seeding machine equipment consists of cylindrical shape container in which the seeds can fill. The container is attached on the four wheeled carrier assembly. It consists of metering plate bevel gear mechanism and two holes at the bottom depending on seed size. The working as plate will rotate in container when thebottom holes of container and meter plate hole coincide seeds will flow through pipe to soil. Here the metering plate gets rotating motion by bevel gear assembly and the bevel gears get the motion by rear wheels with the help chain and sprocket assembly.[6]

Kannan A This research paper presents design modification in multipurpose sowing machine. In this they present that for sowing purpose we import the machinery which are bulk in size having more cost. To prevent this they design multipurpose sowing machine which consists of hopper, seed metering mechanism, ground wheel, power transmission system, seed distributor, and tiller. In this they design model on PRO-E software. Actually the working is very simple as the tiller rotates it directly transmit motion to ground wheel which directly connected through main shaft. A main shaft has a disc with scoops inside the hopper. When the ground wheel rotates the main shaft also rotates with the help of power transmission system. The scoops collect the seed from hopper and leave it inside the seed distributor. The tiller is having very good contact with ground.[7] Marode . This research paper represents “Design & Implementation of Multi fertilizer sprayer Machine” .In this paper gives types sowing machine. The following are the three different types of fertilizer sprayer are broadcasting: A field is initially prepared with a plough to a series of linear cuts known as furrows. The field is then seeded by throwing the seeds over the field, a method known as manual broadcasting. The result was a field planted roughly in rows, but having a large number of plants. When the seeds are scattered randomly with the help of hand on the soil, the method is called broadcasting. Dribbling: Drill sowing and dribbling (making small holes in the ground for seeds) are better method of sowing the seeds. Once the seeds are put in the holes, they are then covered withthe soil. As the plough moves over the field the tube attached to it leaves the seeds

kept in the funnel at proper spacing and depth. The plough keeps making furrows in the soil in which the seeds are dropped by the seed drill.[8]

Shivprasad. This research paper presents information about modern globalization; many technologies are to update a new development based on automation which works very rigidly, high effectively and within short time period. The aim of designedsystem is to seeding fertilizing and soil ph, temperature, moisture, humidity checking. The robot and remote system are connected through internet system. DC motors are used for navigation of the robot. The speed of DC motor is controlled using controller. The solenoid is used to control seeding fertilizing. This paper gives idea about the automation and use of motor for movement of belt conveyor[10].

Rohokale .Agriculture is demographically the broadest economic sector and plays a significant role in the overall economy of India. For the growth of Indian economy, mechanization is necessary. The main purpose of mechanization in the agriculture is to improve the overall productivity and production. Planning is conventionally done manually which involves humans and draught animals, this result in higher cost of cultivation and delay in planting. The purpose of this paper is to compare conventional sowing methods and modern methods. The required row to row spacing seed rate ,seed to seed spacing can be achieved by proposed machine.[3]

P.P. Shelke [3] concludes that bullock drawn planters are becoming necessity for sowing as the skilled workers for sowing are almost diminishing. Planting distance and plant population are crucial factors in maximizing the yields of crops.

2.3 CONCLUDING REMARK OF LITERATURE REVIEW

The exploration of existing literature on solar-powered remote-controlled seed sowing machines underscores a significant paradigm shift in modern agricultural practices. The integration of solar energy with remote-controlled automation offers a promising solution to many of the challenges faced by contemporary farming, including labor-intensive processes, dependency on non-renewable energy sources, and the need for precision in seed sowing.

Research indicates that traditional seed sowing methods, while effective, are increasingly becoming unsustainable due to high labor costs and environmental impact. The transition to mechanized and automated systems is essential for improving efficiency and reducing the ecological footprint of agricultural operations.

Solar power, as a renewable and cost-effective energy source, has demonstrated considerable potential in various agricultural applications, further validating its viability for powering seed sowing machinery.

The incorporation of remote control technology enhances the functionality and flexibility of agricultural equipment, allowing for precise and adaptable farming operations. Studies have shown that such systems can significantly improve the accuracy of seed placement and depth, leading to better crop yields and resource management.

Despite the promising advantages, the literature also highlights several challenges and areas for further research. These include optimizing the design and functionality of the machinery, ensuring affordability and accessibility for small-scale farmers, and addressing potential technical and operational issues related to the integration of solar and remote-controlled technologies.

CHAPTER 3

DIFFERENT COMPONENT AND ASSEMBLY

3.1 INTRODUCTION

This chapter details the various components required for the FABRICATION OF SOLAR POWERED REMOTE CONTROLLED SEED SOWING MACHINE and outlines the assembly process. Each component plays a crucial role in ensuring the functionality and efficiency of the solar power bank. Understanding these components and their interactions is essential for creating an effective and reliable solar power solution.

3.2 COMPONENTS

3.2.1 SOLAR PANEL

As shown in the fig.3.2.1, A solar panel, or photo-voltaic (PV) module, is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity. A collection of PVmodules is called a PV panel, and a system of panels is an array. Arrays of aphotovoltaic system supply solar electricity to electrical equipment.

Fig. 3.2.1 SOLAR PANEL

Solar panels collect clean renewable energy in the form of sunlight and convert that light into electricity which can then be used to provide power for electrical loads. Solar panels are comprised of several individual solar cells which are themselves composed of layers of silicon, phosphorous (which provides the negative charge), and boron (which provides the positive charge). Solar panels absorb the photons and in doing so initiate an electric current. The resulting energy generated from photons striking the surface of the solar panel allows electrons to be knocked out of their atomic orbits and released into the electric field generated by the solar cells

which then pull these free electrons into a directional current. This entire process is known as the Photovoltaic Effect. An average home has more than enough roof area for the necessary number of solar panels to produce enough solar electricity to supply all of its power needs excess electricity generated goes onto the main power grid, paying off in electricity use at night. In a well-balanced grid-connected configuration, a solar array generates power during the day that is then used in the home at night.Net metering programs allow solar generator owners to get paid if their systemproduces more power than what is needed in the home. In off-grid solar applications,a battery bank, charge controller, and in most cases, an inverter are necessary components. The solar array sends direct current (DC) electricity through the charge controller to the battery bank. The power is then drawn from the battery bank to the inverter, which converts the DC current into alternating current (AC) that can be used for non-DC appliances. Assisted by an inverter, solar panel arrays can be sized to meet the most demanding electrical load requirements. The AC current can be used to power loads in homes or commercial buildings, recreational vehicles and boats, remote cabins, cottages, or homes, remote traffic controls, telecommunications equipment, oil and gas flow monitoring, RTU, SCADA, and much more.

3.2.2 LITHIUM ION BATTERY- 3.7V 20000mah

As we shown in the fig. 3.2.2, Lithium ion polymer (also known as 'lipo' or 'lipoly') batteries are thin, light and powerful. The output ranges from 4.2V when completely charged to 3.7V. This battery has a capacity of 2000mAh. If you need a larger (or smaller!) battery, we have a full range of LiPoly batteries

The batteries come pre-attached with a genuine 2-pin JST-PH connector as shown and include the necessary protection circuitry. Because they have a genuine JST connector, not a knock-off, the cable wont snag or get stuck in a matching JST jack, they click in and out smoothly.

The included protection circuitry keeps the battery voltage from going too high (over-charging) or low (over-use) which means that the battery will cut-out when completely dead at 3.0V. It will also protect against output shorts. However, evenwith this protection it is very important that you only use a LiIon/LiPoly constant-voltage/constant-current charger to recharge 1 Downloaded from Arrow.com. them and at a rate of 2A or less (500mA is best). We suggest our Micro Lipo charger,

which has a 100mA default rate. You can also set the Micro Lipo to 500mA rate for a faster charge.

Like most lipos, the batteries we sell do not have thermistors built in. This is why we suggest charging at 1 C or even less - 100 to 500mA is a good rate, and available from any USB port if using a USB-powered charger

Additional safety notes: Do not use a NiMH/NiCad/lead-acid charger! Also, do not abuse these batteries, do not short, bend, crush or puncture. Never charge or use unattended. Always inspect batteries and surrounding circuitry constantly for any damage, loose wiring, or possibility of short circuits. As with all Lithium ion polymer batteries and with any power source - they should be used by experts who are comfortable working with power supplies

TECHNICAL DETAILS Dimensions: 60mm x 36mm x 7mm / 2.4" x 1.4" x 0.3"• Weight: 34g

- Nominal Capacity: 2000mAh ±2%• Nominal Voltage: 3.7V• Standard Charge Current: ~0.2C / 0.5A• Charge Cut-Off Voltage: 4.2V• Standard Discharge Current: ~0.2C / 0.5A• Battery Datasheet• MSDS Report•

Fig. 3.2.2 LITHIUM ION BATTERY

3.2.3 CHARGE CONTROLLER

As we shown in the fig. 3.2.3, A charge controller, charge regulator or batteryregulator limits the rate at which electric current is added to or drawn from electric batteries .It prevents overcharging and may protect against overvoltage,

Fig. 3.2.3 CHARGE CONTROLLER

which can reduce battery performance or lifespan and may pose a safety risk. It may also prevent completely draining (“deep discharging”) a battery, or perform controlled discharges, depending on the battery technology, to protect battery life. The terms “charge controller” or “charge regulator” may refer to either a standalone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery charger. Charge controllers are sold to consumers as separate devices, often in conjunction with solar or wind power generators, for uses such as RV, boat, and off-the-grid home battery storage systems. In solar applications, charge controllers may also be called solar regulators. Some charge controllers / solar regulators have additional features, such as a low voltage disconnect (LVD), a separate circuit which powers down the load when the batteries become overly discharged (some battery chemistries are such that over-discharge can ruin the battery).A series charge controller or series regulator disables further current flow into batteries when they are full. A shunt charge controller or shunt regulator diverts excess electricity to anauxiliary or “shunt” load, such as an electric water heater, when batteries are full. Simple charge controllers stop charging a battery when they exceed a set high voltage level, and re-enable charging when battery voltage drops back below that level. Pulse width modulation (PWM) and maximum power point tracker (MPPT) technologies

are more electronically sophisticated, adjusting charging rates depending on the battery's level, to allow charging closer to its maximum capacity.[citation needed] A charge controller with MPPT capability frees the system designer from closely matching available PV voltage to battery voltage. Considerable efficiency gains can be achieved, particularly when the PV array is located at some distance from the battery. By way of example, a 150 volt PV array connected to an MPPT charge controller can be used to charge a 24 or 48 volt battery. Higher array voltage means lower array current, so the savings in wiring costs can more than pay for the controller.[citation needed] Charge controllers may also monitor battery temperature to prevent overheating. Some charge controller systems also display data, transmit data to remote displays, and data logging to track electric flow over time Circuitry that functions as a charge regulator controller may consist of several electrical components, or may be encapsulated in a single microchip, an integrated circuit (IC) usually called a charge controller IC or charge control IC. Charge controller circuits are used for rechargeable electronic devices such as cell phones, laptop computers, portable audio players, and uninterruptible power supplies, as well as for largerbattery systems found in electric vehicles and orbiting space satellites.

3.2.4 ARDUINO

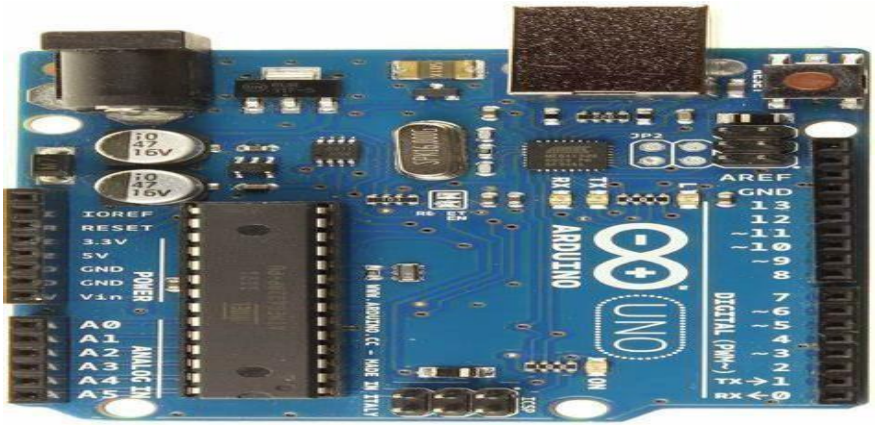

Fig. 3.2.4 ARDUINO

As we shown the fig. 3.2.4, The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. The

Arduino Nano has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provide UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An FTDI FT232RL on the board channels this serial communication over USB and the FTDI drivers (included with the Arduino software) provide a virtual com port to software on the computer. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Nano's digital pins. The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus. [5] The Arduino Nanois equipped with 30 male I/O headers, in a dip-30 like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-b micro-USB cable, or through a 9V battery.In 2019, Arduino released the Arduino Nano Every, a pin-equivalent evolution of the Nano. It features a more powerful ATmega4809 processor, and twice the RAM. Microcontroller: Microchip ATmega328P Operating Voltage: 5 Volts Input Voltage: 6 to 20 Volts Digital I/O Pins: 14 (plus 6 can PWM output pins) Analog Input Pins: 8 DC Current per I/O Pin: 40 mA DC Current for 3.3V Pin: 50 mA Flash Memory: 32 KB of which 0.5 KB used by bootloader.

3.2.5 DRIVER (L298N)

As we shown in the fig. 3.2.5, This L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control. The L298N Motor Driver module consists of an L298 Motor Driver IC, 78M05 Voltage Regulator, resistors, capacitor, Power LED, 5V jumper in an integrated circuit. 78M05 Voltage regulator will be enabled only when the jumper is placed. When the power supply is less than or equal to 12V, then the internal circuitry will be powered by the voltage regulator and the 5V pin can be used as an output pin to power the microcontroller. The jumper should not be placed when the power supply is greater than 12V and separate 5V should be given through 5V terminal to power the internal circuitry. ENA

& ENB pins are speed control pins for Motor A and Motor B while IN1& IN2 and IN3 & IN4 are direction control pins for Motor A and Motor B. Applications of L298N Module: Drive DC motors. Drive stepping motors in Robotics

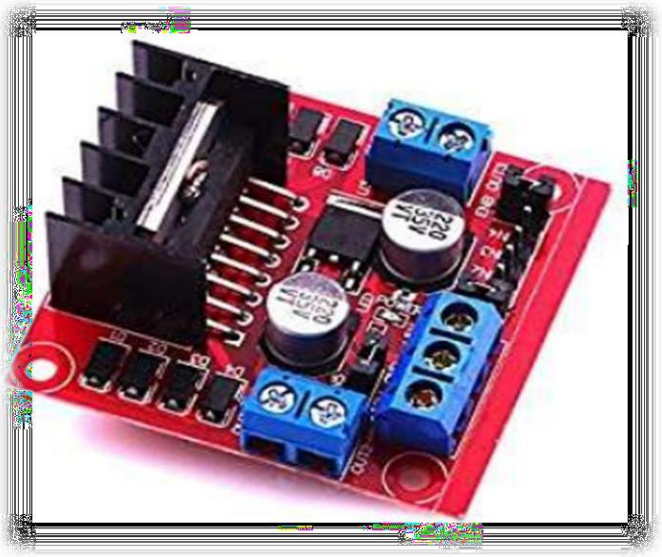

Fig. 3.2.5 DRIVER (L298N)

3.2.6 SERVO MOTOR

Fig. 3.2.6 SERVO MOTOR

As we shown the fig. 3.2.6, A servo motor is a rotary actuator or a motor that allows for a precise control in terms of the angular position, acceleration, and velocity. Basically it has certain capabilities that a regular motor does not have. Consequently it makes use of a regular motor and pairs it with a sensor for position. Servo motor works on the PWM (Pulse Width Modulation) principle, which means its angle of rotation is controlled by the duration of pulse applied to its control PIN. Basically

servo motor is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears. Basically a servo motor is a closed-loop servomechanism that uses position feedback to control its motion and final position. Moreover the input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft . The motor is incorporates some type of encoder to provide position and speed feedback. In the simplest case, we measure only the position. Then the measured position of the output is compared with the command position, the external input to controller. Now If the output position differs from that of the expected output, an error signal generates. Which then causes the motor to rotate in either direction, as per need to bring the output shaft to theappropriate position. As the position approaches, the error signal reduces to zero. Finally the motor stops. The very simple servomotors can position only sensing via a potentiometer and bang-bang control of their motor. Further the motor always rotates at full speed. Though this type of servomotor doesn't have many uses in industrial motion control, however it forms the basis of simple and cheap servo used for radio control models. Servomotors also find uses in optical rotary encoders to measure the speed of output shaft and a variable-speed drive to control the motor speed. Now this, when combined with a PID control algorithm further allows the servomotor to be inits command position more quickly and more precisely with less overshooting . Servo motors control position and speed very precisely. Now a potentiometer can sense the mechanical position of the shaft. Hence it couples with the motor shaft through gears. The current position of the shaft is converted into electrical signal by potentiometer, and is compared with the command input signal. In modern servo motors, electronic encoders or sensors sense the position of the shaft . We give command input according to the position of shaft . If the feedback signal differs from the given input, an error signal alerts the user. We amplify this error signal and apply as the input tothe motor, hence the motor rotates. And when the shaft reaches to the require position error signal become zero , and hence the motor stays standstill holding the position. The command input is in form of electrical pulses . As the actual input to the motor is the difference between feedback signal (current position) and required signal, hence speed of the motor is proportional to the difference between the current position and required position . The amount of power require by the motor is proportional to the distance it needs to trave.

3.2.7 60 RPM DC MOTOR

As we shown the fig. 3.2.7, An electric motor is a device used to convert electrical energy to mechanical energy. Electric motors are extremely important in modern day life. The basic principle on which motors operate is Ampere's law. This law states that a wire carrying an electric current produces a magnetic field around itself. A DC motor is any of a class of rotary electrical motors that converts direct current electricalenergy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor. DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications. 60RPM DC Motor is high quality low cost DC geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. The output shaft rotates in a plastic bushing. The whole assembly is covered with a plastic ring.Gearbox is sealed and lubricated with lithium grease and require no maintenance. The motor is screwed to the gear box from inside. Although motor gives 60 RPM at 12V but motor runs smoothly from 4V to 12V and gives wide range of RPM, and torque. information below gives fairly good idea of the motor's performance in terms of RPMand no load current as a function of voltage and stall torque, stall current as a functionof voltage. For compatible wheels refer to Wheels and Accessories product category. You can also mount this motor on the chassis using Motor Mount for Centre Shaft Economy Series DC Motor.

For adding Position Encoder, refer to Encoder Kit for Centre Shaft Economy Series DC Motor Specifications DC supply: 4 to 12V RPM: 60 at 12V Total length: 46mm Motor diameter: 36mm Motor length: 25mm Brush type: Precious metal Gear head

diameter: 37mm Gear head length: 21mm Output shaft: Centred Shaft diameter: 6mm Shaft length: 22mm Gear assembly: Spur Motor weight: 100gms.

Fig. 3.2.7 60 RPM DC MOTOR

3.2.8 RELAY

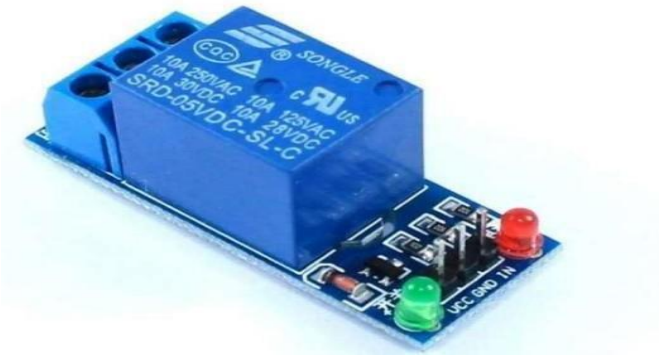

Fig. 3.2.8 RELAY

As we shown the fig. 3.8.8, A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof. Relays are used where it is necessary to control a circuit by an independent low-power signal, or

where several circuits must be controlled by one signal. Relays were first used in long distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. The traditional form of a relay uses an electromagnet to close or open the contacts, but other operating principles have been invented, such as in solid-state relays which use semiconductor properties for control without relying on moving parts. Relays with calibrated operating characteristics and sometimes multiple operating coils are used toprotect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protective relays. Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to a second set of control terminals, or a pulse withopposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling. The use of relays for the logical control of complex switching systems like telephone exchanges was studiedby Claude Shannon, who formalized the application of Boolean algebra to relaycircuit design in A Symbolic Analysis of Relay and Switching Circuits. Relays can perform the basic operations of Boolean combinatorial logic. For example, the boolean and function is realised by connecting normally open relay contacts in series, the OR function by connecting normally open contacts in parallel. Inversion of a logical input can be done with a normally closed contact. Relays were used for controlof automated systems for machine tools and production lines. The Ladderprogramming language is often used for designing relay logic networks.

3.2.9 HC05 BLUETOOTH MODULE

Fig. 3.2.9 HCO5 BLUETOOTH MODULE

As we shown the fig. 3.2.9, HC05 bluetooth module –The HC-05 is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The module communicates with the help of USART at 9600 baudrate hence it is easy to interface with any microcontroller that supports USART. We can also configure the default values of the module by using the command mode. Soif you looking for a Wireless module that could transfer data from your computer or mobile phone to microcontroller or vice versa then this module might be the right choice for you. However do not expect this module to transfer multimedia like photos or songs; you might have to look into the CSR8645 module for that.The HC-05 has two operating modes, one is the Data mode in which it can send and receive data fromother Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin as explained in the pin description.It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). Simply power the module with +5V and connect the Rx pin of the module to the Tx of MCU and Tx pin of module to Rx of MCU as shown in the figurebelow During power up the key pin can be grounded to enter into Command mode, if left free it will by default enter into the data mode. As soon as the module is powered you should be able to discover the Bluetooth device as “HC-05” then connect with it using the default password 1234 and start communicating with it. The name passwordand other default parameters can be changed by entering into the HC-05.

3.2.10 WHEELS

Fig. 3.2.10 WHEELS

As we shown the fig. 3.2.10, A wheel is a disc or circle-shaped mechanical device. Its main purpose is to allow things to roll; in other words, the wheel spins, and object on the wheels moves more easily along the ground. It is a simple machine. Most land vehicles roll on wheels. Wheels are often used in pairs, connected by a rod of wood or metal known as an axle. Many machines have wheels with teeth, known as gears. The principle behind the wheel is that of mechanical advantage. Four disc wheels with 50mm diameter are used for movement purpose. The movement of machine is dependent on the movement of wheels. Wheels will rotate with rotation of motor in forward position. Hence the motor will also move in forward direction.

3.3 LIST OF MATERIAL

Sr. No.	Particulars	Quantity
1	Solar Panel	2
2	Battery	2
3	Charge Controller	1
4	Arduino	1
5	Driver (L298N)	1
6	Servo Motor	1
7	DC Motor	4
8	Relay	1
9	HC05 Bluetooth Module	1
10	Wheels	4

Table No. 3.3

3.4 COST FOR PURCHASE PARTS

Sr No.	Particulars	Quantity	Cost
1	Solar Panel	2	100
2	Battery	2	150
3	Charge Controller	1	200
4	Arduino	1	400
5	Driver (L298N)	1	150
6	Servo Motor	1	130
7	DC Motor	4	320
8	Relay	1	80
9	HC05 Bluetooth	1	360
10	Wheels	4	200

Table No. 3.4

CHAPTER 4

PERFORMANCE ANALYSIS AND WORKING

4.1 INTRODUCTION

Overview of Agriculture and Technology

Agriculture has been the backbone of human civilization, playing a crucial role in the sustenance and development of societies. With the exponential growth in population and the corresponding increase in food demand, modern agriculture faces significant challenges. Technological advancements have continually sought to address these challenges by improving efficiency, productivity, and sustainability. One such innovation is the integration of renewable energy and automation in farming practices.

Solar Powered Technology in Agriculture

Solar power, a clean and renewable energy source, has gained prominence in various sectors, including agriculture. The utilization of solar energy in farming not only reduces dependency on fossil fuels but also lowers operational costs and minimizesthe environmental impact. Solar-powered machinery, such as irrigation systems, tractors, and processing units, is becoming increasingly common, contributing to the overall sustainability of agricultural practices.

Remote Controlled Seed Sowing Machines

Among the numerous agricultural tasks, seed sowing is fundamental. Traditionally, seed sowing is labor-intensive and time-consuming, often requiring significant human effort and precision. To enhance efficiency and accuracy, remote controlled seed sowing machines have been developed. These machines offer several advantages, including reduced labor costs, precise seed placement, and the ability to operate in challenging terrains.

Integration of Solar Power and Remote Control

Combining solar power with remote controlled seed sowing machines represents a significant technological leap in modern agriculture. Solar-powered remote controlled seed sowing machines leverage the benefits of both renewable energy and automation. They ensure continuous operation without reliance on external power sources, making them ideal for use in remote or off-grid areas. Additionally, remote control

capabilities allow for precision farming, enabling farmers to manage their fields with greater accuracy and less physical presence.

4.2 Objectives of Performance Analysis

The performance analysis of solar-powered remote controlled seed sowing machines involves assessing various parameters to ensure optimal functionality and efficiency. The primary objectives include:

- **Evaluating Energy Efficiency**: Analyzing the efficiency of solar panels and the overall energy consumption of the machine to ensure sustainable operation.
- **Assessing Operational Efficiency**: Measuring the accuracy and speed of seed placement, coverage area, and the ability to operate in different soil and terrain conditions.
- **Determining Cost-Effectiveness**: Comparing the operational costs with traditional methods and other mechanized solutions to evaluate economic viability.
- **Ensuring Reliability and Durability**: Testing the machine's performanceunder various environmental conditions to determine its robustness and lifespan.
- **User Experience and Feasibility**: Gathering feedback from users regarding ease of operation, maintenance requirements, and overall satisfaction.

4.3 ADVANTAGES, DISADVANTAGES AND APPLICATION

4.3.1 Advantages Of solar powered remote control seed sowing machine

1. This machine is going to run on solar energy i.e., solar panel will capture the solar energy and going ito convert it into electrical energy
2. Reduces the human efforts in the field.
3. Reduces the cost of work.
4. Seed get fertilized at the same time of sowing.
5. Seed gets sowed at proper depth.
6. It can be used also for various seed.
7. it saves operating time and saving on cost of operation as compared –to conventional method of behind country plough

8. Seed gets sowed at proper depth.

4.3.2 Disadvantages Of solar powered remote control seed sowing machine:

1. Needs prepared soil at the correct temperature .
2. Tiny seedlings are often bait for snails, mice and other munching creatures.
3. Small seeds often get sowed too thickly and need to be thinned.
4. Autumn sowing can be damaged by overwinter wet and cold.

4.3.3 Application Of solar powered remote controlled seed sowing machine:

1. Small and mediun sized farm
2. Precision Agriculture
3. Difficult Terrain
4. Sustainable Farming
5. Farming

4.4 WORKING

Solar powered remote controlled seed sowing machine is device which works on solar energy with the help of remote. When farmer going to sow the seed he can do it by ourself without any man power. Solar panel is the main component of this device. Solar energy takes and store's all the solar energy and after convet it into Electrical energy and converts it to battery thus farmer/person doesn't need to worry about the charging of battery. And in addition to this we set the program in nano Arduino. So now the whole device going to work on remote/mobile app with the help of blutooth.

4.5 SCOPE FOR FUTURE DEVELPOEMENT

Addition of multi-hopper can be attached side by side for sowing of large farm. This machine can be added with other sensors as soil pH sensor and temperature and humidity sensor. Also addition of the moisture sensors which can be used to check moisture

CHAPTER 5

CONCLUSION

5.1 CONCLUDING REMARK

the development of the solar-powered remote-controlled seed sowing machine represents a significant advancement in agricultural technology. This innovative solution addresses key challenges in modern farming, including labor shortages, sustainability, and efficiency. By harnessing solar energy, the machine offers an eco-friendly alternative to traditional methods, reducing the reliance on fossil fuels and minimizing the carbon footprint. The integration of remote control capabilities further enhances precision and ease of use, allowing farmers to optimize their planting processes. Overall, this technology promises to revolutionize the agricultural sector, contributing to increased productivity and promoting environmentally responsible farming practices.

5.2 CONCLUSION

The solar-powered remote-controlled seed sowing machine represents a significant advancement in agricultural technology, offering numerous benefits that address environmental, economic, and operational challenges in farming. By improving efficiency, reducing costs, and promoting sustainable practices, such machines play a crucial role in the future of agriculture.

5.3 FUTURE SCOPE

Addition of multi-hopper can be attached side by side for sowing of large farm. This machine can be added with other sensors as soil pH sensor and temperature and humidity sensor. Also addition of the moisture sensors which can be used to check moisture

REFERENCES

[1] H. Heege and B. Feldhaus. “Site Specific Control of Seed-Numbers per Unit Area for Grain Drills,” Agricultural Engineering International: the CIGR Journal of Scientific Research and Development.Manuscript PM 01 012, Vol. IV December, 2002.

[2]. Prof.Pranil V. Sawalakhe Amit Wandhare, Ashish Sontakke, BhushanPatil, Rakesh Bawanwade&SaurabhKurjekar Department of Mechanical Engineering,Priyadarshini College of Engineering , Nagpur, India.

[3]. Sahay (1990), Principals of Agricultural Engineering (2005), Volume 1, Text book published by Jain brothers, New Delhi, India.

[4]. Horizontal seed metering machine in Rahuri Agriculture R and D department

[5]. 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

[6]. Mahesh. R. Pundkar and A. K.Mahd - Sowing Machine: Review International Journal of Engineering and Social SciencVolume3,Issue3, Pp-68-74

[7]. 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.

[8]. 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 [

[9]. Pranil V. Sawalakhe, Amit Wandhare, Ashish Sontakke, BhushanPatil, Rakesh Bawanwade and SaurabhKurjekar, Solar Powered Seed Sowing Machine, Global Journal of Advanced Research, Vol-2, Issue4, Pp-712-717

[10]. Sridhar H .S Development of Single Wheel Multi-Use Manually Operated Weed Remover, International Journal of Modern Engineering Research, 2013