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Automatic Solar Seed Sower

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Abstract- This project describes the design and implementation of a solar-powered seed sower machine for small and mid-scale farmers. In the machine, the solar power acts as the driving force, and the system is eco-friendly and economically feasible. In the proposed system, the use of solar power will reduce the dependency on human labor and increase the efficiency of the seed sowing process while ensuring equal distribution of seeds. In addition, the solar-powered seed sower helps automate the process of seed sowing, and the seeds will be planted at the correct distance and depth, allowing for efficient crops to be obtained and optimizing the amount of seeds used during the process. Moreover, the use of the solar-powered seed sower facilitates the farmer in terms of reduced effort and cost associated with planting and maintaining crops. Finally, the solar seed sower machine is simple to construct and handle, and the system requires low maintenance.

Keywords: Agricultural automation, Renewable energy, Seed sowing machine, Solar energy, Sustainable farming.

I. INTRODUCTION

Agriculture is an essential element in the economic development of various countries, and more so in rural areas where agriculture is the basic living source for the people. The conventional method for planting seeds is done by human effort, which is time-cumbersome, manual, and at times resulting in an equal distance between the planted seeds. with the increasing shortage and cost of agricultural workers, the need for affordable and workable machines for small, medium, and large scale farmers is increasing day by day.

With the increasing need for green and eco-friendly technologies, the usage of renewable sources of energies in agricultural equipment has also risen up substantially in the past few years, and sunlight, with its incessant supply and zero pollution, provides a viable extension of the previous machines that run in terms of fueled energies. the engineering project that has been taken up for development is related to creating a seed sowing machine that can run using sunlight as its energy source, which can in turn reduce human effort as well as costs that are involved in seed planting, providing a viable alternative for sustainable farming practices.

II. LITERATURE REVIEW

The Automatic Solar Seed Sowing Machine is rooted in research on agricultural mechanization, precision farming, renewable energy utilization, and embedded system automation.

Literature indicates that traditional seed sowing methods such as broadcasting and manual dibbling are labor-intensive and often result in non-uniform seed spacing and depth, leading to reduced crop yield. Mechanized seed drills and planters have improved sowing accuracy, but their dependence on fossil fuels and high operational costs limit accessibility for small and marginal farmers.

Recent studies in precision agriculture highlight the use of microcontroller-based systems, sensors, and motor-driven seed metering mechanisms to achieve accurate seed placement and optimized plant population. Parallel research in renewable energy shows that solar power is increasingly being integrated into agricultural applications such as irrigation pumps, dryers, and autonomous field robots, demonstrating its feasibility as a clean and sustainable energy source.

Solar-powered robotic platforms and automated farming tools emphasize the importance of

photovoltaic panels, battery storage, and efficient power management systems to ensure reliable operation under varying environmental conditions. Studies on seed metering mechanisms, including cell wheel and vacuum-based systems, confirm that controlled actuation improves germination rates by reducing seed wastage and overlapping. However, existing literature reveals limited work on compact, low-cost, solar-powered automatic seed sowing machines designed specifically for small-scale farming. Thus, the development of an Automatic Solar Seed Sowing Machine addresses the research gap by combining renewable energy, automation, and precision seed placement to enhance agricultural productivity while promoting sustainable and eco-friendly farming practices.

III. METHODOLOGY/EXPERIMENTAL

A. MATERIALS AND WORKING PRINCIPLE

The proposed method for the solar seed sower machine is based on component selection, integration, and testing for the efficiency of the system in its operations. The components identified for use in the Solar Seed Sower machine are a Solar Panel, Rechargeable Battery, Bo Motor, Seed Hopper, Arduino Nano, Hc-05 Bluetooth, SG 90 Servo Motors, Wheels, Frame. The solar panels are used for converting sunlight into electrical power, which is stored in the rechargeable battery for use in running the motor.

The mechanism involves using solar energy for seed sowing through mechanical movements. the solar panel converts light energy into electricity and stores it in a battery when in contact with sunlight. The electricity turns on the motor that causes rotation of the wheels and seed dispersing mechanism. the seeds are planted at an equal rate and depth to allow proper growth since they are equally distributed without wastage. The use of solar energy eliminates fuel costs and dependence on human-made electricity present in most farms, making it cheaper than other methods.

IV. RESULTS AND DISCUSSIONS

The developed solar seed sower machine was tested under normal field conditions to evaluate its performance in terms of efficiency, energy utilization, and ease of operation. The system operated smoothly using solar power, and the battery provided sufficient backup to ensure continuous functioning during short periods of low sunlight. the seed metering mechanism delivered seeds at uniform intervals, resulting in consistent spacing and proper placement in the soil.

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The machine significantly reduced the time required for seed sowing compared to traditional manual methods. manual sowing typically involves high labour effort and uneven seed distribution, whereas the proposed system minimized human intervention and improved sowing accuracy. The use of solar energy eliminated fuel consumption, reducing operating costs and environmental impact.

Field observations indicated a noticeable reduction in seed wastage due to controlled seed flow and uniform depth placement. The machine was found to be easy to operate. its lightweight and simple construction made it suitable for small and medium-sized farms. However, the performance of the system depends on sunlight availability, and efficiency may decrease under cloudy conditions. overall, the experimental results demonstrate that the solar seed sower machine is an effective, economical, and sustainable solution for modern agricultural practices. The system successfully meets the

objectives of saving time, reducing manual labour, and promoting renewable energy usage in farming.

V. CONCLUSION

The solar-powered seed sowing machine designed in the project proves to be an efficient application of renewable energy sources in agricultural mechanization. The designed system eliminates the efforts of human beings by saving their time to sow seeds uniformly, resulting in enhanced agricultural efficiency. The biggest advantage of the machine is that it runs on solar energy; therefore, it does not consume any fuel or electricity. It proves to be an economical solution to farmers. Though there could be variations in performance based on sunlight, it has been confirmed through experimentations that the designed system is quite efficient to be implemented in agricultural fields. Some improvements could be done by adding sensors to the system to make it fully automatic.

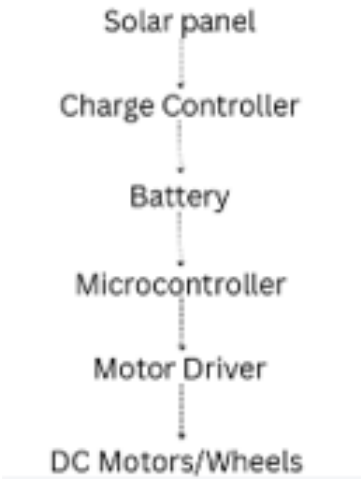

FIG.1-FLOWCHART

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