

# Development and Design of Solar Grass Cutter

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**Abstract:** *This paper presents the design and development of a solar-powered grass cutter aimed at reducing fuel consumption and environmental pollution. The system uses a photovoltaic panel to convert solar energy into electrical energy, which is stored in a battery and used to operate a DC motor for grass cutting. The proposed model is cost-effective, easy to operate, and environmentally friendly. Experimental results show that the solar grass cutter provides efficient cutting performance under adequate sunlight conditions, making it a sustainable alternative to conventional grass cutting machines.*

**Keywords:** Solar energy, Solar grass cutter, Renewable energy, DC motor, Photovoltaic panel, Eco-friendly machine

## I. INTRODUCTION

Agricultural equipment has led to the development of solar-powered machines. A solar grass cutter is an eco-friendly system that operates using electrical energy generated from photovoltaic (PV) panels. The solar energy is converted into electrical power, stored in a battery, and used to drive a DC motor coupled with a cutting mechanism.

## II. LITERATURE REVIEW

Research on solar grass cutters mainly focuses on designing eco-friendly, cost-effective alternatives to conventional petrol-powered machines. Most studies emphasize solar panel integration, battery storage, and DC motor selection to reduce fuel consumption, noise, and pollution. Recent works introduce automation using sensors, microcontrollers, and IoT for obstacle detection and remote control. While solar grass cutters are efficient and sustainable, limitations such as dependency on sunlight, limited power output, and lack of long-term performance evaluation remain. Future research highlights the need for improved energy storage, standardized performance metrics, and advanced automation.

## III. PROBLEM STATEMENT AND OBJECTIVE

Conventional grass cutters cause pollution, noise, and high fuel costs. A solar grass cutter is needed to provide an eco-friendly, low-cost, and energy-efficient alternative.

### OBJECTIVE

The objective of this project is to design and develop a solar-powered grass cutter that reduces fuel consumption, operating cost, noise, and environmental pollution by efficiently utilizing renewable solar energy while minimizing human effort.

## IV. DESIGN LOGIC AND METHODOLOGY

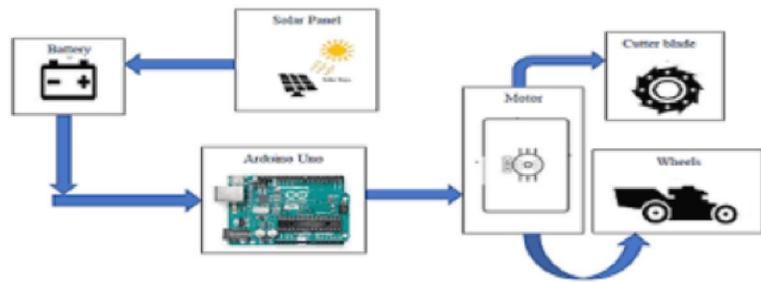
### Design logic

The design logic is to convert solar energy into electrical energy using a solar panel, store it in a battery, and use this power to drive a DC motor for grass cutting. The system is designed to operate efficiently with minimal energy loss, reduced noise, and low maintenance while ensuring safe and effective cutting performance.



### Methodology

The methodology involves first selecting appropriate components, including solar panels, batteries, DC motors, cutting blades, and frame materials, based on efficiency and durability. Next, the mechanical design of the frame, wheels, and blade assembly is developed to ensure stability, balance, and ease of operation. The electrical system is then integrated, connecting the solar panel to a charge controller and battery, which powers the motor for blade rotation and movement. After assembly, the system is tested under different operating conditions to evaluate cutting efficiency, battery performance, motor operation, and overall reliability, with adjustments made to optimize performance and ensure safe, eco-friendly, and cost-effective grass cutting.



### V. WORKING PRINCIPLE

The solar grass cutter operates by converting sunlight into electrical energy using a solar panel. The energy is stored in a rechargeable battery through a charge controller, which then powers a DC motor. The motor drives the cutting blades and wheels of the machine, allowing it to move and cut grass efficiently. When sunlight is insufficient, the stored battery power ensures continuous operation. This system reduces fuel consumption, noise, and environmental pollution while providing a portable and eco-friendly solution for grass cutting.

### VI. APPLID ELECTRICAL CONCERT

The solar grass cutter uses **solar photovoltaic (PV) technology** to convert sunlight into DC electrical energy. A **charge controller** regulates the voltage and current from the solar panel to safely charge the **battery**. The stored energy is then supplied to a **DC motor**, which drives the cutting blades and wheels. The system may include switches, wiring, and protective devices to control power flow, prevent overcharging, and ensure efficient and safe operation. This integration of solar energy, energy storage, and DC motor control forms the core electrical concept of the machine.

### VII. RESULT AND DISCUSSION

The solar grass cutter was successfully fabricated and tested under different conditions. The cutting mechanism operated efficiently, and the DC motor powered by the solar-charged battery provided sufficient torque to cut grass of moderate height. The solar panel effectively charged the battery under sunlight, allowing continuous operation for several hours.

During testing, it was observed that cutting efficiency depended on battery charge level and grass thickness. The machine worked quietly and produced no harmful emissions, demonstrating its eco-friendly design. Compared to conventional petrol-powered grass cutters, the solar grass cutter reduced fuel costs and maintenance requirements. However, performance decreased under low sunlight or cloudy conditions, highlighting the importance of energy storage and optimal solar panel placement. Overall, the project achieved its objective of creating a sustainable, cost-effective, and environmentally friendly grass cutting solution.

### VIII. LIMITATION

The solar grass cutter's performance depends on sunlight, and efficiency decreases on cloudy days; it has limited cutting time due to battery capacity, may struggle with very tall or thick grass, and requires careful handling of electrical components, with an initially higher cost than conventional cutters.



### **IX. FUTURE SCOPE**

In the future, the solar grass cutter can be enhanced with larger battery capacity, hybrid solar and grid power, automated navigation using sensors or AI, and stronger motors to handle taller or denser grass, making it more efficient, fully autonomous, and suitable for large-scale agricultural or landscaping applications.

### **X. CONCLUSIONS**

The solar grass cutter is an eco-friendly, cost-effective, and energy-efficient alternative to conventional petrol-powered machines. It successfully uses solar energy to operate the cutting mechanism, reducing fuel consumption, noise, and pollution while minimizing human effort. Although performance depends on sunlight and battery capacity, the project demonstrates a sustainable solution for small-scale grass cutting, with potential for future improvements in automation and efficiency.

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