

Advanced Technological Institute

Colombo 15



Higher National Diploma in Engineering

Department of Electrical and Electronic Engineering

SOLAR POWERED AGRICULTURAL
ROBOT

Project Proposal

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Reg No : COL/EE/2021/F/090

Course : HND in Electrical & Electronic Engineering (Power Electrical)

Introduction

Agriculture plays a vital role in sustaining livelihoods, yet many farming practices remain labor-intensive, time-consuming, and costly. With advancements in automation and renewable energy, smart farming solutions can significantly improve productivity.

This project proposes the design and development of a Multifunctional Agricultural Robot powered by solar energy and controlled using an ESP32 microcontroller. The robot will perform essential agricultural tasks, including seed spraying, fertilizer spraying, grass cutting, insecticide spraying, and water spraying.

To enable remote monitoring and control, the robot will be connected to a web server via Wi-Fi, allowing farmers to operate it wirelessly through any smart device. This project aims to provide a sustainable, cost-effective, and user-friendly solution for modernizing agricultural practices.

Objectives

- To develop a solar-powered agricultural robot that automates essential farming tasks.
- To implement seed spraying, fertilizer spraying, water spraying, insecticide spraying, and grass cutting mechanisms in a single robot.
- To integrate an ESP32 microcontroller for real-time control and task execution.
- To provide a Wi-Fi-based web server interface for remote control and monitoring.
- To enhance agricultural productivity while reducing manual labor and operating costs.

Expected Outcomes

- A working prototype of a solar-powered multifunctional agricultural robot.
- Reduction of manual labor and time in performing agricultural tasks.
- Demonstration of renewable energy use in smart farming technology.

- Cost-effective, portable, and farmer-friendly robotic system.
- Potential to expand functionality by integrating IoT sensors and automation in the future.

Estimated Budget

Component	Quantity	Price (Rs)
ESP 32 Microcontroller	1	1 100.00
Solar Panel (10W)	1	4 000.00
Solar Charge Controller	1	800.00
Motor Drivers	2	700.00
Wheels	4	1 500.00
Dc Motors	6	6 000.00
Battery Pack	1	3 000.00
Pump Motor	1	800.00
Jumper Wire	2 Sets	300.00
Chassis	-	1 000.00
Other	-	800.00
Total Estimated Cost		20 000.00

Methodology

System Design and Power Supply

- The robot will be powered by a solar panel and a rechargeable battery. A power management circuit will regulate stable power delivery to the ESP32, motors, pumps, and motor drivers.

Microcontroller Integration (ESP32)

- ESP32 will serve as the central control unit. It will handle motor control, spraying mechanisms, and communication with the web server.

Locomotion and Navigation

- The chassis will be equipped with DC motors and motor drivers for movement. ESP32 will control forward, reverse, left, and right movement. Optional obstacle detection sensors can be added for autonomous navigation.

Functional Units

- Seed Sprayer: DC motor-based seed sprayer and fertilizer sprayer mechanism.
- Water Sprayer: Mini pump and solenoid valves to spray liquids.
- Grass Cutter: DC motor-driven cutting blade with safety shielding.

Web Server Control Interface

- ESP32 will host a Wi-Fi-based web server accessible via smartphone/laptop. The interface will allow remote control of movement and functions. Battery and operational status will be monitored through the dashboard.

Project Timeline

Task	October			November				December				
1. Study About Project Procedure	■											
2. Mechanical Assembly		■	■									
3. Power System Setup				■	■							
4. Motor Driver control						■						
5. Esp 32 Programming							■					
6. Webserver Development								■				
7. System Integration									■			
8. Final Testing										■		
9. Final Presentation & Documentation											■	■

Supervised By : - Eng. Rajitha Jayasinghe

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Date

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Supervisor Approval

Head of Department :- Eng. Rajitha Jayasinghe

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Date

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HOD Approval