INVENTION REPORT

SMART FERTILIZER AGRI-ECONOBOT

GROUP MEMBERS:

COL/EE/2324/F/111 K.A.R.P. KASTHURIARACHCHI
COL/CE/2324/F/061 K.D.S.PUBUDU
COL/CE/2324/F/041 R.A.R.CHAMIKA
COL/ME/2324/F/020 K.D.A.SALINDA
COL/ME/2324/F/031 N.M.K.V.GUNATHILAKA

DESIGNING AND HANDLED BY : K.A.R.P.KASTHURIARACHCHI
REGISTRATION NO : COL/EE/2324/F/111
SUPERVISED BY : Eng.H.D.A.GUNASEKARA

INTRODUCTION

Agriculture faces challenges such as labor shortages and uneven fertilizer application, leading to increased costs and reduced crop yields. The Smart Fertilizer Agri-EconoBot is a low-cost, farmer-friendly robotic solution designed to evenly distribute fertilizer along crop rows. Using a hybrid mechanical and basic electronic system, it reduces fertilizer wastage, labor dependency, and supports efficient, sustainable farming practices.

This robot operates using a lightweight chassis and row-guided movement supported by simple sensors, ensuring accurate navigation between crop rows. Fertilizer application is controlled through a mechanically synchronized dispensing mechanism, which releases a precise quantity of fertilizer based on the robot's movement.

The robot is designed to operate using battery power, while a solar panel is used to recharge the battery, enabling environmentally friendly and energy-efficient operation. In addition, a mobile application is being developed to allow remote control and real-time monitoring of the system. This application will provide farmers with a convenient and user-friendly way to manage operations and observe essential functions with ease.

AIM

The aim of this project is to design and develop a low-cost, durable, and semi-automated Smart Fertilizer Agri-EconoBot to assist small and medium-scale farmers in applying fertilizer evenly across crop rows, thereby reducing labor dependency, minimizing fertilizer wastage, and improving overall crop productivity using a simple mechanical system integrated with basic electronic control.

PROBLEM STATEMENT

- Difficulty in uniform fertilizer application using manual methods.
- Labor shortages and high labor costs affecting timely operations.
- Fertilizer wastage due to over-application, increasing costs and environmental impact.
- Low crop yield caused by insufficient or uneven fertilizer application.
- High cost of existing fertilizer machines, making them unaffordable for small farmers.
- Complex and highly electronic systems that are difficult to use and maintain in rural areas.
- Time-consuming and physically demanding manual fertilizer spreading.
- High energy consumption and dependence on external power sources.
- Lack of low-cost, durable, and weather-resistant fertilizer application solutions.

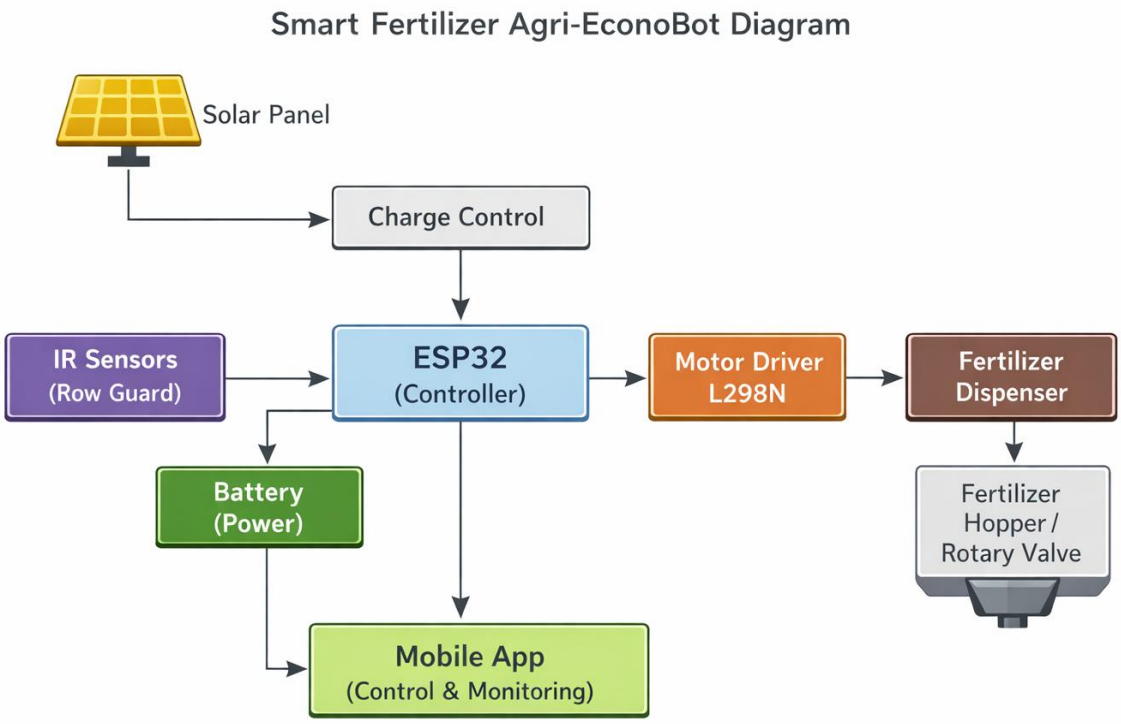
OBJECTIVES

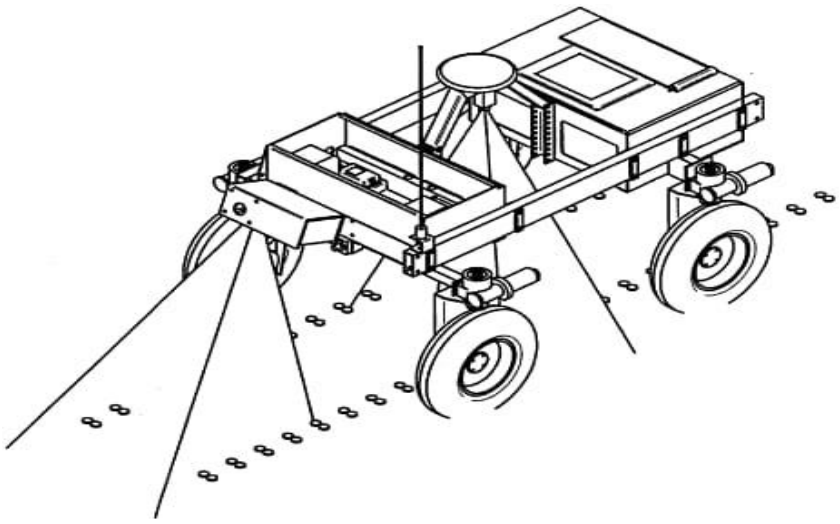
- To design a lightweight and sturdy robotic platform suitable for operation in agricultural field conditions.
- To develop a controlled fertilizer dispensing mechanism that ensures uniform and precise application.
- To reduce manual labor and operational time involved in fertilizer spreading.
- To integrate basic sensors and a microcontroller for row-guided navigation and system control.
- To incorporate a battery-powered system with optional solar charging for energy efficiency.
- To design the robot to be easy to operate, maintain, and adaptable for different crops and field conditions.

WORKING PRINCIPLE

The Smart Fertilizer Agri-EconoBot moves along crop rows using wheels and sensors to stay on track. It releases fertilizer evenly from a hopper using a motorized dispenser, with the amount linked to its movement. A microcontroller manages the motors, sensors, and fertilizer flow, while a rechargeable battery optionally topped up with solar power keeps it running efficiently.

BLOCK DIAGRAM





FIGURE

BUDGET REPORT

No.	Items	Net Price (Rs.)	Qty	Total Price (Rs.)
01	ESP 32 BOARD	1300.00	1	1300.00
02	IR SENSOR	200.00	2	400.00
03	ULTRA SONIC SENSOR	250.00	2	500.00
04	SERVO MOTOR	500.00	4	2000.00
05	12V BATTERY	2000.00	1	2000.00
06	SOLAR PANEL	1400.00	1	1400.00
07	WIRES	250.00	1	250.00
08	NAILS	50.00	1	50.00
09	MOTOR DRIVER MODULE	500.00	1	500.00
10	SOLAR CHARGE CONTROLLER	500.00	1	500.00
11	OTHERS			1000.00
	TOTAL			9900.00

Supervised by:-

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Date Signature

FUTURE ENHANCEMENTS

- Seed Sowing Module – Automates planting of seeds with precision, saving time and labor.
- Weed Removal System – Detects and removes weeds efficiently, promoting healthy crop growth.
- Moisture Sensors – Monitors soil water levels in real time, enabling optimal irrigation.
- GPS Tracking – Provides accurate navigation and field mapping for precise operation.
- Automated Fertilizer Delivery – Ensures uniform fertilizer distribution, reducing wastage.
- Solar-Powered Operation – Enhances energy efficiency and supports sustainable farming.
- Data Logging & Analytics – Tracks soil, weather, and operational data to improve crop yield.
- Modular Design – Allows easy addition of new tools and sensors for future farming tasks.

In the future, we expect to incorporate the above-mentioned enhancements, thereby transforming the robot into a fully integrated smart farming assistant that increases productivity, reduces costs, and supports sustainable agriculture.