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DESIGN AND FABRICATION OF AGRICULTURE ROBOT

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Abstract— The Indian economy's foundation has always been and will be agriculture. To have a decent harvest, it is now crucial to do farming tasks on time, as in planting seeds, harrowing, hoeing, spraying pesticides, and assessing the moisture. Therefore, modern improvements in robotic technology can be a highly valuable tool. Because robots can quickly and easily input data without needing to use their hands, the goal was to create a multipurpose farm robot that could handle all the key tasks remotely. The wheels of this electromechanical vehicle are driven by motors, which also serve as steering. Depending on the crop, precise rows and columns are taken into consideration while by using an automated method, the farm is cultivated. A smartphone is used to operate the robot remotely. A webcam-based method for tracking plant health is available to look for signs of illness. The system has sensors that can collect information from its surroundings. After analysing the information, the system will make a decision based on the information and then issue a command to other components to perform an action. This configuration uses a Raspberry Pi to operate the robot. Various robotic tasks and electronics components are powered by 12 Volt Lithium, and the robot itself a 12 Volt Lithium battery powers it. The robot was designed using Catia software. Multifunctional agriculture robot efficiency and productivity.

Keywords: -Arduino, Blynk App, Soil Moisture Sensor, CATIA, Node MCU

INTRODUCTION

For a very long time, agriculture has been and will be the foundation of the Indian economy. Three days of hunger will cause a man to struggle, battle for a week, and eventually die after around a month. India has a very outstanding track record of agricultural development during the last forty years. In order to meet the growing need for food, the agriculture industry has been successful. Increasing the amount of land used for agricultural production has a decreasing effect with time, and productivity growth has accounted for practically all output growth over the last two decades. Around the world, agriculture accounts for more than 42% of people's primary employment. The creation of autonomous cars has been an increase in interest in during the past few years. agriculture. Many academics have started working on creating more intelligent and adaptive cars as a result of this advancement.

A idea for researching whether a fleet of tiny autonomous machines would be more effective than conventional big tractors and human labour is being explored in the field of agricultural autonomous vehicles. These machines ought to be able to operate around-the-clock, throughout the year, and in most weather situations. They should also be intelligent enough to act responsibly for extended periods of time in a semi-natural environment while doing a valuable activity without human supervision. Autonomous vehicles can carry out a variety of field tasks, which gives them advantages over traditional machinery. Agriculture robots technology use is a relatively new concept. Robots are becoming more prevalent on farms in a variety of forms and in greater numbers as a result of the enormous potential for productivity gains offered by robots in agriculture. The autonomous performance of agricultural tasks including seed sowing, grass cutting, watering, and pesticide application by the robots is to be expected. Using a node MCU and Wi-Fi model, the robot is managed. Interacting with the robot, which is well-known to most humans, is made possible via verbal input. These robots have the advantages of hands-free operation and speedy data entering. A concept has been developed in the field of agricultural autonomous robots to investigate if a number of small autonomous machines may be more efficient than conventional giant tractors and human forces.

2. LITERATURE REVIEW:

"Agricultural Robot for Automatic Seeding and Ploughing" The TIAR 2015 conference is an annual event sponsored by the IEEE. (Amrita Sneha. A., Abirami.E., Ankita. A., Mrs. R. Praveen, Mrs. R. Srimeena).

The objective of this work is to develop a robot that is capable of autonomous ploughing and seed distribution. It also uses humidity sensors to track the humidity, and manual control is available as necessary. Here, the main component is the AVR At mega microcontroller, which manages every action. Before beginning to plough and simultaneously distribute seeds side by side, the robot first tills the entire field. Only off the field of play does the robot require human control; when on the field of play, it operates automatically.

"Design and Implementation of Seeding Agricultural Robot" (JIRAS) (P. Usha, V. Maheshwari, and Dr. V. Nandagopal)

This work is focused on creating a technique for cultivating land for agriculture without using labourers. By requiring less work, saving time, and utilising fewer resources, the paper seeks to increase productivity.

Abdullah Tanveer, Abhishek Choudhary, Divya Pal, Rajani Gupta, and Farooq Husain's article "Automated Farming Using Microcontroller and Sensors" (IJSRMS) ISSN: 23493371

In order to produce more crop growth, farming may be done utilising innovative technology. In this project, we'll measure the humidity, soil moisture, temperature, and light. The focus of this study is on automated control features using cutting-edge electronic hardware, specifically GSM phone line and microcontroller. As a result of the project's autonomous operation, less labour is required.

“IJARCCE June 2016 (Nikesh Gondchawar1, Prof. Dr. R. S. Kawaka) "IOT Based Smart Agriculture"

This article describes a project model for an agricultural robot. A significant need for effective water management exists in the contemporary world, when water tables are dropping, rivers and tanks are drying up, and the environment is unpredictable. In order to handle this, a microcontroller-based gateway that manages water amount may be programmed with an algorithm that was built using temperature and soil moisture threshold values. For crop monitoring, this sensor system installs moisture and temperature sensors in strategic locations. The system, which can be run on solar power and has a duplex communication link based on a cellular internet interface, may be designed with data inspection and irrigation scheduling using a web page. Precision agriculture can now monitor and manage greenhouse parameter through the technical advancement of wireless sensor networks. Researchers discovered that agriculture's production is declining daily as a result of their studies in the field. However, the use of technology in agriculture is crucial for both boosting output and minimising the need for more labour. Some of the research initiatives include systems that employ technology beneficial for enhancing agricultural productivity are provided for the benefit of farmers.

3.METHDOLOGY:

The primary objective is to create and build a system that can remotely control agricultural tasks such seed sowing, grass cutting, watering, and detecting the moisture content of soil using a soil moisture sensor. A node microcontroller serves as the system's brains and is the system's main component.

4.WORKING:

BLOCK DIAGRAM AND DESCRIPTION

Fig. 1 a comprehensive block schematic of an agriculture robot created for farming tasks. For seed tank and field detection, LDR circuit to assess conditions. To accomplish seeding activities, mechanical parts are employed, and DC motors are used to regulate their movement.

We utilized a voltage regulator, the IC7805, to control this high voltage since the Node much board is powered by a 12V lead-acid rechargeable battery, but the Node much only needs 5V. In order to proceed, the moisture content of the soil must first be verified using a soil moisture sensor. The customer then has the option to activate the water motor based on their requirements once the moisture level is presented on the Blynk app. In the suggested method, seeds are sown by first digging a hole at a depth appropriate for the crop, then placing them there, covering them with earth, and then spraying water on them.

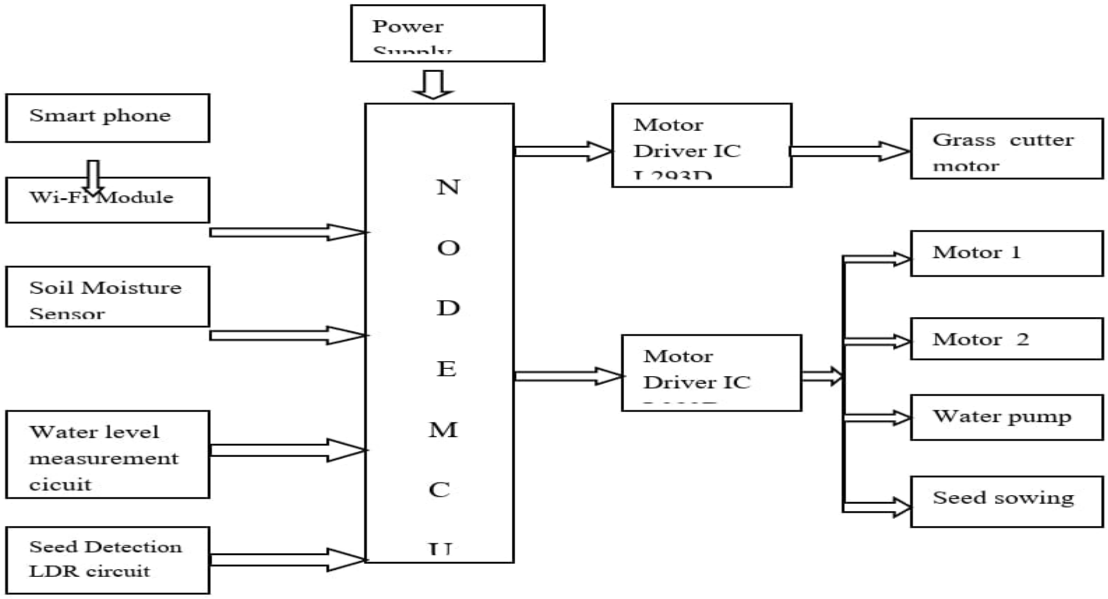

Fig. 1: Block Diagram of the Proposed System

Mechanical Design

For our own reference alone, we made an effort to create the fundamental design. Having 2 x 4-foot measurements throughout.

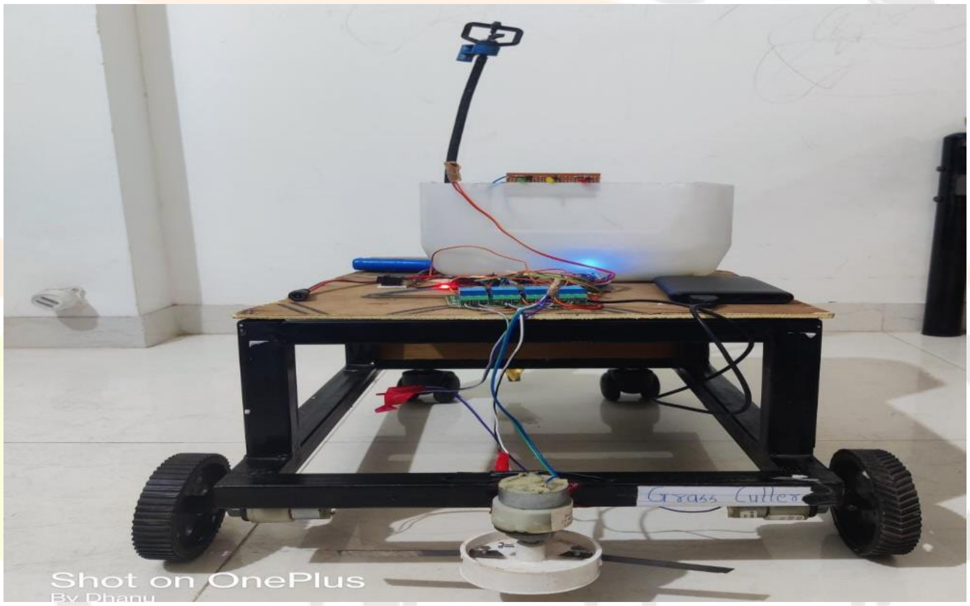

Fig. 2: Mechanical Frame of Agriculture Robot

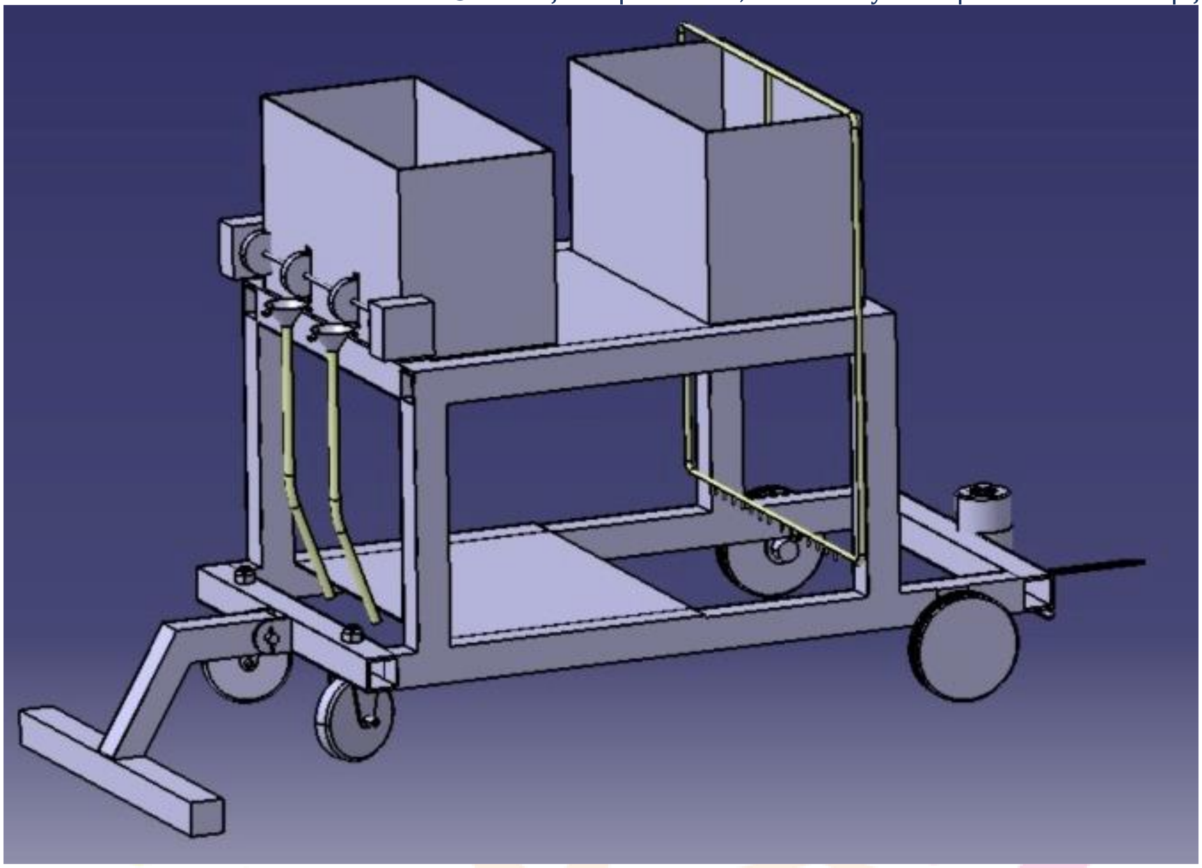

Fig. 3: 3-D Mechanical frame of Agriculture Robot

A. ALGORITHM FOR SMART AGRICULTRE ROBOT

The following are the actions the agriculture bot takes after being turned on: The movement of the robot is depicted in flow chart, and the bot's mechanism is shown in Figure 2. The

The robot's algorithm looks like this:

Step 1: Start

Step 2: Set the robot to work.

Step 3: Establish a wireless connection between the node MCU and the phone.

Step 4: It is advised that the robot wait until receives the application signal.

Step 5: The robot acts appropriately if it gets the signal.

Step 6: Step 4 should be taken if the signal is not received.

Step 7: To disable, use the global off signal.

B. DIMENSION OF TWO CROPS:

Types	Distance between two crops	Distance between two crop rows
Cotton	15 cm	60 cm
Soybean	7 cm	30 cm
Maize	7cm	60 cm
Gram	7 cm	30 cm

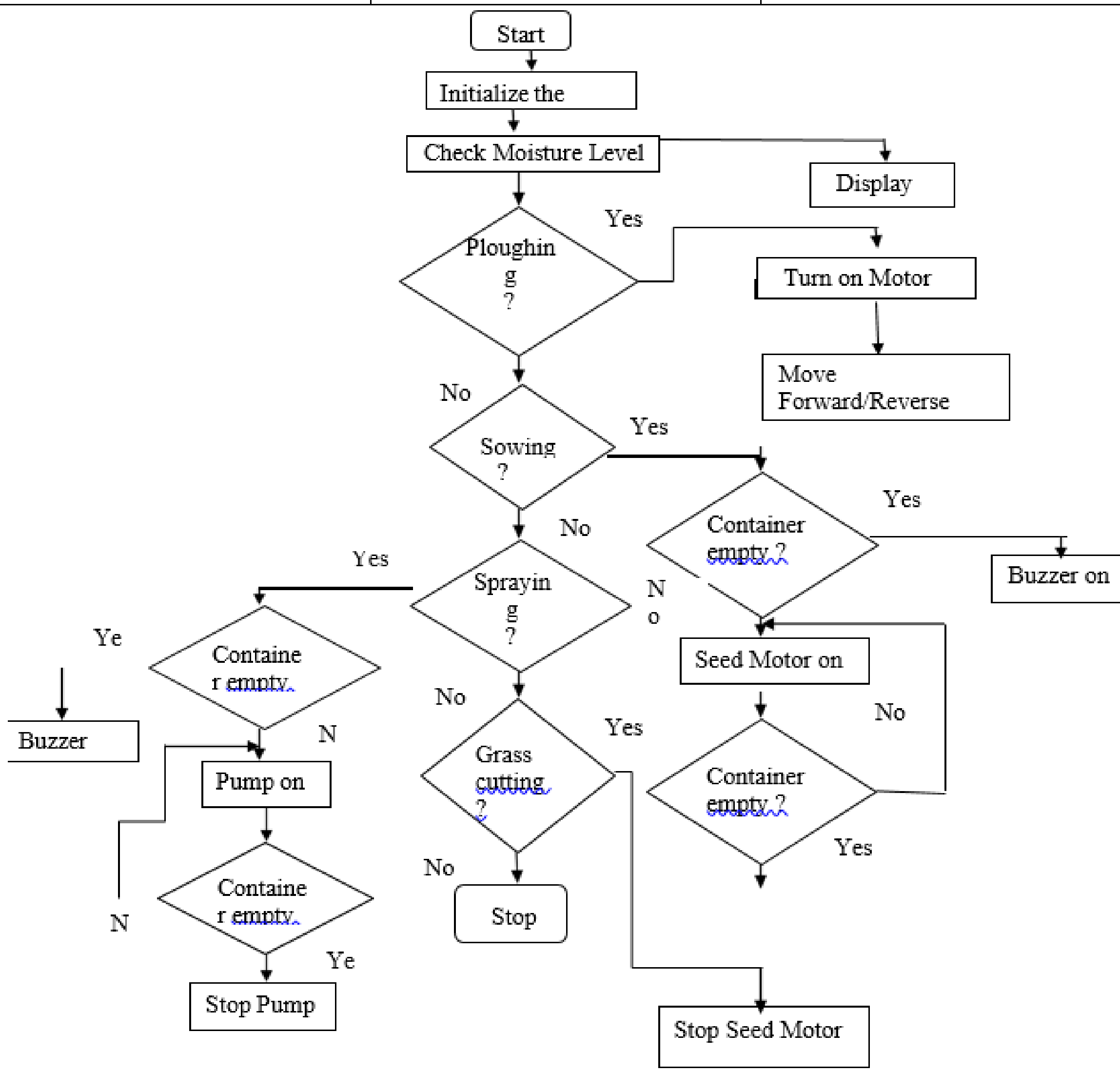

Fig.4: Flowchart for the Mechanism of the Robot

5. FUNCTION OF AGRICILTRE ROBOT

We made the decision to create a system that would allow us to remotely manage several processes. Agriculture-related tasks including automated seeding, mowing the lawn, watering the plants, and pesticide spraying have a significant impact on this project. It also saves time by reducing human effort. To further eliminate the need for human work, we may add a number of other procedures.

1.Automatic seed sowing

An LDR circuit, a circular disc, a seed tank, and a dc motor make up the automated seed sowing module. A jar for storing seeds makes up the robot. Connected to the DC motor is the circular disc. The disc's teeth give it the ability to take up a certain number of seeds and scatter them over the ground steadily and in sufficient amounts. Controlling the DC motor's speed allows us to alter the disc's speed. When the tank is empty, the buzzer on the LDR circuit, which is made up of a laser and a photo-resistor sensor, alerts the farmer.

1.96 x 0.65 x 1.64 are the tank's measurements (in feet).

Fig.5: Seed Tank

1. **Pesticide and fertilizer spraying**

The device consists of a tank, an LDR Circuit ultrasonic sensor, a dc motor, a dc gear motor, a sprayer, and other components.

1.96 x 1.14 x 1.96 feet are the tank's measurements (in feet).

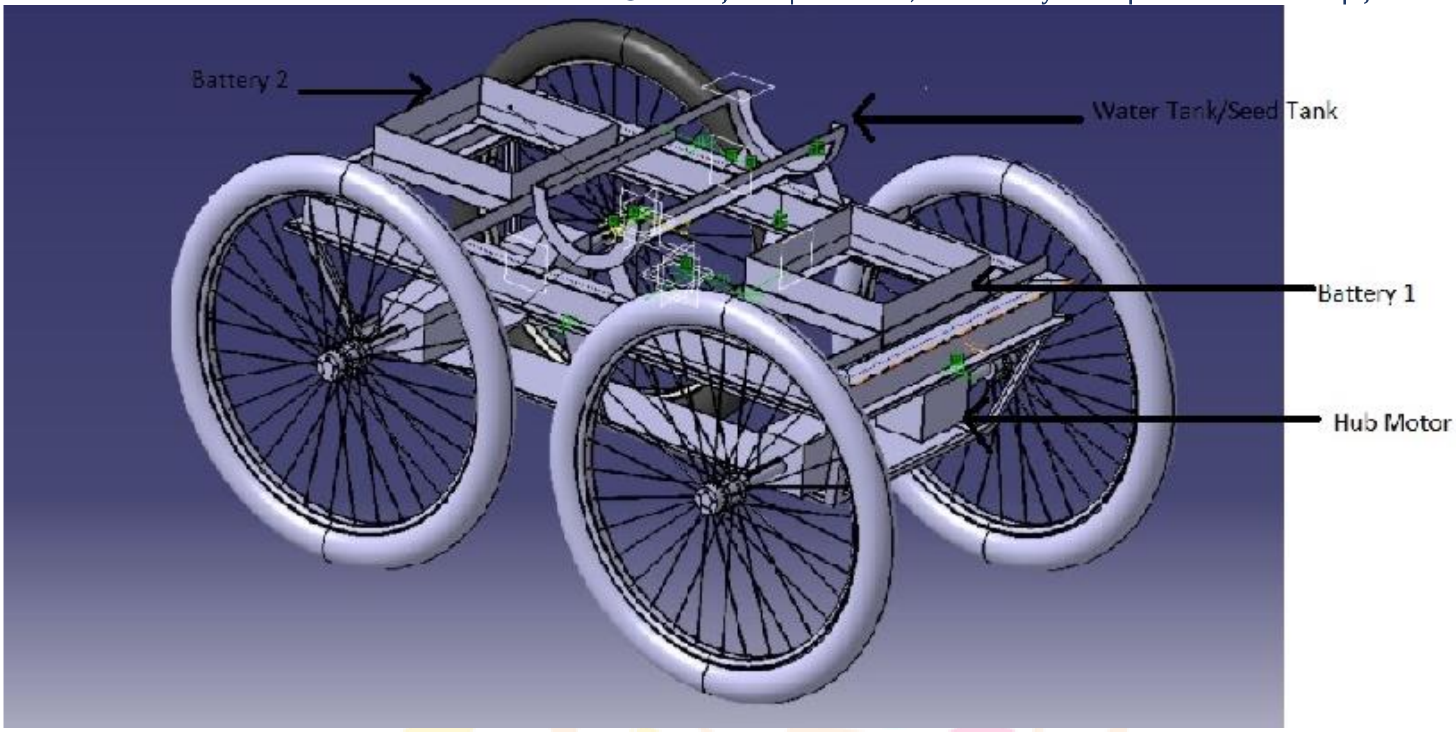

Fig.6: Mechanical Design

2. **Harrowing**

It is a tool used to aerate and level the soil's surface as well as get rid of extra vegetation. The humus content of the soil is also increased. The harrowing machine is designed in CATIA, and simulation is done, as shown in Fig. 5.

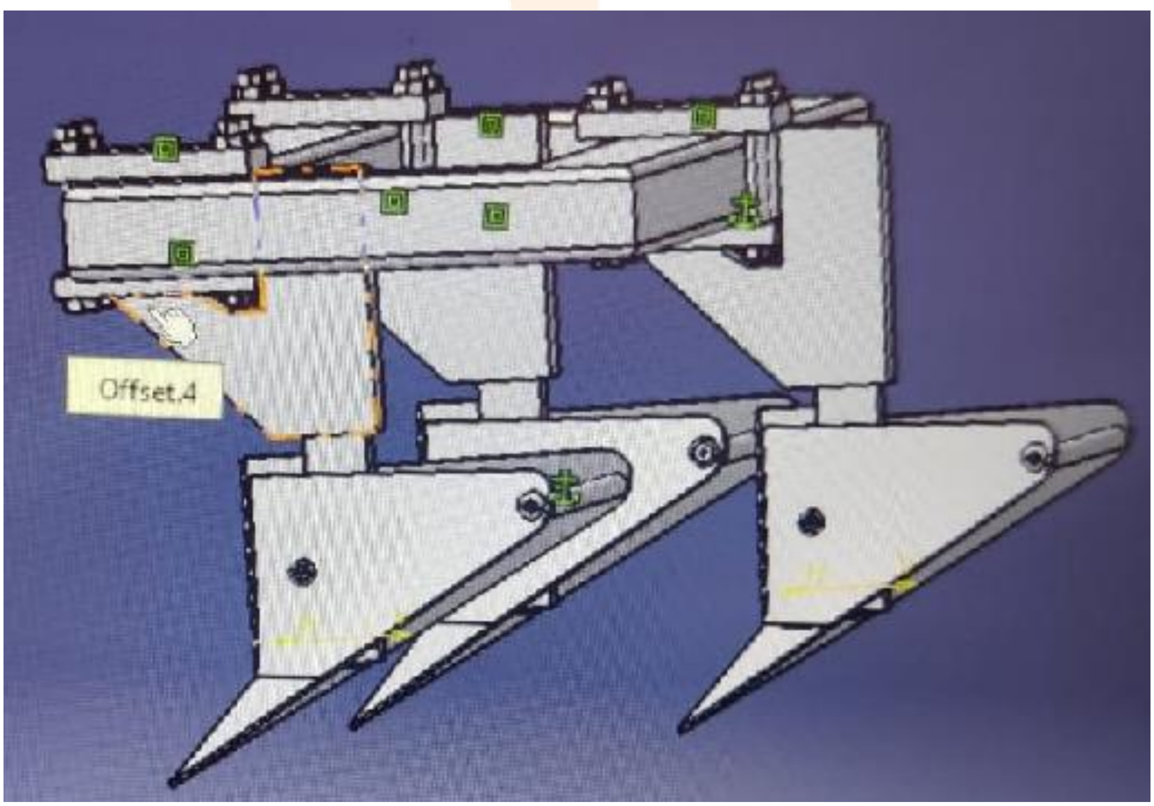

Fig.7: Design of Cultivator

3. **Soil moisture sensor**

A soil moisture sensor is used to calculate how much moisture is present in the soil. The result will be shown on the LCD screen so that the farmer can decide right away whether to send water to the farm. The two probes that make up the soil moisture sensor gauge how much water is present in the soil. In order to detect the soil's moisture content, the resistance of the soil is measured by the two probes by allowing an electric current to flow through it. The resistance will be lower when there is more water present since more water will cause the soil to conduct more electricity. As a result, a higher degree of moisture will be observed. The conductivity of dry soil is lowered. Soil conducts electricity less efficiently and hence has greater resistance when water levels decrease. Therefore, there will be less moisture.

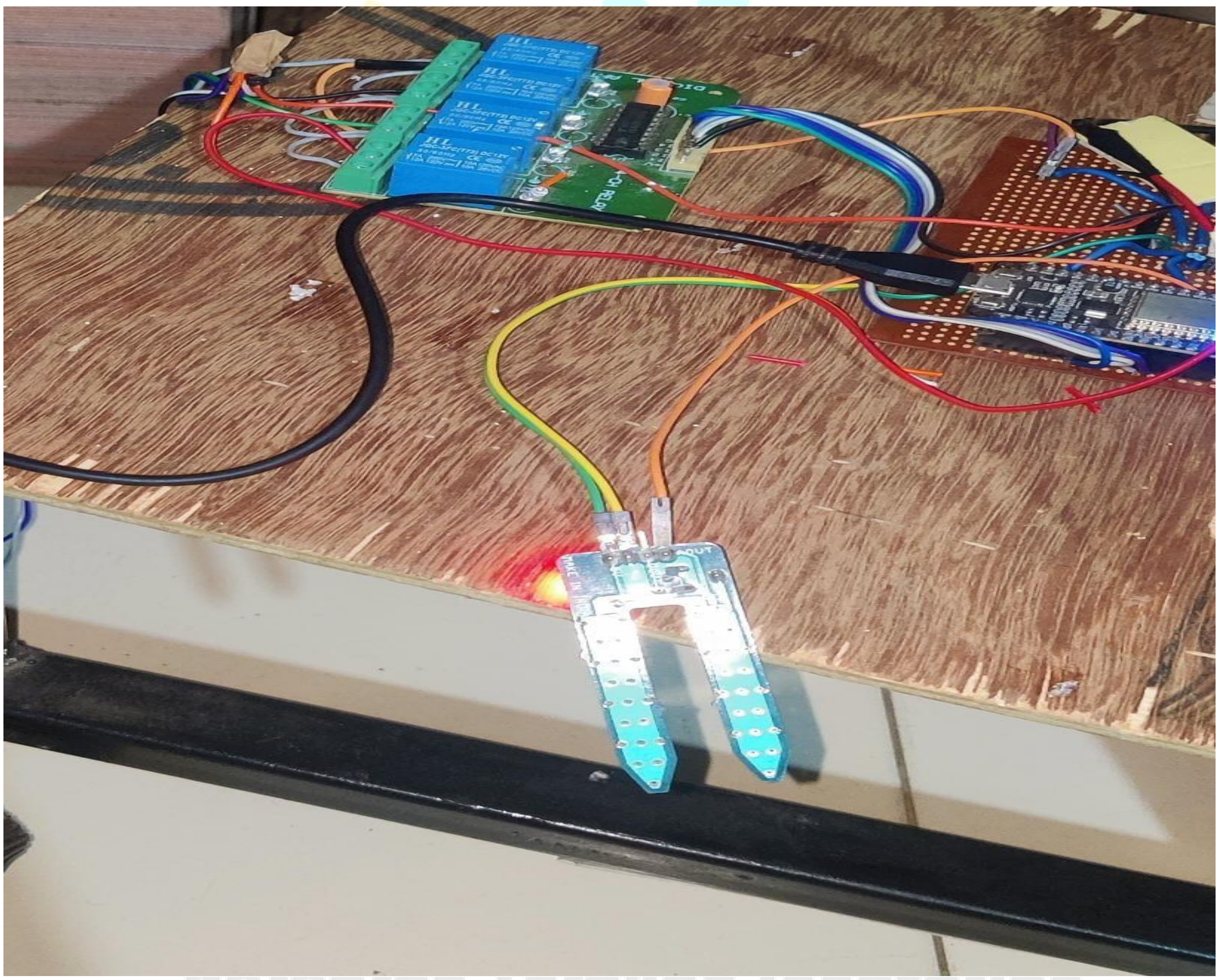

Fig.8: Implementation of Soil Moisture Sensor

4. **Water level measurement circuit**

To measure the amount of water, a water level indicator is utilised. We have simply used transistors and four LEDs to indicate the water level at four different stages. Sensing is done by using a set of 4 probes that are placed at 4 different levels on the tank walls. Level 4 represents the condition "tank full" and

Level 1 represents the condition "tank empty". The circuit diagram for this is as shown in fig.

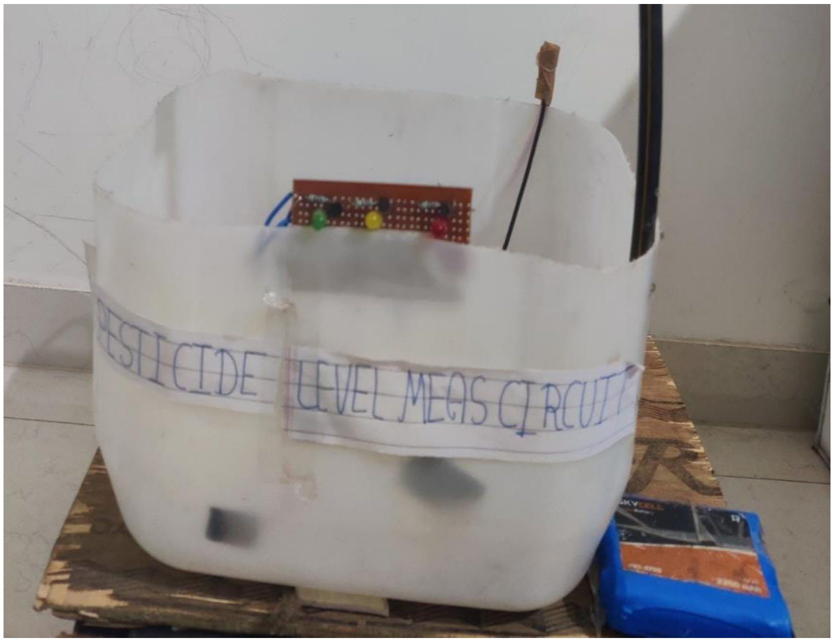

Fig.9: Water Level Measurement Circuit

5. Grass Cutter

The design of the grass-cutting machine allows it to power through various wooded areas. It works well in those areas where an overgrown brush, a conventional line trimmer, or a lawnmower cannot work. The blades are available in many variations to work well in tight areas where you cannot use any large equipment.

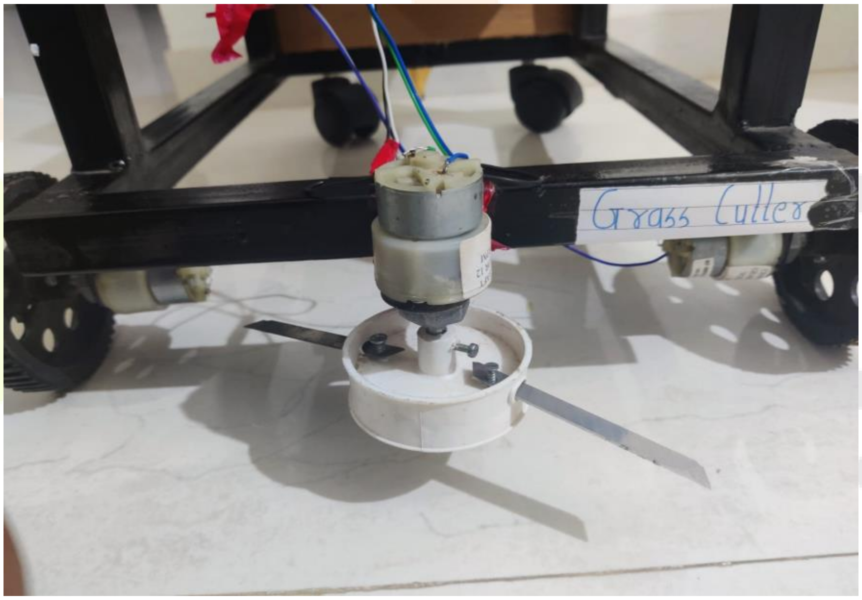

Fig.10: Grass Cutter

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