

# Multipurpose Agricultural Robot

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## ABSTRACT

The motivation for this project came from the countries where economy is based on agriculture. Our idea presents a system with high speed of operation for an advanced agriculture process which includes grass cutter, seed sowing, sprinkler, ploughing and solar panel for battery charging. The robotic system is an electromechanical (conveys a sense that it has agency of its own) and artificial agent which is steered by DC motor which has four wheels. Generally in farm lots of time consumes for grass cutting, seed sowing and spraying work, here is an approach to reduce farmer's time for cultivation and increase farm efficiency by using multipurpose agricultural robot. The machine can be controlled using buttons and solar panel is used to charge DC battery. Assembly language is used in programming the microcontrollers. The microcontroller is used to control and monitor the process of system motion of vehicle with the help of wiper motor.

**Keywords:** Agricultural Robot, Solar Energy, Robotics, Field Operations, Multipurpose.

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## I. INTRODUCTION

Agriculture is the need of most of the Indian's livelihood and it is one of the main sources of livelihood. It also has a major impact on economy of the country. We know there is day by day increase in population. Due to this tremendous growth in population there is huge demand of food. Agriculture is the main source for food production. So, we need to develop the methodologies which are currently uses in agriculture application to increase the efficiency of application. Due to this reason we are going to prepare —Multipurpose Agricultural Robotl which present four applications are like Grass Cutting, Ploughing, Seed Sowing and Fertilizer Spraying. These applications make sure that the time required for it is less than conventional methods. We prefer robot for carried out these applications because robot is a mechanical, artificial agent and is usually an electromechanical (Mechatronics) system. By using controller we operate whole robot by using buttons. In the keypad we have three buttons, one for forward motion and drilling the soil then sowing the seeds and covering the soil on these seeds, one switch for operating sprinkler and third switch for grass cutter mechanism. For sprinkler high pressure liquid is provided with the help of pump. If we use this robot in real time application it save money and time

consumption. With this help of robot we can achieve human safety at the night time and we easily perform task which is in complicated location. Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. It has to support almost 17 percent of world population from 2.3 percent of world geographical area and 4.2 percent of world's water resources. The present cropping intensity of 137 percent has registered an increase of only 26 percent since 1950-51. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and spacing, cover the seeds with soil and provide proper compaction over the seed. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agricultural and climatic conditions to achieve optimum yields and an efficient sowing machine should attempt to fulfill these requirements. In addition, saving in cost of operation, time, labour and energy are other advantages to be derived from use of improved machinery for such operations. The major occupation of the Indian rural people is agriculture and both men and women are equally involved in the process. The main objective of our project is to design and fabricate the smart seed sowing machine, which can be automatically sow seeds in the field

which is given as input by the farmers using keypad present on the machine.

## II. OBJECTIVES

The objective of this project is to present the status of the current trends and implementation of Agricultural and autonomous systems and outline the potential for future applications. Different applications of autonomous vehicles in agriculture have been examined and compared with conventional systems, where Four main groups of field operations have been identified to be the first potential practical applications: Grass-Cutting, Drilling the hole for sowing seeds, Seed Sowing and Pesticide Spraying. Our aim is to fabricate a Prototype Solar Operated Multi-Purpose Agricultural Robot which can perform the following functions:

- The main objective of this project is to fabricate a robot vehicle which can make hole in the soil & sow the seed in soil, & this whole setup is run by using motors.
- Providing the grass cutter for grass cutting operation which is run by using a motor. •Using solar energy for functioning of machine as well as cost saving since solar energy is available free of cost.
- Providing the pump on the robot vehicle for pesticide and water spraying.
- To reduce human effort in the agricultural field with the use of small robot.
- To complete large amount of work in less time.
- Making this machine user friendly so that farmer can operate this robot easily.
- Focus will be put on potential labour cost savings, daily working hours, potential environmental impact, energy costs and safety issues.

## III. BLOCK DIAGRAM

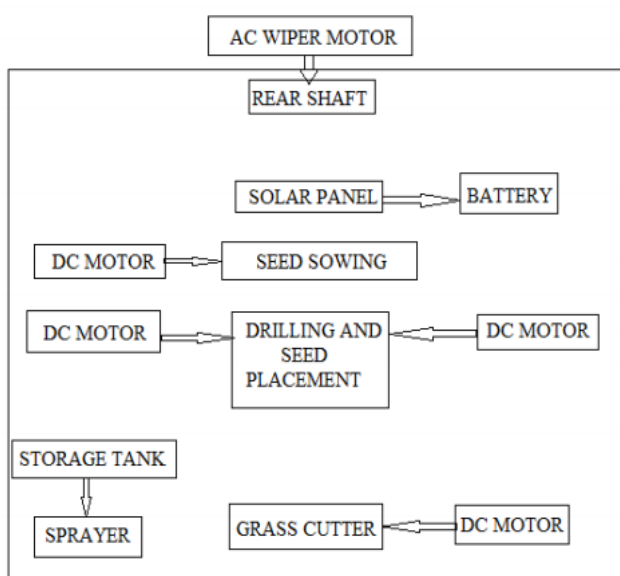


Fig: Block Diagram

## IV. OPERATIONS

The Drilling the Hole in Soil / Ploughing : Ploughing is the first preparation for planting. A field is normally ploughed when a seedbed is required and:

- The soil is covered with weeds and debris from the previous crop.
- A grass lay is exhausted and has to be renewed.
- A field is ready to come out of extended fallow.
- The topsoil has become compacted and must be broken up.

A properly set up plough will cut and turn the soil so that all of the weeds, grass and crop residue are buried with not a scrap of green showing. Originally ploughs turned only one furrow at a time as that was all a team of horses could manage. On light soils a 50 horsepower tractor can turn four or more furrows at a time and the most powerful tractors may draw many more.

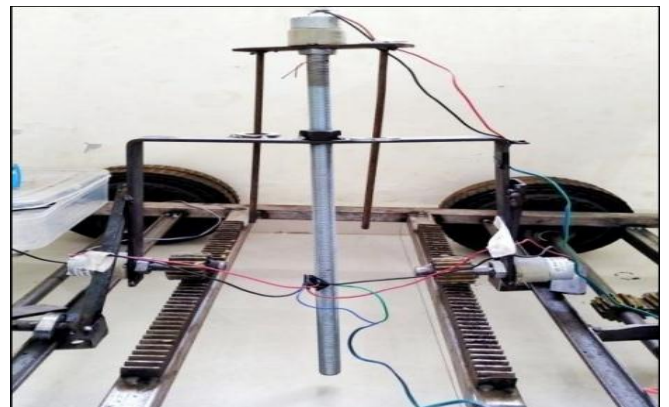


Fig: Drilling Mechanism

### Seed Sowing:

Sowing is the process of planting seeds. An area or object that has seeds planted in it will be described as being sowed. Among the major field crops, oats, and wheat are sown, grasses and legumes are seeded and maize and soybeans are planted. In planting, wider rows {generally 75 cm (30 inch) or more} are used, and the intent is to have precise; even spacing between individual seeds in the row, various mechanisms have been devised to count out individual seeds at exact intervals. In sowing, little if any soil is placed over the seeds, as seeds can be generally sown into the soil by maintaining a planting depth of about 2-3 times the size of the seed.

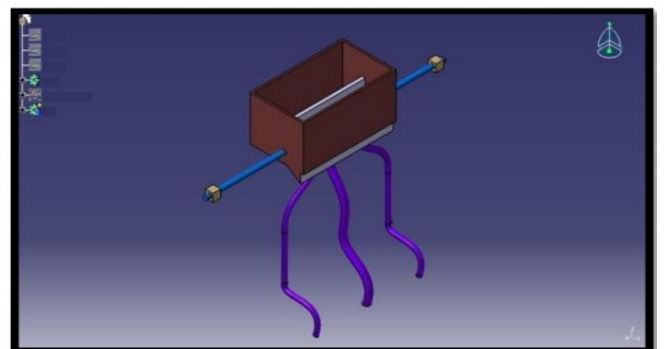
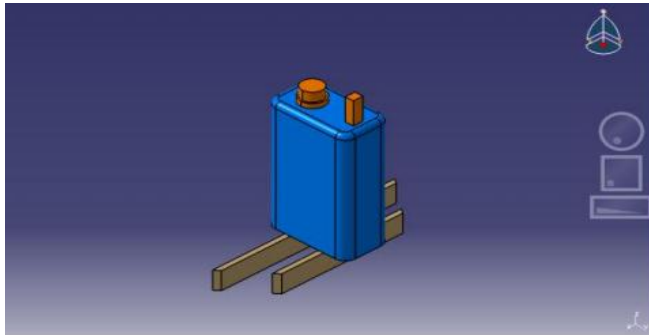


Fig.4.2.1. Seed Sowing Mechanism

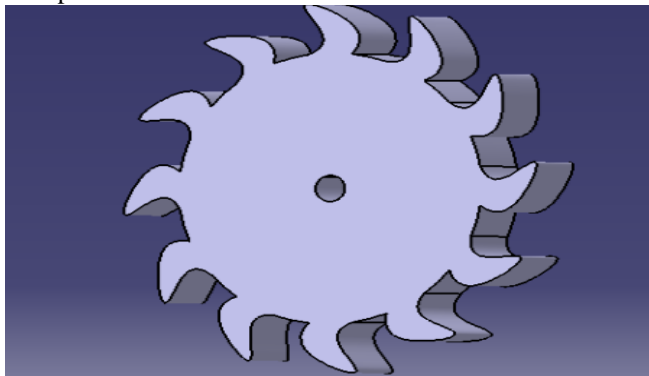
**Pesticide Spraying :**

A fertilizer is any material of natural or synthetic origin that is applied to soils or to plant tissues to supply one or more plant nutrients essential to the growth of plants. Fertilizers enhance the growth of plants. This goal is met in two ways, the traditional one being additives that provide nutrients. The second mode by which some fertilizers act is to enhance the effectiveness of the soil by modifying its water retention and aeration. This article, like many on fertilizers, emphasizes the nutritional aspect.



**Grass Cutting :**

Now-a-days grass cutting is important stage in agriculture field. Currently in India farmer used conventional method for the grass cutting purpose i.e. manually cutting using labour but this method is lengthy and time consuming. In our machine we made this operation less costly and efforts are also reduced since we use a separate grass cutter for this operation and the grass cutter operates using dc motor, so the operational time is also reduced.



Fig; Catia Model of Grass Cutter

**V. MATERIAL SPECIFICATION**

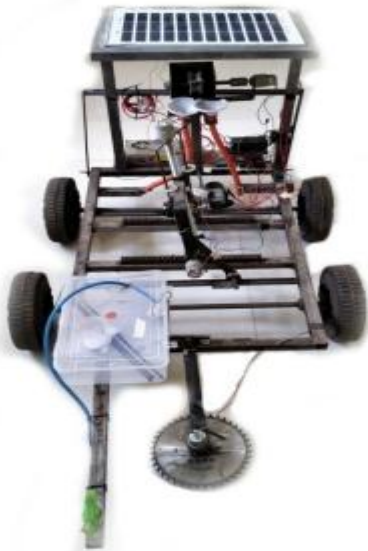
Table: Specifications of Materials

Name of component	Specifications		Quantity
Frame	Martial—Mild steel Chemical Composition		10 ft. Square Pipe
	Element	Content	
	Carbon, C	0.14 -0.20 %	
	Iron, Fe	98.81-99.26	
	Manganese, Mn	0.60 -0.90	
	Phosphorous, P	≤ 0.040 %	
	Sulphur, S	≤ 0.050 %	

DC Motor	RPM: 30 at 12 V Total length: 46 mm Motor diameter: 36 mm Motor length: 25 mm Brush type: Precious metal Gear head diameter: 37 mm Gear head length: 21 mm Weight : 100 gms	4
Wheel	Material: Plastic Diameter: 230 mm	4
Pulley	Material: Mild steel Diameter: 50 mm Thickness: 25 mm	2
DC Motor	RPM: 60 at 12 V Total length: 46 mm Motor diameter: 36 mm Motor length: 25 mm Brush type: Precious metal Gear head diameter: 37 mm Gear head length: 21 mm Weight : 100 gms	1
AC Wiper Motor	Voltage (V) = 12 V Current (I) = 1 Amp Power (P) = 12 W Speed (N) = 45 rpm	1
Grass Cutter	6 inch Diameter Max. rpm = 7500 No. of teeth = 40 Bore = 25.4 mm	1
Solar Plate	Voltage at max power =18V Current at max power = 0.58 I Power = 10.44 W No. of Cells = 36	1

**VI. FINAL ASSEMBLY**





## VII. CONCLUSION

This multipurpose farming machine has considerable potential to greatly increase productivity of crops, so we are designing and fabricating a multipurpose farming machine which will do multiple operations simultaneously i.e. drilling, seed sowing, pesticide spraying and grass cutting. In agriculture, the opportunities for robot – enhanced productivity are immense and the robots are appearing on farms in various guises and in increasing numbers. The other problems associated with autonomous farm equipment can probably be overcome with technology. Robots can improve the quality of our lives but there are downsides. The present situation in our country all the agricultural machine is working on manual operation otherwise by petrol engine or tractor which is expensive, farmer cannot work for long time manually to have some kind of power source system to operate the digging mechanism. To implement a prototype model of drilling and seed sowing machine system within the limited available source and economy. The system can be subjected to further development using advanced technologies. Our team has successfully combined many ideas from various fields of mechanical engineering and agricultural knowledge to improve the yield and by reducing the labour effort and expenses. The whole idea of multipurpose equipment is a new concept patentable and can be successfully implement in real life situations.

## VIII. ACKNOWLEDGEMENT

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