Design and Manufacturing of an Automated Seed Sowing Robotic Vehicle Using Solar Panels

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Abstract – *Today`s world is marching towards the rapid growth of all sectors including the agricultural field. Agricultural sector is changing the social as well as economic environment of the population due to globalization. Agriculture has been the backbone of the Indian economy and it will remain as it is for a long time. The conventional methods are less efficient and time consuming. To meet the future food demands, the farmers have to implement the new techniques which will not affect the soil texture but will increase the crop production. To overcome the drawbacks of conventional methods we are developing the seed sowing machine, which can perform different operations. For this machine we can plant different types and different sizes of seeds and also we can vary the space between two seeds which in turn increases the planting accuracy and efficiency. For effective handling of the machine by any farmer or by any untrained worker we have simplified its design. The main purpose of our machine is to automate the process of digging and seed sowing at proper distance and depth.*

Key Words: Sowing, Robotic, Automation, Photovoltaic, Reliability, Optimization

1.INTRODUCTION

In India record of progress in agriculture over the past four decades has been quite impressive. The agriculture sector has been successful in keeping pace with rising demand for food. The contribution of increased land area under agricultural production has declined over time and increases in production in the past two decades have been almost entirely due to increased productivity. Contribution of agricultural growth to overall progress has been widespread. Increased productivity has helped to feed the poor, enhanced farm income and provided opportunities for both direct and indirect employment.

Future growth needs to be more rapid, more widely distributed and better targeted. These challenges have profound implications for the way farmers problems are conceived, researched and transferred to the farmers. On the one hand agricultural research will Increasingly be required to address location specific problems facing the communities on the other the systems will have to position themselves in an increasingly competitive environment to generate and adopt cutting edge technologies to bear upon the solutions facing a vast majority of resource poor farmers. The robotic systems play an immense role in all sections of societies, organization and industrial units. The objective of the project is to develop a system that helps in on-farm operations like seeding and fertilizing at pre-designated distance and depths with all applicable. Agriculture comes from the words Ager which means a field. Culturia which means cultivation, Due to traditional methods of agricultural process the Indian farmer faces many problems about productivity of agricultural product than others. It is due to unbalance feeding of fertilizer without knowing the actual requirement of nutrient to a particular crop. Traditional methods include broadcasting manually, opening furrows by a country plough and dropping seeds by hand, and dropping seeds in the furrow through a bamboo/meta funnel attached to a country plough. For sowing in small areas dibbling i.e., making holes or slits by a stick or tool and dropping seeds by hand is practiced. Multi row traditional seeding devices with manual metering of seeds are quite popular with experienced farmers In the current generation most of the countries do not have sufficient skilled man power specifically in agricultural sector and it affects the growth of developing countries. So it is now the time to automate the sector to overcome this problem. In India there are 70% people dependent on agriculture. So we need to study agriculture. Innovative idea of our project is to automate the process of sowing crops such as Sunflower, Baby corn, Groundnut and vegetables like Beans, Lady`s-finger, Pumpkin and pulses like Black gram, Green gram etc. & to reduce the human effort and increase the yield.

2. OBJECTIVES

1. The main objective of this project is to design and fabricate smart seed sowing machine which can automatically sow seeds in the field based on variable pitch which is given as input by the farmers using the keypad present on the machine.

2. To reduce extensive labour work.

3. To automate conventional agriculture machine.

4.To reduce cost of current agriculture methods

3. COMPONENTS OF THE VEHICLE

Solar Panel:

Photovoltaic solar panels absorb sunlight as a source of energy to generate electricity. We have used a solar panel of 12 Watt power and 6 Volts potential difference.

Sprocket:

A sprocket or sprocket-wheel is a profiled wheel with teeth, cogs, or even sprockets that mesh with a chain, track or other perforated or indented material.

Chain:

A chain is a roller chain that transfers power from the pedals to the drive-wheel of a bicycle, thus propelling it. A bicycle chain can be very energy efficient with efficiencies as high as 98.6%.

Pedestal Bearings:

It is used for proper fixing of shaft and shaft is easily assembled or dissemble from the plumber block. six plumber blocks are used in this machine. Ours is a split type of bearing.

Battery:

In isolated systems away from the grid, batteries are used for storage of excess solar energy which can be converted into electrical energy. We have used a 12 V and 9 Ah battery.
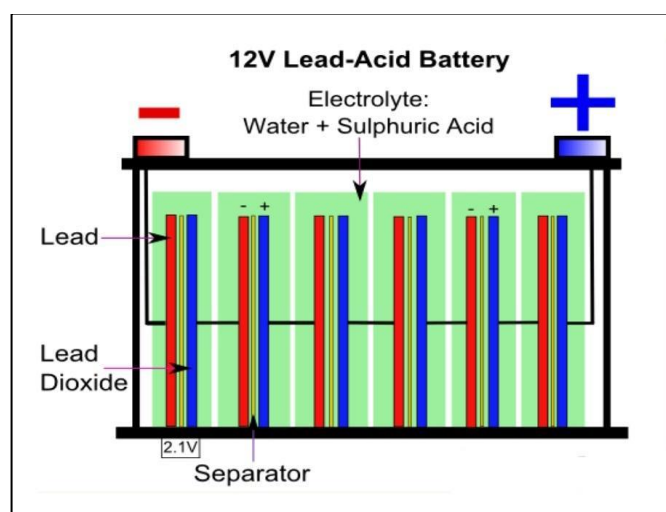

Figure 1. 12 V Lead-Acid Battery

Motor:

A DC motor is an electric motor that runs on direct current power. We have used a motor of 10 rpm speed and 0.5 Nm torque.
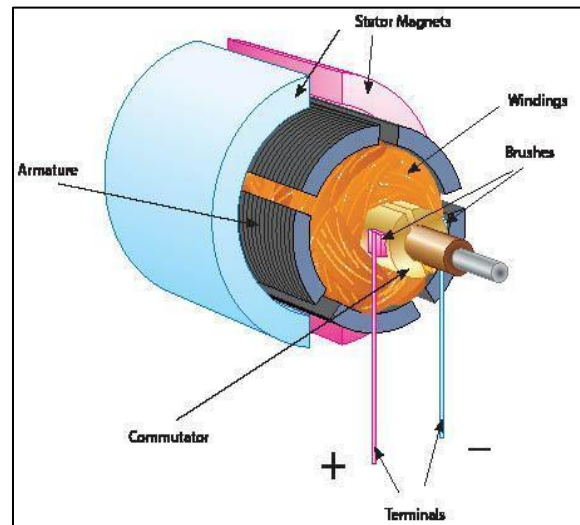

Figure 2. DC Motor

4. METHODOLOGY

In this machine a solar panel is used to capture solar energy and then it is converted into electrical energy which in turn is used to charge 12V battery, which then gives the necessary power to a shunt wound DC motor. This power is then transmitted to the rear wheel through chain drives. Consequently, in this project an attempt is made to make the electric and mechanical systems share their powers in an efficient way.

The basic objective of sowing operation is to fix the seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. A solar panel is a device that collects and converts solar energy into electricity or heat or mechanical work. Solar energy is first used to charge a storage battery. An electric battery is a device consisting of one or more electrochemical cells that convert stored chemical energy into electrical energy.
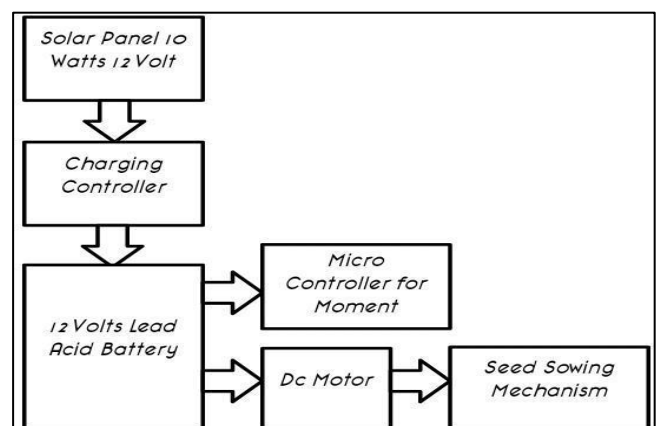

Figure 3. Methodology

The solar energy stored in the battery is utilized to operate DC motor. A DC motor is a device that converts direct current (electrical energy) into mechanical energy. By using the bevel gear and Chain drive with sprockets power is transferred to the wheels for their movement.
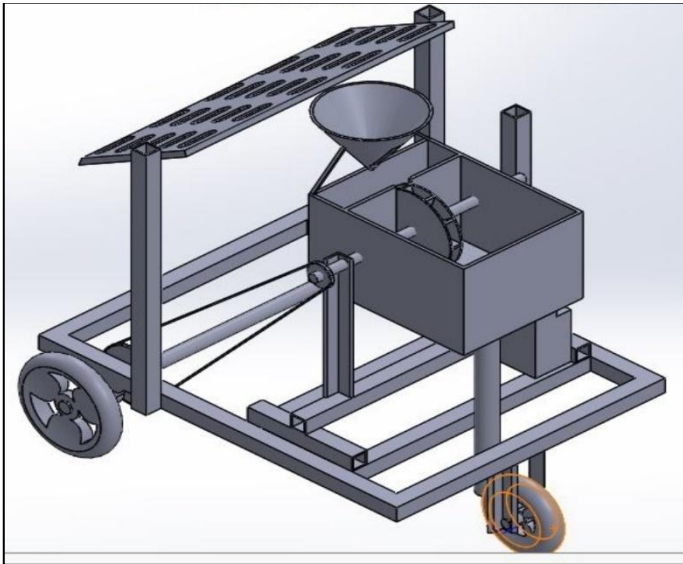
5. 3-D DESIGN
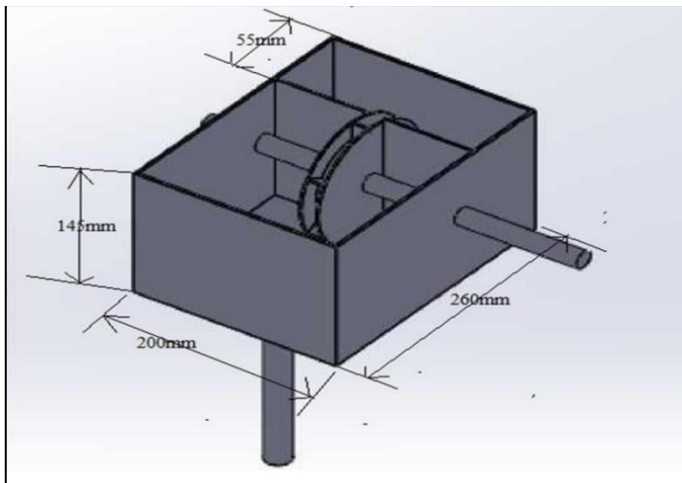

Figure 4. Vehicle Design

Figure 5. Design of seed container

6. ADVANTAGES

1.   Reduces the manual work.

2.   Less skill technicians are sufficient to operate.

3.   Installation is simplified to a greater extent.

4.   Labour requirement reduces.

5.   Wastage of seeds reduces.

6.   No fuel required for power generation.

7.   No pollution.

DISADVANTAGES

1.   Electronics component cannot sustain the vibrations and the high temperature.

2.   Accuracy reduces due to clod and mud.

3.   Seed sowing process is slow.

4.   It takes time to charge battery.

7. FUTURE SCOPE

1.   Using remote control machine can be made automatic.

2.   Addition of multi hopper can be attached side by side for sowing of large farm.

3.   Water dripping unit could be included in seed sowing machine.

8. CONCLUSION

1.   The main focus of this system is to automatic way of sowing the seeds. The seeds are been sowed in a proper sequence which results in proper germination of seeds.

2.   There is fixed distance between sowed seeds and this distance can be varied. Here the wastage of seeds is also been reduced to a great extent.

3.   In this project we have used the natural source of energy which is solar energy, so it eliminates any chance of pollution and use of fossil fuels.

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