

DEVELOPMENT AND FABRICATION OF SEED SOWING MACHINE POWERED BY SOLAR PANEL

Tirth S.Patel Hemil B. Patel Neel A. Modh Devang J. Madhani Dharmendra Sapariya
 Department of Mechanical Engineering
 Indus Institute of Technology and Engineering, Gujarat (INDIA)

ABSTRACT

The project aims on the design, development and the fabrication of the vehicle which can dig the soil, sow the seeds, leveler to close the soil, these whole systems of the vehicle works with the battery. The advantages of these vehicles are hands-free and fast input operations. In the field of agricultural autonomous vehicle, a concept is been developed to investigate if multiple small autonomous machine could be more efficient than traditional large tractors and human forces. Keeping the above ideology in mind, a unit with the following feature is designed; Ploughing is one of the first steps in farming. During this process we till the land and make it ready for the seed sowing. By tilling we mean that a plough will be used which will have teeth's like structure at the end and will be able to turn the top layer of soil down and vice-versa. Seed sowing comes next where the seeds need to be put in ground at regular intervals and these needs to be controlled automatically. Limiting the flow of seeds from the seeds chamber is typically doing this. Hence it is crucial to bolster the efforts of people contributing in the field of agriculture. This project will espouse their efforts.

KEYWORDS

Seed Sowing Equipment's, Solar Panel, Seed Spacing

1. INTRODUCTION

Most of the increase in the area of irrigated land in the world has been through the increasing use of engine-driven pumps. However, the increasing price of oil-based fuel has reduced the margin to be gained by farmers from irrigation, since food prices have generally been prevented from rising in line with energy costs. Despite present short-term fluctuations in oil prices, conventional oil-based engine-driven power sources and mains electricity are expected to continue to increase in the longer term. If we are to decrease our dependence on imported oil, we have to find methods for energizing irrigation pumps that are independent of imported oil or centralized electricity.

“Energy - demand” is one the major thread for our country. Finding solutions, to meet the “Energy - demand” is the great challenge for Social Scientist, Engineers, Entrepreneurs and Industrialist of our Country. According to them, Applications of Non conventional energy is the only alternate solution for conventional energy demand. Now-a-days the Concept and Technology employing this Non-conventional energy becomes very popular for all kinds of development activities. One of the major area, which finds number applications are in Agriculture Sectors.

Solar radiation as a source of energy is of course, the epitome of the clean. Sustainable energy technology except for residues possibly arising out of the manufacture of solar component(e.g. semiconductors), solar technology have very low environmental impacts. The environmental impacts of solar system in operation are very low and the source is, for us inexhaustible. Solar energy plays an important role in using agriculture products and for irrigation purpose which will help in remote villages without use of electricity.

Solar Panel



2. PROBLEM DEFINITION

Now days with use of modern technologies new automobile vehicles/ Machines or instruments are being automatically operated or controlled.

During survey (Survey of local villages or farm) we found that, farmers are using old traditional methods for farming like bullock cart or farming by tractors. Some farmer cannot afford tractors as fuel costs high and it also spreads lots of pollution which is very dangerous to Human as well as it also effect environment. Combustion of fuel makes dangerous gases like SO₂, CO₂, SO₃, CO etc. farmer having cart has to make more effort. This both processing of cultivating and seeding consume time as well as human effort. We try to solve all problem which is face farmers during seed sowing. As we took project title as “SEED SOWING MACHINE” We will try to make a mechanism which is capable of digging, seeding seed at equal interval and leveling of land.

3.OBJECTIVE

The main aim of project is on the basic problems faced by farmers. That is Seed Sowing, cultivation, digging and leveling. We are looking this project as revolution in small farms in India, which is most uncovered area in this sector is cost and more efficient way.

4.COMPONENTS

The different components of “air compressed car” are as follows:

- DC Motor
- Battery
- Funnel
- Levelling Plate
- Wheels
- Plough
- Frame

4.1 D C Motor: An electric motor is a device used to convert electrical energy to mechanical energy. Electric motors are extremely important in modern-day life. The basic principle on which motors operate is Ampere's law. This law states that a wire carrying an electric current produces a magnetic field around itself.

D.C. MOTOR

4.2 Battery: Powers the Air Compressor.

4.3 Wheels: Runs the vehicle.



WHEEL

4.4 Solar Panel: Photovoltaic solar panels absorb sunlight as a source of energy to generate electricity. A photovoltaic (PV) module is a packaged, connected assembly of (typically 6x10) photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.



4.5 Wires: For electrical connections

4.6 Seed storage tank: Storage device is one of the important devices of the system. And is designed according to weight sustained by the robot as well as the required capacity for planting. This component is stationary. To the bottom of this tank seed sowing disc is arranged. This disc serves the function of distribution of the seeds, as for each complete rotation of the rotating wheel, only one seed falls from the tank. Also number of seeds falling from tank is varied according to requirements. This disc evenly opens the way to seed hence planting is done smoothly and accurately.

4.7 Seed sowing disc & seed bucket: Disc which is attached at the bottom of the tank allows one seed during one rotation of wheel. The buckets are screwed on the disc. These buckets are very similar to half shape of pelton buckets. As these are screwed to disc its size is varied according to diameter of the seed and required distance between the seeds.

4.8 Digger mechanism: For digging and seeding Digger mechanism is used. With the help of nut and bolts digger is

connected to the frame. We used adjustable diggers so we can adjust depth of digger.



DIGGER

4.9 Hooper: A ladle is used for Seed storage. The hole is provided to the hallow cylinder which is coupled to the DC motor shaft, where the funnel is placed above it. The DC motor is powered by a battery which is controlled using a toggle switch. As the motor is switched on, the hallow cylinder tend to rotate which makes the seeds fall on the cultivated field making consistent gap between seeds.

4.10 Surface Leveling: The sheet metal plate is used for the surface finish and for surface leveling. The long bolt and nut is used for leveler up & down movement. The Leveler is not powered.

5. Working

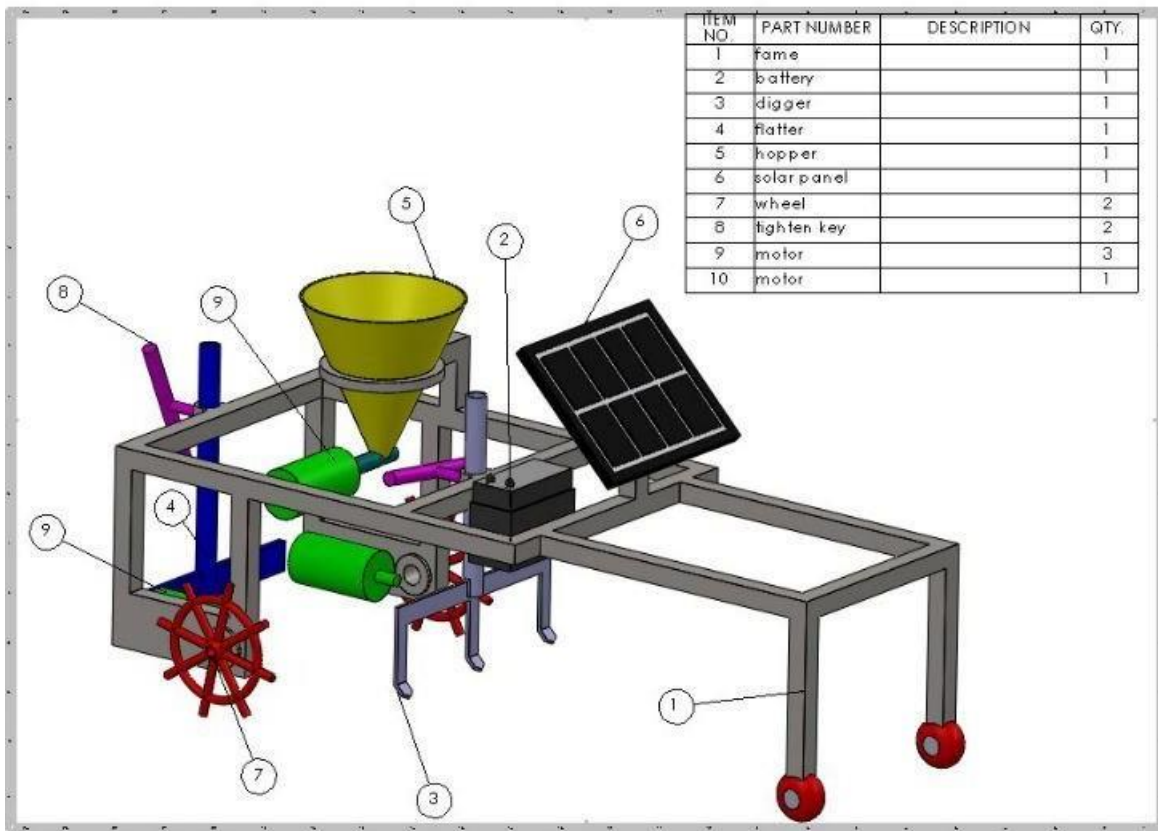
India is a country where farming is main occupation and culture then also in India most of farmers attempt suicide reason behind this is machine , as in India 10-20% of farmers are rich but rest of farmers don't have much source to purchase heavy equipment and machines. So we have decided to design a machine which can fulfill basis need of farming and price of machine should be very less as compared for market .Main objective of machine is digging, seed sowing, cultivating and leveling .For solving this purpose we have designed this type of machine.

For digging operation motor, battery and switch is given. When switch is on, energy/power from the motor enters to the digging mechanism, then seed sowing in done.

We have used hopper for seed sowing and that hopper is connected to lever at handle so handler can press lever to drop seed.



6. DESIGN



7. Calculation and Analysis:

7.1 CALCULATION OF TORQUE TRANSMITTED ON THE WHEEL

$$T_w = K_w \times W_t \times R$$

Where, w = Coefficient of the rolling resistance (0.3 for metallic wheel)

W_t =weight of the machine (15kg approx.)

R_w = Radius of the ground wheel

We have, K_w = 0.3,

$$W_t = 15 \text{ kg} = 15 \times 9.81 = 147.72 \text{ N}$$

$$R_w = 150\text{mm} = 0.15\text{m}$$

$$T_w = 0.3 \times 147.72 \times 0.15$$

$$= 6.6244 \text{ N-m}$$

7.2 Power Required For Motor, (N=30 rpm)

$$P = 2 \times \pi \times N \times T / 60$$

$$= 2 \times 3.14 \times 30 \times 6.64 / 60$$

$$= 20.84 \text{ Watt}$$

Where, Angular velocity,(wheel)

$$w = 2 \times \pi \times N / 60$$

$$w = 2 \cdot \pi \cdot 30 / 60$$

$$w = 3.14 \text{ rad/s}$$

7.3 ANGULAR VELOCITY TO LINEAR VELOCITY FORMULA

$$v = r \cdot w$$

Where, r = radius of the wheel in m

$$v = 0.15 \times 3.14$$

$$v = 0.4 \text{ m/s}$$

7.4 Solar Panel Calculation

Solar panel capacity: 10 watt/hour

It means it generate 10 watt electricity per hour

If we get 6 hours sunrays then it will generate

$$10 \times 6 = 60 \text{ watt}$$

So it will use to charge 12 Volt of 7ah battery.

It will take at least 6 hour to charge battery.

8. Practical Analysis:

On practical basis, the following information is obtained,

I) Time of Charging Battery

The battery takes 6 hours to charge with the help of solar panel.

II) Working Time of machine

The machine can work for approximately 2.5 hours on farm field depending on its conditions and usage.

III) Distance travelled by machine in one minute (60 seconds)

The machine can cover distance of 16m in one minute without any interruption.

IV) Speed of machine in farm

The speed of machine in farm is 0.267 m/s depending on the varied conditions of the farm surfaces.

- On performing practical tests, it can be concluded that the machine works properly on the farm surface without major interruptions and can travel specific required distance with appropriate speed. Practical testing was performed on various farm surfaces as per the requirement.

- Hence, this analysis construes that the machine meets the requirements that were presumed theoretically in previous project phases.

9. Technical Specification

SR.NO	PART NAME	MATERIAL	DIMENSION
1	Hooper	Aluminium	Outside Diameter: 200mm Inside Diameter: 25mm
2	Solar Panel	Monocrystalline silicon	12V , 10W
3	Battery	Lead Acid	12V , 7 Ah
4	D C Motor	Copper wiring	12V DC motor, 60 RPM
5	Digger	Mild Steel (E-350)	-
6	Flat plate	Mild Steel	-
7	Wheel	Harden M.S.	Diameter: 300mm

10. Experimental Setup

The view of seed sowing machine is as follows,

Seed Sowing Machine Powered By Solar Panel

11. Conclusion



After the manufacturing, conclusions construed are as follows:

- Based on designing, the overall performance of the machine will satisfy the need of small scale farmer, because they are not able to purchase costly agricultural equipment.
- The machine required less man power and less time compared to traditional methods, so if we manufacture it on a large scale its cost gets significantly reduce and we hope this will satisfy the partial thrust of Indian agriculture.

So in this way we can overcome the labour problem that is the need of today's farming in India.

12. REFERENCES

12.1 BOOKS:

12.1.1 Design Data Book by V.B. Bhandary.

12.2.2 Design of Machine Element, Prof.V.B.Bhandari, Mc-Graw-Hill Publishing Company Ltd.2007

- Strength of Machine Element, Prof.R.K.Rajput,S.Chand Publication edition 2008.
- Fluid mechanics and hydraulic mechanism, R.K.BANSAL,Ninth edition

12.2 RESEARCH PAPER:

12.2.1 Literature review by Prashant G. Salunkhe, Sahil Y. Shaikh, Mayur S. Dhable, Danis I. Sayyad, Azeem S. Tamboli, Professor UG Scholar on April 2016. ISSN: 2321-3361, "Automatic Seed Plantation Robot"

12.2.2 Literature review by Prof. P.S.Gorane, Patil Nikhil, Patil Shubham, Pawar Ganesh, Raut Madhuri on April 2017. ISBN:978-93-86171-12-2 "DESIGN AND DEVELOPMENT OF SEED SOWING MACHINE ALONG WITH FERTILIZER SPRAYER"

12.2.3 Literature review by Pradip S. Gunavant, Sarfraj J. Mulani, Vishal N. Gandhe, Gurnath Shinde, Vinayak D Yadav on January 2017. ISSN: 2394-1588, "Farm Mechanization by using Seed Planting Machine"

12.2.4 Literature review by A.O.Hannure, S.P.Kshirsagar, V.S.Kodam, O.N.Patange, V.S.Nakod on June 2016. ISSN: 2231-5381 "Automatic Seed Feeder"