

ELECTRICAL BASED SEED SOWING MACHINE

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Abstract: Agriculture, the backbone of Indian economy is the chief occupation for about one-half of Indian population. The impact of Green Revolution made many farmers become aware about the various techniques of farming and the advantages involved in it. The rapid progress in science led to the development of modern techniques in it. In dry land regions, where the availability of labour is less, various models of seed sowing implements became popular over the last few years as they ensured the timely seeding as well as the proper and precise distribution of seed within the row. Agro-Technology is one such branch in science which provides us the scope to apply some new engineering techniques like Mechanical machine to agricultural domain to increase the efficiency and productivity. In this paper we are planning to design a cost effective, less power consuming and efficient mechanical machine to be made available for the farmers at a cheaper price to sow and seed the crop and that can be extensively used for sowing soya bean, maize, pigeon pea, Bengal gram, groundnut etc.

Index Terms: Agriculture, Seed sowing, Wheels, Battery, DC gear Motor, Vehicle

I. INTRODUCTION

The record of progress in agriculture has been quite extraordinary in India over the past five decades. Due to the rise in demand for food the agriculture sector has been successful in keeping pace. The addition of land area under agricultural production has declined over time. The contribution of agricultural growth to overall progress has been all over the place. The increase in agricultural production helped in feeding the poor, improving farm income and creating hope for both direct and indirect employment.

The aim of the paper is to ease the in farm operations like seeding and fertilizing at pre-designated distance and depths. The Indian farmers face many problems about productivity of agricultural product due to traditional methods of agricultural process than other country farmers. The reason is unbalance feeding of fertilizer which is not of the actual requirement of nutrient to crop. Digital models of biological objects have proven to deliver new facilities for the analysis of structural and functional interrelationships as well as developmental processes in a spatial temporal context.

The idea of our paper is to increase the yield by making the process of sowing crops like sunflower, baby corn, some vegetables and some pulses automatic which even reduces the man power in the field. With the help of DC motor the seeds can be planted automatically. Different seeds can be cultivated at different distances. Generally in farms the seeds are planted with the help of tractors. The manual plantation of seeds requires more time and man power. As agriculture is the largest livelihood provided in India the farmers are in need of easier methods in ploughing and cultivation.

In present situation there is a huge scarcity in skilled man power in Agricultural sector in many countries. This effects the growth in development of countries. The updated technology makes the farmers much helpful in cultivation activities. It also reduces the need for more man power and wastage of seeds. It being an autonomous agricultural based project we are motivated for doing this project.

The vehicle is an electromechanical as well as an artificial agent that is driven by DC motor having four wheels. The machine helps in cultivation, depending on the crop considering particular rows & columns. Water pressure is used in detecting and solving the seed block. As there are some good tractor based seeding systems in existence there is no much importance for seeding. Horticulture has significantly less robotic applications than in agriculture.

In this design and development of manually operated seed planter machine they present objective of seed planter machine design, factors affecting seed emergence, some mechanisms. The basic idea of the sowing operations is to plant the seed in rows up to required depth with spacing between consecutive seeds. The main aim of the sowing operation is to plot the seed and fertilizer in rows at required depth with seed to seed spacing, the importance of study is in the contribution of wireless control of automatic vehicle systems and robotics. The seed spacing and depth of seed placement vary depending on the climatic conditions for achieving good yield. From this we know that mechanical factors effects the seed germination based on uniformity of depth of placement of seed, uniformity of distribution of seed along rows.

In this paper section I describes about introduction and objective of the work, section II explains proposed system description, section III discuss about how to design seed sowing vehicle, calculations and fabrication of the vehicle and section IV concludes the result of the work. Section V describes how to develop automated AgriRobot.

II. PROBLEM IDENTIFICATION AND PROPOSED SYSTEM

The following steps are to be taken to identify the problem.

- i. The first step is to meet the farmers and identify the problems faced by them.
- ii. The second step is to select a problem.
- iii. The third step is to collection of data regarding the seed sowing and planting by farmer interview and literature review.

The drawbacks of existing machines are:

- a. The spacing between two seeds is uneven.
- b. It requires more than two operators.
- c. Flow rate of seeds are not convenient.

After the field visit and literature review we are concluded to work on seed planter machine which will rectify the previous machines drawbacks.

2.1. Seed Storage Tank



Fig.1 Designed seed storage tank.

This is one of the stationary components which are mounted on the main frame. Inside this drum we can pour the seed for planting / sowing operation. Bottom of this seed tank there is seed sowing disc arrangement. In this system the seed storage tank is used .when the seeds are empty it detect the level of storage seed and indicate the alarm. When any obstacle comes in the in-front of machine or divert path the seed sowing machine can detect this obstacle very easily.

2.2 Seed Sowing Disc



Fig.2 Seed sowing disc.

In each complete rotation of rotating wheel there is seed falls from this seed drum and the seed plantation process can taken place smoothly as well as without wastage of seeds. The end of system machine reached and it create an alarm. This system provides the entire facility and farmer sow the seeds very easily.

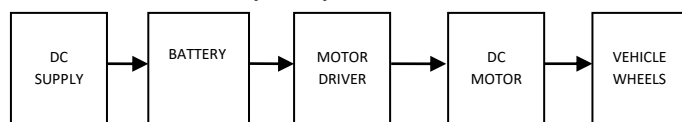


Fig.3 Overall block diagram.

The figure 3 shows the block diagram of proposed system. In agricultural system the more facilities to provide the farmer and accurate work. This system has 4 wheel systems. The seed sowing machine is developed which has very less cost. Also the unskilled farmer can be easily operated automatic seed sowing system. The design and fabrication of a manually operated single-row seed planter that is cheap, easily affordable by the rural farmers. The single-row seed planter is very simple to use the various adjustments are made with ease, and it is maintenance free. In seed sowing machine system they are used battery powered wheels and dc motor inbuilt in these wheels.

2.3 DC Gear Motor

A gear motor is a specific type of electrical motor that is designed to produce high torque while maintaining a low horsepower, or low speed, motor output. A gear motor can be either an AC or a DC electric motor. Generally gear motors have an output of between about 1,200 to 3,600 revolutions per minute. These types of motors also have two different speed specifications: normal speed and the stall-speed torque specifications. Gear motors reduce speed in a series of gears that leads to creation of more torque. This is accomplished by an integrated series of gears or a gear box being attached to the main motor rotor and shaft via a second reduction shaft.



Fig.4 DC gear Motor.

An H-Bridge is a circuit that can drive a current in either polarity and be controlled by Pulse Width Modulation (PWM). PWM is a means in controlling the duration of an electronic pulse. Let us imagine the brush in the motor as a water wheel and electrons as flowing droplets of water. The voltage would be the water flowing over the wheel at a constant rate, the more water flowing the higher the voltage. Motors will be damaged if the voltage applied is heavier than rated voltage or if they are forced to slow down quickly. Take the water wheel analogy and think of the water hitting it in pulses but at a constant flow. The longer the pulses the faster the wheel will turn, the shorter the pulses, the slower the water wheel will turn. Motors will last much longer and be more reliable if controlled through PWM.



Fig.5 Gears in DC gear Motor

2.4 Battery

Batteries can be divided into two major categories, primary batteries and Secondary batteries. A primary battery is a disposable kind of battery. Once used, it can't be recharged. Secondary batteries are rechargeable batteries. Once empty, it can be recharged again. This charging and discharging can happen many times depending on the battery type. Alkaline batteries, Mercury batteries, Silver-Oxide batteries, and Zinc carbon batteries are examples of primary batteries where as Lead-Acid batteries and Lithium batteries fall into the secondary battery's category.

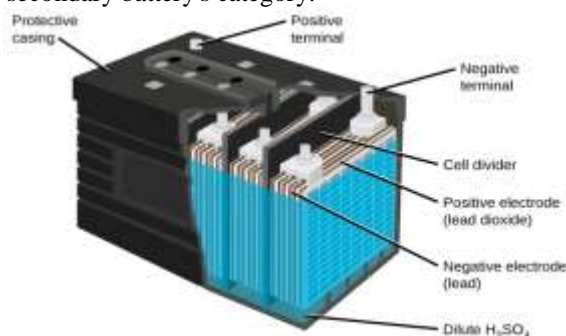
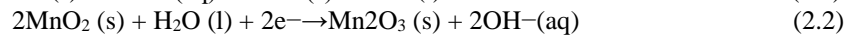
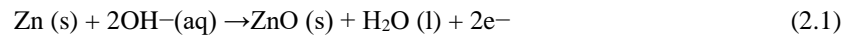


Fig.6 Lead acid battery.

The chemical reactions are:



Lead-acid batteries are the rechargeable kind of batteries invented in the 1980s. These large, heavy weight batteries find the major application in automobiles as these fulfil the high current requirements of the heavy motors. The composition of Lead-Acid battery changes in charged and discharged states. A combination of Pb (negative) and PbO₂ (positive) as electrodes with H₂SO₄ as electrolyte in charged form and PbSO₄ and water in discharged form.

2.5 Battery Powered Wheels



Fig.7 Battery powered wheels.

The rotating wheels are designed also it has fabricated rib parts so it helps to give grip during the seed planting, so that user can easily pull the whole assembly as per required direction. The both wheels are powered by battery and DC motor is inbuilt fitted in these wheels.

III. DESIGN OF SEED SOWING VEHICLE

The figure 9 shows the detailed drawing of seed sowing design mechanism. It is designed as per farm condition and also it is as per the requirement so that it can dig the required size of rows for seed sowing. Battery powered rotating wheels are designed and also it has fabricated rib parts so it helps to give grip during the seed planting, so that user can easily pull the whole assembly as per required direction. The both wheels are powered by battery and DC motor shown in figure 8 is inbuilt fitted in these wheels. Seed storage tank is one of the stationary components which are mounted on the main frame. Inside this drum we can pour the seed for planting / sowing operation. Bottom of this seed tank there is seed sowing disc arrangement. Seed sowing disc, in each complete rotation of rotating wheel there is seed falls from this seed drum and seed plantation process taken place smoothly and without wastage of seeds. These seed buckets are fitted on the seed sowing disc with the help of screws. The buckets are designed in such a way that they can select the size of bucket as per seed type, size and shape. Also these buckets fit on the seed sowing disc in such a way that the distance between two seed during the plantation we can adjust and set according to requirement. This is one of the stationary components which are mounted on the main frame. Inside this drum it can pour the seed for planting / sowing operation. Bottom of this seed tank there is seed sowing disc arrangement.

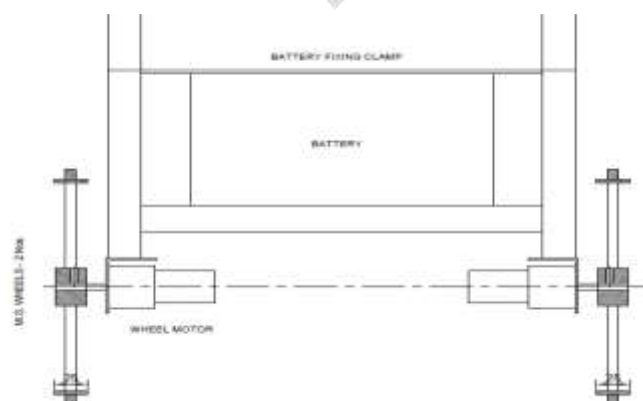


Fig.8 Crossectional View of Motor with Battery.

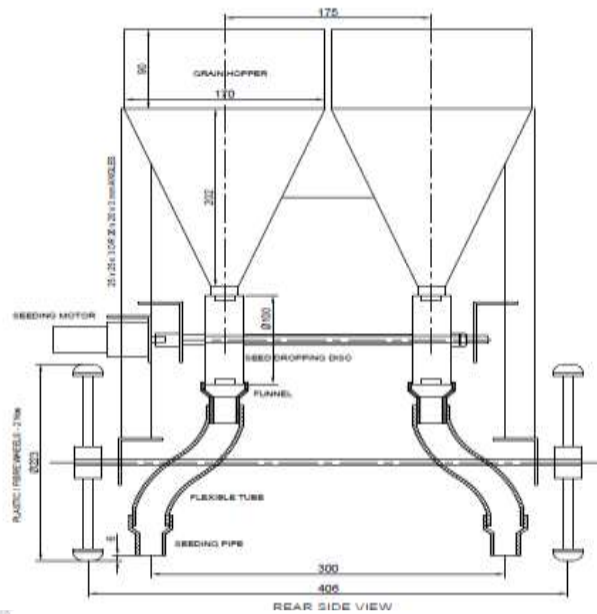


Fig.9 Crosssectional View of Seed Sowing Mechanism.

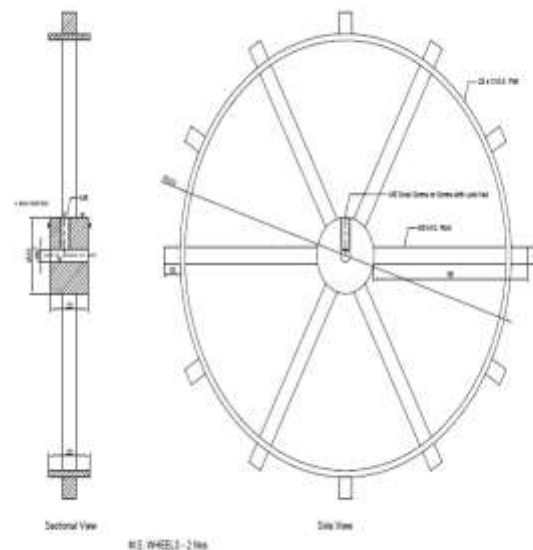


Fig.10 Crosssectional view of the wheel.

3.1 Calculations

Please find the calculations for Wheel Drive Motor is as below:

1 Acre = 4840 Sq. Yards = 4840 x 9 Sq Feet = 120 Ft wide x 363 ft long (assumed) = 36.5 x 111 Mtrs

Number of Rows at 8" (0.2 Mtr) Planting = 111 / 0.2 Mtr = 555 Numbers at single seed

Total distance to travel = 555 x 36.5Mtr Long = 20257.5 Mtrs = 20.25 Km

Speed of Vehicle = 10 Km/Hr

Time Taken to complete sowing = 20.25 / 10 = 2 Hrs approx.

Diameter of the wheel = 8" = 0.2 Mtr

Travel for 1 Rev = $3.1415 \times 0.2 = 0.6283$ Mtr / rev

Travel required per Min = $10000 / 60 = 166.66 = 167$ Mtr/Min

Speed of Wheel = $167 / 0.6283 = 265.26$ RPM Say 300 RPM

When 2 rows of seeds sowing is done at a time then total distance to travel will be half as calculated above and the 300 RPM Motor with 8" Wheel can travel 1 Acre in about 1Hour.

3.2 Fabrication Of The Vehicle



Fig.11 Arrangement of DC gear motor in the vehicle.



Fig.12 Total assembly of designed vehicle.

The motor specifications are 1100 watt, DC power, 12V, 7A current.

IV. CONCLUSION

The main focus of this system is its way of sowing the seeds. The seeds are sowed in a proper way depending on the agricultural and climatic conditions, which results in proper germination of seeds. This way of sowing seeds using a vehicle reduces the labour requirement and also reduces the wastage of seeds. This project will help the farmers to do farming more easily and effectively. This project can also be implemented for other kind of crops such as fruits, paddy, sugarcane etc. In this paper we tried to resolve the problems faced by farmers in their day to day work in the agricultural fields. The conventional method of farming requires more man power and still the efficiency is less. So with the help of this system we can increase the efficiency with less man power.

V.FUTURE SCOPE

We will design the system in future by using the robotic system is an artificial agent which will steered by DC motor which has four wheels. The infrared sensor detects the obstacles in the path and it also senses turning position of vehicle at end of the land. The seed block can be detected and solved using water pressure. The machine can be controlled remotely and solar panel will be used to charge DC battery. Assembly language will be used in programming the microcontrollers. The microcontroller will be used to control and monitor the process of system motion of vehicle with the help of DC motor. The significance of the study will be the contribution in the field of wireless control of automated guided vehicle systems and robotics. A simpler approach and algorithm will be designed for using low cost and in house available RF transceiver and ASSR with low processing requirements but with effective results. The recommended seed to seed spacing and depth of seed placement vary from crop to crop and for different agro climate conditions to achieve optimum yields.

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