

DEVELOPMENT OF SOLAR POWERED SEED SOWING AND FERTILIZER SPRAYING MACHINE

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ABSTRACT :

This dissertation provides information about the various types of innovations done in seed sowing machine available for plantation and fertilizer sprayer. The seed sowing machine is a key component of agriculture field. Today's era is marching towards the rapid growth of all sectors including the agricultural sector. 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 overall crop production. This dissertation deals with the various sowing methods used in India for seed sowing and fertilizer spraying. The comparison between the traditional sowing method and fertilizer spraying and the new proposed machine which can perform a number of simultaneous operations and has number of advantages. As day by day the labor availability becomes the great concern for the farmers and labor cost is more, this machine reduces the efforts and total cost of sowing the seeds and fertilizer spraying. In this dissertation we are development of solar powered seed sowing and fertilizer spraying machine.

KEY WORDS : Seed Sowing, Spraying, Solar Power

1. INTRODUCTION

A. Problem Statement

Seed sowing machine is a device which helps in the sowing of seeds in a desired position hence assisting the farmers in saving time and money. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. The paper discusses different aspects of seed sowing machine which will be helpful for the agriculture industry to move towards mechanization. The agricultural industry has always been the backbone of India's sustained growth. As the population of India continues to grow, the demand for produce grows as well. Hence, there is a greater need for multiple cropping on the farms and this in turn requires efficient and high-capacity machines. Mechanization of the Agricultural industry in India is still in a stage of infancy due to the lack of knowledge and the unavailability of advanced tools and machinery. In traditional methods seed sowing is done by broadcasting manually, opening furrows by a plough and dropping seeds by hand. The agricultural has always been the backbone of India's sustained growth. As the population of India continues to grow, the demand for produce grows as well. Hence, there is a greater need for multiple cropping in the farms and this in turn requires efficient and time saving machines. The paper discusses different types of seed sowing machine which will be helpful for the agriculture industry to move towards mechanization.

Traditional Sowing Methods: 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/metal 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 manual seeding, it is not possible to achieve uniformity in distribution of seeds. A farmer may sow at desired seed rate but inter-row and intra-row distribution of seeds is likely to be uneven resulting in bunching and gaps in field.

Traditional sowing methods have following limitations:

1. In manual seeding, it is not possible to achieve uniformity in distribution of seeds.
2. A farmer may sow at desired seed rate but inter-row and intra-row distribution of seeds is likely to be uneven resulting in bunching and gaps in field Poor control over depth of seed placement. Labor requirement is high because two persons are required for dropping seed and fertilizer. The effect of inaccuracies in seed placement on plant stand is greater in case of crops India is set to be an agricultural based country approximately 75% of population of India is dependent on farming directly or indirectly. Our farmers are using the same methods

and equipment for the ages. e.g. seed sowing, spraying, weeding etc. There is need for development of effective spraying and weeding machine for increasing the productivity. Most of the developing countries of Asia have the problem of high population and low level of land productivity as compared to the developed nations. One of the main reasons for low productivity is insufficient power availability on the farms and low level of farm mechanization. This is especially true for India. It is now realized the world over that in order to meet the food requirements of the growing population and rapid industrialization, modernization of agriculture is inescapable. It is said that on many farms, production suffers because of improper seedbed preparation and delayed sowing, harvesting and threshing. Mechanization enables the conservation of inputs through precision in metering ensuring better distribution, reducing quantity needed for better response and prevention of losses or wastage of inputs applied. Mechanization reduces unit cost of production through higher productivity and input conservation. Agricultural implement and machinery program of the government has been one of selective mechanization with a view to optimize the use of human, animal and other sources of power. In order to meet the requirements, steps were taken to increase availability of implements, irrigation pumps, tractors, power tillers, combine harvesters and other power operated machines and also to increase the production and availability of improved animal drawn implements. Special emphasis was laid on the later as more than 70% of the farmers fall in small and, marginal category. It is generally said that mechanization of small farms is difficult. But Japan having average land holding even smaller than ours, with proper mechanization has led agriculture to great heights. In order to minimize the drudgery of small farmers, to increase efficiency and save farmer's time for taking up additional /supplementary generating activities, the use of modern time saving machines/implements of appropriate size needed to be suitably promoted.

B. Objectives

Objective of the project can be stated as

1. Investigation of various types of seed sowing and fertilizer spraying machine
2. Development of solar powered seed sowing and fertilizer spraying machine.
3. Testing of development of solar powered seed sowing and fertilizer spraying machine in actual agricultural farm.

C. Scop

Seed sowing machine is a device which helps in the sowing of seeds in a desired position hence assisting the farmers in saving time and money. So considering these points related to spraying and seed sowing an

attempt is made to design and fabricate such equipment which will able to perform both the operations more efficiently and also will results in low cost. Decrease the operational cost by using new mechanism.

1. Work reliably under different working conditions.
2. Decrease the cost of machine.
3. Decrease labor cost by advancing the spraying method.
4. Machine can be operated in small farming land (1 acre).
5. Making such a machine which can be able to perform both the operation

2. METHODOLOGY

The section 1 discusses about the work like as:

1. Introduction of the various parts used in the project like solar plate, battery, spray pump, seed drilling mechanism and tank.
2. Design or selection of various parts used the project
3. Fabrication model of the project

In our country farming is done by traditional way, besides that there is large development of industrial and service sector as compared to that of agriculture. The spraying is traditionally done by labor carrying backpack type sprayer which requires more human effort. The weeding is generally done with the help of Bulls which becomes costly for farmers having small farming land. So to overcome these above two problems, we tried to eliminate these problems and designed the equipment which will be beneficial to the farmer for the spraying and weeding operations.

A. Selection of Sowing and Planting Machines:

Different designs of improved seed drills/planters have been developed for sowing of crops. Basic difference in the design of these seed drills is mainly in the type of seed metering mechanism and furrow openers. Therefore, it is essential to select the machine with a metering unit and furrow opener suitable for the crop and soil conditions.

Selection solar panel:

Solar panel Specification:

P_{max} (W)	20
V_{max} (V)	17.60
I_{max} (A)	1.14
V_{oc} (V)	21.50
I_{sc} (A)	1.23
Module Size (mm)	555x340x22
Weight (kg)	2.1

- As per solar panel specification I_{max} is 1.14 (A)

Solar panels are a great way of cutting your electricity. We all want to live self-sustainably, or at least reduce the carbon footprint of our home, and solar panels make that dream possible. Solar panels are made of photovoltaic (PV) cells, which turn sunlight into electricity. This electricity can then be fed into your home's mains electricity supply. The technology behind solar is relatively old, despite their futuristic appeal, but while the basics are the same the efficiency of solar panels has improved greatly in recent years. Rated power 20W Frame Heavy duty aluminum Kind of connection waterproof junction box, can be customized Guarantee of power 90% within 10 years 80 within 25 years, Kind of glass and its thickness Low Iron, high transparency tempered glass of 3.2mm SLA Battery Voltage 12V size 555X340X22

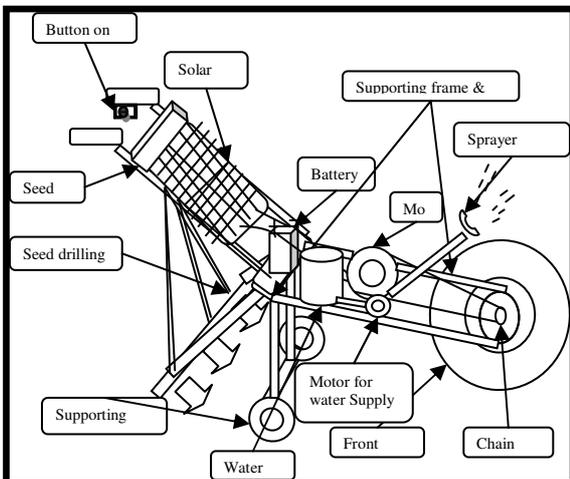
Selection of Battery :

An electric battery is a device consisting of one or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell contains a positive terminal, or cathode, and a negative terminal, or anode. Electrolytes allow ions to move between the electrodes and terminals, which allows current to flow out of the battery to perform work.

Battery: 7.2 Amp Hour 12 Volts Sealed Lead Acid Battery

Selection of Motor as battery specification
Motor 12V DC 30 RPM

An electric motor is a machine which converts electric energy into mechanical energy. Its action is based on the principle that when a current carrying conductor is placed in magnetic field, it experiences a



mechanical force whose direction is given Fleming's

Left Hand Rule.

Design of the Motor

We know,

Specification of the DC motor,

$$\text{Toque (T)} = 5 \text{ N-m}$$

$$\text{Speed (N)} = 30 \text{ rpm}$$

We know,

$$\begin{aligned} \text{Power (P)} &= 2\pi NT/60 \\ &= (2 \times 3.14 \times 30 \times 5)/60 \\ &= 15.7 \text{ watt} \end{aligned}$$

Power of the motor (P) = 15.7 watt.

Chassis:

A consists of an internal framework that supports a man-made object in its construction and use. It is analogous to an animal's skeleton. An example of a chassis is the under part of a motor vehicle, consisting of the frame (on which the body is mounted). If the running gear such as wheels is included then the assembly is described as a rolling chassis. Material Used In Chassis – Iron

Size of Chassis – 22 inch x 8 inch x 36 inches

Battery Charging Design

Analytical calculation of current and charging time of the battery:

- (i). The current produced by the solar panel (I) was calculated by knowing the maximum power (P) of the solar panel and the voltage rating (V) of the battery that is given by

$$I = P/V$$

Therefore, $I = 20/12 = 1.66$ Ampere

But actually given in the solar panel specification is 1.14 Ampere

- (ii). Charging time (T) was computed by taking the ratio rating of battery in ampere hour (Ah) to the total current consumed by the solar panel.

$$T = (\text{battery rating in ampere hour}) / (\text{total current consumed by the solar panel})$$

Therefore, $T = 7.2/1.66 = 4.33$ hours

3. CONCLUDING REMARKS AND SCOPE FOR THE FUTURE

Our project is successfully implemented for seed sowing and fertilizer spraying. The equipment is purposely design for the farmers having small farming land say 5-6 acre. It is suitable for spraying as well as weeding at minimum cost for the farmer so that he can afford it. The equipment will results more beneficial when it is subjected to moist soil for weeding purpose, due to moist soil the weed cutter can easily penetrate and dig out the soil and hence will easily accomplished the weeding process. The performance of the equipment will increase when it is operates on the smooth surface or less uneven surface and also it will be more effective when it is used on the crops having nearly similar height and having the less space between two crops

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ABBREVIATION

Symbol	Description
P_{max}	Maximum Power
V_{max}	Maximum Voltage
I_{max}	Maximum Current
T	Torque
P	Power

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