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**International Journal of Research Publication and Reviews**

Journal homepage: www.ijrpr.com ISSN 2582-7421

# DESIGN AND FABRICATION OF SEED SOWING MACHINE

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**ABSTRACT:**

The aim of this project is to create a seed-sowing machine that is lightweight, affordable, and dependable. It also aims to improve mechanical equipment used in agriculture by reducing the amount and kind of labour required to produce a single crop. As a result, we made the decision to develop and construct a machine for small-scale producers that will be affordable and capable of lowering costs while increasing profits for farmers as part of this project. The primary advantage of this idea is that cotton seed can be easily sown. The agricultural industry needs to come up with alternatives to outdated farming methods and replace them with ones that are more effective. We attempted to develop and construct a machine in this project that would lower the goal energy input more effectively than in the past. Small-scale farming really benefits from this strategy. We can now transition to a new equipment generation. We now have the chance to create a new line of agricultural equipment based on small, intelligent machines that can act appropriately in the appropriate context at the appropriate moment. This is made possible by the development of autonomous system architecture. It will boost productivity and cut costs in the agricultural sector.

**Keywords:** Lightweight,Affordable,Effective,Dependable,Lowering Costs,Increasing Profits.

## Introduction

Today's era is marching towards rapid growth in agricultural sector. Crop planting refers to placing seeds in the soil, broadcasting seeds on the field surface or transporting seedlings in the soil, under optimum soil temperature and moisture conditions. To get high yields, the right amount of seeds should be placed at the right time at a predetermined depth and spacing in the soil. Usually the depth of sowing depends upon the moisture availability and seed emergence capacity. The spacing between the seeds is governed by the plant growth and their distribution per unit area. However, the space requirement of a plant is so adjusted between the rows that the subsequent use of inter culturing implements is made possible for the crops. In general the larger seeds are sown at comparatively greater depth and the plants need wider spacings.

The number of seed that needs to be sowed per unit area depends on the size of the seed, the germination rate, the amount of cover at maturity, and whether or not grain or fodder will be harvested from the plant. Under ideal rainfall circumstances, the majority of crops are sown on flat ground. The sowing is done in furrows or on ridges when rainfall is either too low or too high. The promptness of field activities, particularly seeding operations, has been highlighted as a crucial element in enhancing the intensity of cropping in places where human labour and draught animals are the main sources of agricultural power. Therefore, it is necessary to mechanise both the tillage and sowing processes. By completing planting and sowing as soon as possible following the harvest of previous crops, you may maximise the benefits of residual moisture. A seed sowing machine is a tool that assists farmers in saving time and money by helping to spread seeds in the desired location. The primary goal of a sowing operation is to arrange the seeds in rows at the correct depth and seed-to-seed spacing, cover the seeds with soil, and apply the proper compaction over the seeds. In order for the agriculture business to proceed towards mechanisation, the research addresses many features of seed sowing machines. India's steady economic progress has traditionally been supported by the agriculture sector. The demand for food increases along with India's population growth. As a result, farms have a greater requirement for multiple cropping, which in turn demands the use of machines with high productivity. 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.

Experienced farmers are big fans of multi-row traditional seeding equipment with hand seed metering. It is impossible to obtain consistent distribution of seeds when manually sowing. A farmer may plant at the proper seed rate, but the distribution of seeds between and within rows is likely to be unequal, leading to bunching and gaps in the field. Traditional sowing methods have following limitations:

- In manual seeding, it is not possible to achieve uniformity in distribution of seeds.
- A farmer may sow at desired seed rate but interrow and intra-row distribution of seeds are likely to be uneven resulting in bunching and gaps in field Poor control over depth of seed placement. Labour requirement is high because two persons are required for dropping seed and seed.

- No Arrangement for seed bed-preparation.
- Improper compaction of soil over-furrows.
- Adjustment of row spacing is improper.
- The cost of machine is more.

## Literature Review

The review by **Mahesh R. Pundkar** and **A. K. Mahalle** is presented and gives a brief overview of all types of advances made to seed-sowing equipment for plantations. The seed sowing machine is an essential tool in the agricultural sector.. The efficiency of seed sowing equipment significantly affects the price and output of agricultural products. Currently, there are many approaches for determining a seed-sowing device's performance.

According to **Laukik P. Raut** and **colleagues'** research, agriculture must be modernised in order to fulfil the demands of an expanding population and a rapidly industrialising world. Mechanisation makes it possible to conserve inputs by providing accurate metering distribution, lowering the amount required for a better response, and preventing losses or wastage of applied inputs. Through increased productivity and input conservation, mechanisation lowers the production unit cost.

The review by **D. Ramesh** and **H. P. Girish Kumar** provides a summary of the numerous sorts of advances made to seed sowing machinery. The primary goal of a sowing operation is to arrange the seeds in rows at the correct depth and seed-to-seed spacing, cover the seeds with soil, and apply the proper compaction over the seeds. For each crop and for various agro-climatic conditions, variable row-to-row spacing, seed rates, seed-to-seed spacing, and depth of seed placement are advised in order to produce the highest yields. Devices for sowing seeds are widely used in agriculture.

According to **Pranil V. Sawalakhe** and **colleagues ,**all sectors, including the agriculture sector, are growing quickly in the modern era. Farmers must adopt new practises that won't alter the soil's texture but will boost crop productivity overall in order to fulfil future food demands. The numerous seed sowing and seed placement techniques utilised in India are the subject of this essay.

## Objectives Of Project Work

The main objective of "Design and Fabrication of Manually Operated Seed Sowing machine" is to reduce serious back ache problem in hand sowing for the farmer which limits the size of field that can be planted as well as manpower required for planting. Peasant farmers will benefit greatly from this project. In this machine we are going to use two seed sowing wheels along with seed metering mechanism which sows the seeds at equal distance and which are mounted on axle. Hopper is used for storing seeds. Both manual and towing operation are options for this device.

➢ To manufacture seed sowing machine which can be operated by the single operator.
➢ To construct a chassis that can support a plough, a seed-dispensing wheel and a soil-covering bar.
➢To make the seed dispensing wheel interchangeable for sowing multiple variety of seeds.
➢To make this machine as lightweight and inexpensive as possible.
➢ To design and fabricate the proposed design and to test the machine in actual.

## Methodology

- To make agriculture project we follow this steps.
- The first step is to visit the farmers and learn about their issues.
- Selecting a problem is the next stage.
- Finding a solution to the issue is the third phase.
- The fourth stage is choosing the gear design for the correct seed distance.
- Finding the most appropriate method at the lowest cost is the fifth phase.
- Finding all of the necessary components in the right dimensions is the sixth phase.
- The beginning of fabrication is the seventh phase.
- Testing the machine is the final phase.

## Theory

In this chapter, we've covered sowing techniques, seed drill varieties, seed metering technology, and planter capacity estimation. A detailed design of our project's seed-sowing machine has also been explained.

**Methods of Sowing**

The skill of planting seeds in the ground for optimal germination in the field is known as "seeding" or "sowing." The right amount of seed is distributed per unit area with a perfect sowing. a. The proper depth at which the seed is buried in the ground. b. Proper distances should be left between plants and rows.

***1.Broadcasting***

The act of randomly distributing seed on a seedbed's surface is known as broadcasting. It can be carried out mechanically or manually. When broadcasting is done manually, the man's competence determines how uniform the seed will be. The seeds are covered with planking or other devices shortly after being disseminated. In this approach, greater seed rates are typically attained. For large-scale work, mechanical broadcasters are employed. The seeds are distributed on the seedbed's surface using this equipment at predetermined rates.

***2.Dibbling***

Seeds are planted and covered during the process of "dibbling," which involves creating holes in the seedbed. With this technique, seeds are inserted into pre-drilled holes at a set depth and distance apart. The term "dibbler" refers to the apparatus used for dibbling. It is a conical tool used to drill accurate holes in the ground. Several conical projections created in a frame are used to create small hand dibblers. Small seeds are not ideal for this technique because it takes so long. This is how most plants are seeded.

***3.Drilling***

When drilling, the seeds are dropped into the furrows and then covered with soil. Measuring seeds can be done automatically or manually. There may be one or more rows planted. This technique is highly useful for getting the right depth, right spacing, and right quantity of seed to be spread in the field. Sowing behind the plough and bullock-drawn seed drills & Seed drills pulled by tractors are three methods of drilling.

***4.Transplanting***

In order to transplant, seedlings must first be prepared at a nursery and then planted in a field that has already been prepared. For paddy, vegetables, and flowers, it is customary. The process takes a long time. Transplanter is the name of the equipment used to put seeds in the ground.

***5.Hill dropping***

This approach does not drop seeds in a continuous stream, but rather at predetermined intervals. As a result, the distance between each plant in a row is constant. Drills drop the seeds continuously, and the spacing between the plants in a row is not constant.

***6.Check row planting***

It is a planting technique that uses equal spacing between plants and rows. With this technique, seeds are properly sown along furrows that are parallel and straight. The rows are always parallel to one another. Check row planter is the name of the device used for check row planting. From the methods listed above,we have chosen the dribbling method for our project.


Fig : Methods of Sowing

## Components used :

***Main shaft :***

The disc and four gear sprockets are mounted on it, which is manufactured of C.I. Power is transferred from the ground wheel to each disc using it. At the end, there are two bearings that lessen friction. A shaft is a spinning machine component that transmits power from one part to another or from a machine that creates power to a machine that absorbs power. Shafts are typically circular in cross section. Mild steel is the material used to make standard shafts.

Material of shaft : When high strength is required, an alloy steel such as nickel, nickel-chromium or chromium-vanadium steel is used. Shafts are generally formed by hot rolling and finished to size by cold drawing or turning and grinding.

**Chain :** The type of chain drive most frequently used for mechanical power transmission on a variety of home, industrial and agricultural machinery, including conveyors, wire- and tube-drawing machines, printing presses, cars, motorcycles and bicycles, is roller chain or bush roller chain. It is made up of several short cylindrical rollers connected by side links. It is propelled by a sprocket, a wheel with teeth. It is a straightforward, dependable, and effective method of transmitting power. Tensile strength is the most popular way to assess the toughness of roller chains. A chain's tensile strength indicates how much strain it can sustain before bending under a single load. The fatigue strength of a chain is as crucial to tensile strength.

Fig : Chain & Sprocket

Ground Wheel: A pair of idler wheels on either side aid in the precise adjustment of seed placing depth while the ground wheel supplies the necessary power for the seed metering mechanism to function. To raise and lower the ground wheel during turns, a lever mechanism is also available. The tool is easily towed by a pair of bullocks. Mild steel is used for the grinding wheel. The seed metering mechanism and ground wheel are connected and are located at the box's base. Seed metering is the process that extracts seeds from the seed box and places them in the seed tube.

Fig : Ground Wheel

**Hopper :** A squared shape box which is placed on the upper side of the sowing machine. Hopper is used to store the seeds. The storing capacity of hopper may vary according to the requirement.

Fig :- Hopper

**Seed Dispenser :** An agricultural tool called a seed dispenser is used to plant seeds for crops by placing them in the ground and burying them to a predetermined depth. This guarantees that seeds will be dispersed uniformly.

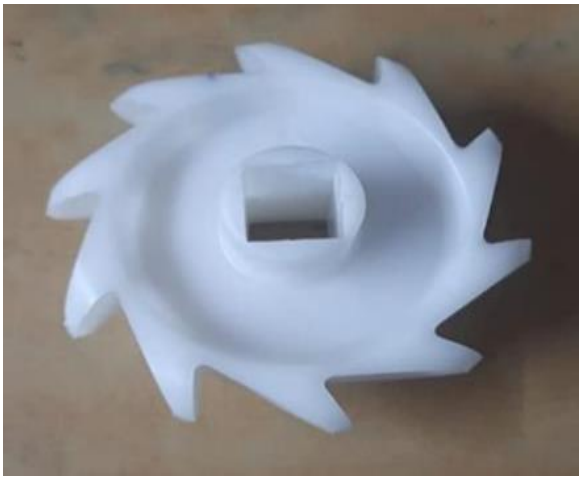

Fig : Seed Dispenser

**Plough :** A plough is a farm instrument used to turn or soften the soil before to planting or spreading seeds. Traditionally, horses and oxen pulled the plough. A blade linked to a wooden, iron, or steel frame is what a plough uses to cut and loosen dirt. It has been essential to farming for the majority of time. Ploughs are primarily used to turn over the top soil, bringing new nutrients to the surface while burying weeds and crop residue for later decomposition.

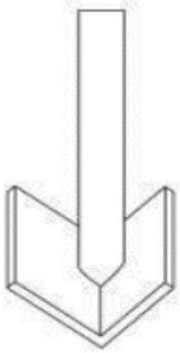

Fig. Plough

**Digger mechanism :** Digging and sowing are done with a digger machine. The actual digger is employed as a digging implement. The nut bolt that holds the digger to the frame. As seen in the figure, there are two adjustable diggers.

Fig :- Digger Mechanism

## Working of the Project :

| | |
|---|---|
| **Length** | **22 Inch** |
| **Width** | **33 Inch** |
| **Height** | **34 Inch** |
| **Weight** | **Around 10 Kg** |
| **Power Transmission** | **Through chain and Sprocket** |
| **Seeding Mechanism** | **Fluted roller with narrow flutes** |
| **Hopper Capacity** | **10 Kg** |
| **No. of Seed Dispenser** | **2** |

Fig : Seed Sowing Machine

The wheel rotates as the machine is pulled forward by the handles, and the gear located on the wheel's axle also begins to rotate. This rotation is then sent to the pinion through the chain drive. After that, the dispenser rotates after receiving the rotating motion. The quantity of seed to be delivered and the spacing between the seeds are determined by the number of groves on the dispenser wheel. Using a pipe, the seed is now properly dropped into the narrow trench. When the seed is sown, it falls into the funnel, travels through the pipe, and finally lands in the trench. The seed used can be changed on the seed distributing wheel. After the seed has been sown, it must now be covered. The soil covering bar is attached behind the machine and is simply dragged over the narrow trench. This completes the operation by covering the trench with soil.

***Calculations of Sowing Machine***

• Sprocket ratio of wheel and dispensing wheel is 1:1
Therefore, when wheel completes one rotation the dispensing wheel also completes one rotation
• For demonstration purpose we are using dispensing wheel of groundnut seed Circumference of wheel=2* π *r =2*3.14*20.4 = 128.11cm
Therefore, when the wheel completes one rotation 128.11cm is covered on ground
• The seed spacing for groundnut is 15cm. Number of groves on the wheel(dispensing wheel)=Circumference/seed spacing =128.11/15 =8 Therefore 8 groves are required for groundnut.
• The seed spacing for mustard is 16cm.
Number of groves on the wheel =Circumference of wheel/seed spacing
= 128.11/16 =8
Therefore 8 groves are required for mustard
• Volume of hopper
The hopper is made up of square prism
Volume of square prism(V)=$(a)^2$*h
=25.4*25.4*25.4
=16387.064cm

## Advantages :

1. It reduces labour expenses.
2. It reduces operational time and money compared to the traditional way of using a behind-the-field plough.
3. It weighs less than similar devices on the market.
4. It cut the utilisation of human labour by 50%.
5. Because it is less expensive, even peasant farmers can get these contemporary gadgets.
6. As soon as the plough touches the ground, seeds begin to fall to the ground automatically.
7. It can also be utilised for different seeds.

## Disadvantages :

1. In hard soil, the machine requires more .
2. Different people use different amounts of force.

## Applications :

1. It is used in agriculture for accurate and at a specific distance to plant seeds.
2. It is employed in gardening.

## Results

In this project we have to take the reading that is how much time is to be required to feed seeds in hopper.
The normal speed of human beings is 2.5km/hr.
Therefore, Speed of machine = 2.5 km/hr =0.7 m/s.
No. of revolutions per minute, N = Speed (m/s) * 1000 / (π * 60)
N = 3.71 rpm
N ≈ 4 rpm
As Wheel has 8 sides, so in 1 revolution it can sow 8 seeds. Therefore no. of seeds sown per minute = 8 * 4 = 32 seeds.
As the machine has 2 wheels, it can sow 64 seeds in 1 minute at distance of 20 cm.
Compared to manual seeding, the time needed for the sowing of seeds is less. The effectiveness of the operator has a major impact on this machine's performance.

## Conclusion

The manual seed planter meets the needs of small-scale and low-income farmers, enabling them to quickly and effectively plant their seeds in the ground. However, due to the fact that various crops have varying requirements for seed planting in the field. Thus, the single crop planter's usefulness is limited. As a result, there is a very strong demand for manually controlled multi-crop planters for plants. The design and construction of a manually operated seed planting that is inexpensive, accessible, simple to maintain, and less difficult to use were the main goals of this effort. The planter will significantly improve farming's value and raise agricultural productivity. Except for the metering mechanism, which was made of high-quality nylon, and

the seed funnel and tube, which were made of rubber, the planter's components were all made of mild steel.

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