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SEED SOWING MACHINE

Yadgiri Ganji[1], Venugopal Vadnal[2], Avinash Vacche[3], Deshpande G.R.[4],
[123]Student, A.G. Patil Institute of Technology, Solapur.
[4]Assistant Professor, Department of mechanical engineering, A. G. Patil Institute of Technology, Solapur.
*Contact: 0102yadgiri@gmail.com, phone +91 7276129327

ABSTRACT

Agriculture is the backbone of Indian economy. About half of the total population of our country has chosen agriculture as their occupation. The states like Maharashtra, Punjab, Kerala are highly involved in agriculture. Hence the objective of our project is to develop a better Mechanical machine to help the agriculture field which reduces the amount of work and time spent on crop. Sowing machine which are suitable to all types of farms and corps. the equipment is robust in construction and also it is should be reliable which is basic requirement of Sowing machine. As there is a scope for developing the sowing machine and which is operated manually but reduces the efforts of farmers, thus increasing the efficiency of planting also reduces the problem encountered in manual planting. The application of this machine can be implemented for various plants and different sizes of seeds, also variations in the space between seeds while planting can be varied as per requirement. This also increases the plant efficiency and productivity. For effective handling of the machine by any farmer or by any untrained worker it has been simplified in design also its adjustments and maintenance methods are also simple.

Keyword: Seed, Sowing, planting, agriculture, efficiency, productivity.

1. 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 interculturing 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 amount of seed to be sown per unit area depends upon the size of seed, germination percentage, extent of cover at the maturity and expected use of the plant either as fodder or for grain. Most of the crops under optimum rainfall conditions are sown on a flat surface. Under too low or too high rainfall condition, the sowing is done in furrows or on ridges. In regions where human labour and draft animals are the main sources of farm power, timeliness of field operations including seeding operation has been identified as a major factor in increasing the intensity of cropping. Hence, there is necessary to mechanize not only tillage but also the seeding operation. Full advantage of residual moisture can be derived by completing the tillage and seeding after the harvest of previous crops with minimum time loss.

1.1 Objectives Of Project Work

The main objective of "**Design and Manufacturing of 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. This project will be very useful for peasant farmers.

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. This machine can be operated manually or it can be towing.

1.Study of different research papers
2.Study of different seed sowing methods
3.Study of different wheel mechanisms
4.Framing of project setup and design of hopper
5.Dimensioning of frame, specification of components for setting of machine
6.Assembling of different components

7.Results and discussion about the error in the machine

2. PROBLEM IDENTIFICATION

To meet the future food demands, the farmer have to implement new techniques which will not affect the seed feeding, soil texture but will increase the overall crop production. The existing seed sowing machine is too cost. It is not abundantly available in India. It has a complex design. Every seed distributor has the individual seed storage place. Hence, it leads to increase the cost of the machine. It is not compact in size and weight. Hence, it is difficult to transportation from one place.

3. THEORY AND DESIGN

In this chapter, we have explained the methods of sowing, seed drill and its types and the seed metering mechanism and determination of planter capacity. We have also explained a detail design of our project seed sowing machine.

Methods of Sowing

Seeding or sowing is an art of placing seeds in the soil to have good germination in the field. A perfect seeding gives

a. Correct amount of seed per unit area.

b. Correct depth at which seed is placed in the soil.

c. Correct spacing between row-to-row and plant-to-plant.

3.1 Broadcasting

Broadcasting is the process of random scattering of seed on the surface of seedbeds. It can be done manually or mechanically both. When broadcasting is done manually, uniformity of seed depends upon skill of the man. Soon after broadcasting the seeds are covered by planking or some other devices. Usually higher seed rate is obtained in this system. Mechanical broadcasters are used for large-scale work. This machine scatters the seeds on the surface of the seedbed at controlled rates.

3.2 Dibbling

Dibbling is the process of placing and seeds in holes made in seedbed and covering them. In this method, seeds are placed in holes make at definite depth at fixed spacing. The equipment used for dibbling is called dibbler. It is a conical instrument used to make proper holes in the field. Small hand dibblers are made with several conical projections made in a frame. This is very time consuming process, so it is not suitable for small seeds. Mostly vegetables are sown in this way.

3.3 Drilling

Drilling consists of dropping the seeds in furrow lines in a continuous flow and covering them with soil. Seed metering may be done either manually or mechanically. The number of rows planted may be one or more. This method is very helpful in achieving proper depth, proper spacing and proper amount of seed to be sown in the field. Drilling can be done by (a) Sowing behind the plough (b) Bullock drawn seed drills (c) Tractor drawn seed drills.

3.4 Transplanting

Transplanting consists of preparing seedlings in nursery and then planting these seedlings in the prepared field. It is commonly done for paddy, vegetable and flowers. It is very time consuming operation. Equipment for placing plants in the soil is called transplanter.

3.5 Hill dropping

In this method, seeds are dropped at fixed spacing and not in a continuous stream. Thus the spacing between plant to plant in a row is constant. In case of drills, the seeds are dropped in continuous stream and the spacing between plant to plant in a row is not constant.

3.6 Check row planting

It is a method of planting, in which row-to-row and plant-to-plant distance is uniform. In this method, seeds are planted precisely along straight parallel furrows. The rows are always in two perpendicular directions. A machine used for check row planting is called check row planter.

We have selected dibbling method for our project from the above methods

Fig. 1 Methods of sowing

DETERMINATION OF PLANTER CAPACITY

(i) The capacity of the planter may be determined in terms of the area of land covered per time during planting or the number of seeds planted per time of planting. The capacity of the planter in terms of the area of land covered per time may be obtained from the following expression:

$$C_{pa} = \frac{area\ covered\ by\ planter}{1000}\left(\frac{hectare}{time}\right)$$

C_{pa} = Capacity of planter in hectare/time

(ii) Time required cultivate a hectare of land

The time required to cultivate of one hectare of land is therefore obtain from following equation: Time required =1/ C_{cp} (31)

(iii) Number of days required to plant on a hectare of land

Assuming 8hrs is used per day for planting, the number of days required to plant on 1 hectare of land is obtained as follows Number of days required =time required to cultivate of one hectare of land (hrs) /no. of hours worked per day (32).

4. DESIGN AND CALCULATION

Design of our project is explained as below

4.1 COMPONENTS USED ARE

- Two octagonal plates
- Centre plate
- Links
- Seed metering mechanism
- Shaft
- Frame
- Tyres

4.2 SELECTION OF COMPONENTS

4.2.1 Selection of material

Selection of proper material is one of the most important step in process of designing. The factors which should be consider while selection of material are as follows:

i) **Availability**--The material should be readily available in market in large quantity to meet the requirements.

ii) **Cost**--For every application, there is limiting cost beyond which the designer cannot go. For cost analysis, there are two factors, namely cost of material and the cost of processing the material into finished goods. Sometimes the cost of material might be less but the processing may involve costly manufacturing process.

iii) **Mechanical properties**--Mechanical properties are the most important technical factor governing the selection of material. They include strength under static and fluctuating loads , elasticity, plasticity, stiffness, toughness, ductility and hardness.

iv) **Manufacturing considerations**--In some application, machinability of material is an important consideration in the selection. Sometimes an expensive material is more economical than a low priced one. Past experience is a good guide for selection of material.

Materials
For Shaft – Mild Steel
For Wheel – Mild Steel
For Seed Cylinder- Poly Vinyl Chloride (PVC)
For Hopper- Sheet metal

4.2.2 Selection of bearing

The most frequently used bearing is the deep groove ball bearing. It is found in almost all kinds of production general mechanical engineering. In this radius of ball is slightly less than the radii of curvature of the grooves in the races. This gives a point contact between the balls and the races may roll freely without any sliding.

Fig. 2 Deep groove ball bearing

Specification
Light series, bearing no. 6004
Dimensions in mm
Bore = 20mm
Outer diameter = 42mm
Width = 12mm

4.2.3 Two octagonal plates:

As per our selected seeds the distance between two crops to be planted in a row is 20 cm. So based on this distance each side of octagonal plate is 20cm.

Circumference = no. of sides * distance

= 8*20
= 160 cm
Circumference = π * D
160 = π * D
D = 50.91 cm ≈ 52 cm
Thickness of Plate = 0.3 cm

For good germination of selected seed, the seeds should be sowed at a depth of 5 cm deep in ground. So subtracting 10 cm from above diameter for the purpose of furrow openers

d = 42 cm

For the purpose of seed metering we need a circle to be cut at the center of one of the octagonal plate. So taking that circle to be

d_i = 20 cm

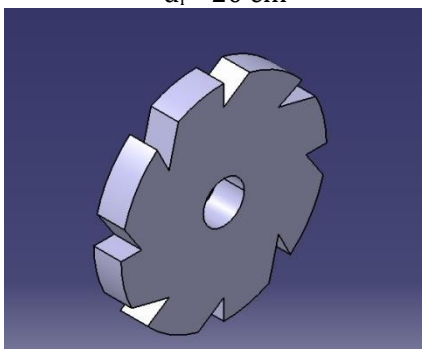

Fig. 3 Seed holder

4.2.4 Centre Plate:

We have taken the diameter of centre plate as $\frac{1}{4}$ of diameter of octagonal plate.

D_c = 42/4 = 10.5 cm
D_c ≈ 10 cm

Thickness is taken as double the thickness of octagonal plate

For press fitting of boss and shaft into the centre plate we have to provide a centre hole of diameter 3.8cm .

The boss dimensions are
Length = 5cm
Outer Diameter = 3.8 cm
Inner Diameter = 2.5cm

The centre plate is divided into 8 equal parts .The angle between each part is 45° and the distance is 2.5cm and 8 strips of dimension 2.5×0.2×0.5cm. These 8 strips are welded at the 8 equal parts on the centre plate.

4.2.5 Links:

There are two links in one side of the octagonal plate namely fixed link and movable link. According to dimension of wheel the calculated dimensions of the link are Dimensions of fixed link: 18 * 2.5 * 0.6 cm

Dimensions of movable link: Three strips are required to make a movable link. The dimensions which are as follows

Link 1 dimension : 12.5 * 2.5 * 0.6cm
Link 2 dimension : 16 * 2.5 * 0.6cm
Link 3 dimension : 5 * 7.5 * 0.3cm

4.2.6 Frame

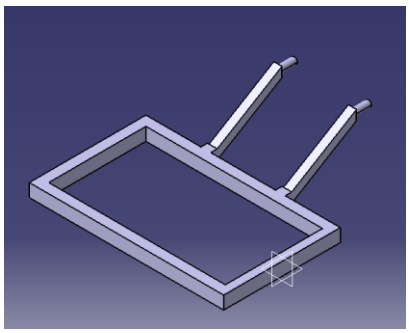

Fig. 4 Frame

The main frame is the skeletal structure of the seed planter on which the seed storage containers will be mounted. The two design factors considered in the determination of the material required for the frame are the weight and strength. In this work, mild steel angle bar of 38mm x 38mm and 6 mm thickness were used to give the required rigidity. The handles consist of two mild steel flat bar fastened to the frame at two ends of the flat bar.

5.ASSEMBLY

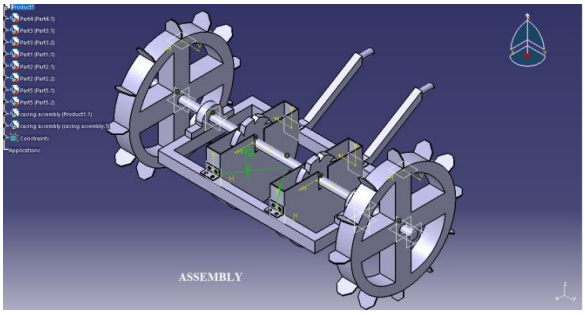

Fig. 5 Assembly

6. RESULTS

In this chapter 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,

$$N_w = \frac{\text{Speed (m/s)} * 1000}{\pi * 60}$$

N_w = 3.71 rpm

$N_w \approx 4$ 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. The time required for the seed sowing is minimum as compared to the manual seed sowing. The main performance of this machine depends on efficiency of the operator.

7. CONCLUSION

The need of a poor and small land farmer has fulfilled by the manual operated seed sowing machine and they can easily and effectively plants their seed in the field by these machine, which is having several advantages like it increases productivity, increases the efficiency of the plant and reduces human efforts, the time required for the seed sowing is less as compared to manual seed sowing, after manufacturing all the assembly we conclude that cost is less as compared to current available machines in the market.

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