Volume-7,Issue-4, (Apr-17)
ISSN (O) :- 2349-3585

Design of Manually Operated Seed Sowing Machine

Mr. Akshay V. Waikar[1], Mr. Kunal C. Sanap[2], Mr. Devendra Kale[3] , Dr. U. V. Kongre[4],Mr. Shailesh Bhoyar[5] , Mr. Sachin Kotele[6]
Mechanical Engineering Dept., JDIET Yavatmal

Abstract – The aim of this project is to develop a lightweight, economical and reliable seed sowing machine that will increase the efficiency of the crop produced and also to develop a better mechanical machine to help the agriculture field which reduce the amount and type of work spend on one crop. Hence in this work of project we decided to design and build a machine which will be available for farmer of small scale production at cheaper rate also which can reduce their expenditure and the profit of farmer at the same time. The main specialty of this projects that it can also sow cotton seed with ease .The agriculture field needs to find solutions on old agricultural technique and replace them with more efficient technique. In this project we tried to design and fabricate machine to reduce target energy input in more efficient way than in the past. Small scale farming has huge benefits of this approach. We can now move towards a new generation of equipments. The advent of autonomous system architecture gives us opportunity to develop a new range of agricultural equipment based on small smart machine that can do the right thing in the right place at the right time in the right way. It will increase Productivity and decrease expenses in agriculture sector.

Introduction

The major occupation of the Indian rural people is agriculture and both men and women are equally involved in the process. Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. It has to support almost 17% of world population from 2.3% of the world geographical area and 4.2% of world's water resources. The present cropping intensity of 137% has registered an increase of only 26% since 1950-51. The net sown area is 142 Mha. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and spacing, cover the seeds with soil and provide proper compaction over the seed.The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agricultural and climatic conditions to achieve optimum yields and an efficient sowing machine should attempt to fulfill these requirements. In addition, saving in cost of operation time, labor and energy are other advantages to be derived from use of improved machinery for such operations. A traditional method of seed sowing has many disadvantages. This paper is about the machine of seed sowing and fertilizer placement in the soil and developing a multifunctional seed sowing machine which can perform simultaneous operations .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 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-column distribution of seeds is likely to be uneven resulting in bunching and gaps in field. The following are the limitations of Existing Machine

1.The Weight of the Machine is more.

2.Available for Tractors drive.

3.No Arrangement for depth control.

4.No Arrangement for seed bed-preparation.

5.Improper compaction of soil over-furrows.

6.Adjustment of row spacing is improper.

7.The cost of machine is more.

Objective

I.To achieve proper distance in two seed in seeding mechanism for proper nutrition and growth of plants.

II.To make this machine which operate manually for small farmer

III.To provide this machine in lowest cost and light in weight.

IV.To adjust proper depth in variable soil in any whether condition

Methodology

To make agriculture project we follow this steps

• The first step is to go to the farmers and find the problems faced by them.

• The second step is to choose a problem.

• The third step is to visit to agriculture industry.

• The fourth step is to analyze the problem& their solution.

• The fifth step is the selection of Design of gear for proper seed distance.

• The sixth step is to find which mechanism is to suitable in lowest cost.

• The seventh step is to find all components we require in proper dimension.

• The eight step to start fabrication.

• The ninth step is to make proper balance sheet of work done.

• The last step is the testing of machine.

Working Principle Seed cum Fertilizer Dropper

Seed drills, fitted with fertilizer dropping attachment, distribute the fertilizer uniformly on the ground. It is called seed cum fertilizer dropper. Such a drill has a large seed box which is dividend lengthwise into two compartments, one for seed and another for fertilizers.

Seed Metering Mechanism

The mechanism of a seed drill or fertilizer distributor which delivers seeds or fertilizers from the hopper at selected rates is called seed metering mechanism. Here we used Star wheel mechanism.

Star Wheel mechanism

It is a seed metering mechanism with star shape gear to collect and deliver the seeds into the seed tube. Star wheel mechanism consists of a star wheel, an axle, chain sprocket to transmit motion for seed metering. The star wheel and chain sprocket are mounted on the shaft .The motion from ground wheel transmitted to the shaft via chain and chain sprocket. The star wheel carries grooves throughout its periphery. It rotates with the axle over which it is mounted throws the seeds. The star wheel which is mounted just below the seed box gets the seeds through a small opening the seed get trapped into the peripheral grooves of the star wheel as the machine moves forward the star wheel rotates and seeds fall into the seed tube. By changing the star wheel size and number of grooves seeds can be increased or decreased and hence amount of seed is controlled.

Design of Seed Metering Mechanism

In this project we used four star wheel, two for fertilizer and two for seed all of them are identical and having six number of grooves.The wheel having diameter = 12.5 cm,centre hole for axle =1cm X 1cm (square)There are six grooves having diameter 1.5 cm and centre of them is at 1.8 cm from the outer periphery of the star wheel As we have used star wheel mechanism the machine is only able to perform discontinues seeding.

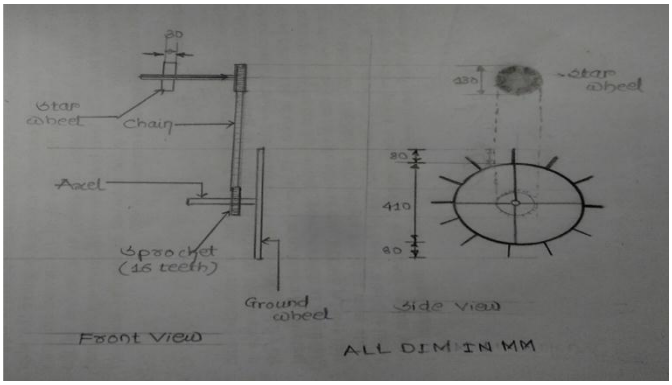

Fig – seed metering and dropping mechanism

Design of Ground Wheel

Diameter of ground wheel = 410 mm

Effective radius of ground wheel (R) = 490/2 =245 mm

Distance travelled by machine in one revolution of ground wheel i.e. periphery of ground wheel = 2 π R

= 2*3.14*245

=1538.6 mm …. i)

So in the one revolution of ground wheel the chain sprocket complete in one revolution, as both of the are on same axel. This motion of sprocket transmitted to another sprocket via chain as the number of teeth (16 teeth) in both sprocket and pitch (5mm) of sprocket are same. Hence velocity ratio of both sprockets is 1As star wheel have 6 grooves in it will drop 6 set of seed in its one revolution and the velocity ratio of ground and star wheel is one Hence, from equation 1 star wheel complete its one revolution when machine travel 1538.6 mm. In this distance there will be 6 seed drop wheel.Distance between in drop wheel = 1538.6/6 =256.43 mm Hence the machine will drop 2 seed sets at a distance of 256.43 mm. The motion from second sprocket to the star wheel is transmitted by a square axel.

Design of Lever

The design of lever consists in determining the physical dimension of lever when forces acting on lever are given. The forces acting on the lever are,

1) Load (W)
2) Effort (P)
3) Reaction at the fulcrum "F" (R_F)

Process to find out the Effective Length of Lever (L=?),

Let, the load and effort acts at a right angle, arm is inclined at an angle of Ɵ.Therefore , for finding out effective length of fulcrum , we have to know the inclination angle of arm. Considering, A man exerting effort(P) at point A on lever, Load(W) acts at point B , C be the fulcrum point. Let, draw triangle from effort point(A),load point(B),and fulcrum point(C) , as shown in following fig..

L = AC= be the effective length of lever

AB=be the distance bet. Effort point and load point

BC= be the distance bet. Load point and fulcrum point.

From triangle ΔABC ,

AB= 67 cm.

BC=68 cm.

$$\text{Tan}\theta=\frac{oppositeside}{adjecentside}=\frac{AB}{BC}$$

$$\therefore \text{Tan}\theta=\left(\frac{67}{68}\right)$$

$$\therefore \theta=\text{Tan}^{-1}\left(\frac{67}{68}\right) \therefore \theta = 45°$$

Ɵ = be the inclination angle of lever

From Pythagoras Equation we can find the effective length of lever,

$$AC^2=AB^2+BC^2$$

$$\therefore AC^2=67^2+68^2$$

$$\therefore AC^2 = 9113$$

$$\therefore AC = 96 \text{ cm} \approx 120 \text{ cm.}$$

$\therefore$The effective length of lever is 120 cm

Reaction at fulcrum R_F is given from following method,

Line of action of load (W) acting downward at point B and line action of reaction at fulcrum point C (R_f)

Figure shows the line of action of Effort force (P) acting at effort point A,

Let,

P=be nominal effort exerted by a normal man is= 400 N

W = Net load seed planter

= (mass of planter + seed material)x acceleration due to gravity

= 10 x 9.81=981N

θ= be the angle of inclination of arm =45°

We know that,

$$R_F = \sqrt{W^2 + P^2 - 2W \times P\cos\theta}$$

$$R_F = \sqrt{981^2 + 400^2 - 2 \times 981 \times 400 \times \cos(45)}$$

R_F= 753.27 N

Now, we know that, the maximum bending stress developed is given by (σ),

$$\sigma = \frac{bendingmoment}{sectionalmodulous}$$

$$= \frac{effortforce(P) \times perpendiculardistance(BC)}{sectionalmodulous(Z)}$$

$$\sigma = \frac{P \times BC}{\frac{\pi}{32} \times b \times a^2}$$

Where, b-minor axis of lever arm=2cm=20mm

a- major axis of lever arm = 2b or2.5b=2.5×20=50mm

P- Effort force = 400N

BC- perpendicular dist. between effort force and fulcrum=68cm=680mm

$$\therefore \sigma = \frac{400 \times 680}{\frac{\pi}{32} \times 20 \times (2.5 \times 20)^2} = 55.41\ N/mm^2$$

ISSN:-2349-3585 |www.ijrdt.org

The allowable bending stress isσ =55.41N/mm^2, which is less than the maximum permissible bending stress of 70 N/mm^2 for CI material.

Conclusions

The need of a poor and small land farmer has satisfied by the manual operated seed planter and they can easily and efficiently plants their seed in the field by these planters. But due to different crops have different condition for the seed planting in the field. So the helpfulness of the single crop planter is limited. Hence the requirement of the manually operated multi-crop container for plants is very high. This work focused on the design and fabrication of a manually operated seed Planting that is cheap, easily affordable, easy to maintain and less laborious to use. The planter will go a long way in making farming more attractive and increasing agricultural output. All parts of the planter were fabricated from mild steel material, except for the metering mechanism which was made from good quality nylon and the seed funnel and tube, which were made from rubber material

References

1) J. E. Iken& N. Amusa, Maize research & production in Nigeria, African Journal of Biotechnology, Vol. 3(6), 2004, PP.302367.

2) B. Mursec et al, "Testing of Quality of Pneumatic See Sowing Machine, "Journal of achievement in materials and manufacturing engineering, volume26 issue 1.

3) M. Lakshmi Prabha and M. ShanmugaPriya, "Effect of Vermicompost on Nutrient Uptake and their Influence on Biochemical Parameters of Selected Vegetable Plants", International Journal of Advanced Research in Engineering & Technology (IJARET), Volume 4, Issue 5, 2013, pp. 147 - 152, ISSN Print: 0976-6480, ISSN Online: 0976-6499.

4)Adisa A F, Braide F. G, "Design And Development of Template Row Planter", Transnational Journal of Science and Technology August 2012 edition vol. 2, No.7

5). Dhawan, K.C. and Mittal, J.P.(1990) "Energy scenario of paddy and wheat production in India" Journal of Rural Development, Hyderabad. 9(4) : 719-728

6) Dhawan, K.C. and Mittal, J.P.(1994) "Role of fertilizer in increasing yield of various crops in India" Economic Affairs, Calcutta 39(2): 92-99

7). Gupta, O.P. Chandra, S.D. and Mittal, J.P. (1992) "Energy and labour inputs under different Tillage and weed control combination for maize and wheat production in India" Journal of Rural Energy 1(1): 11-25

7) Hussain, M.A. (1988) "Power requirement of different cropping system in Bangladesh" A.M.A. 19(3): 15-19.

8). xi Kumar, P. S. Prasanna and Hugar L. B. (2011) "Economic analysis of energy use in paddy cultivation under irrigated situations" Karnataka J. Agric. Sci., 24 (4) : (467-470)

9). Mishra, T.N. (1986) "Energy analysis of major crops of Tarai region of Uttar Pradesh" UnpublishPh.D.Thesis G.B. Pant University of Agricultural and Technology Pantnagar.