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Design of Manual Seed Sowing Machine

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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 equipment. 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.

KEYWORDS: Chain and Sprocket, Hopper, Main Shaft, Seed Dispenser Wheel, Bearing, Plough.

I. 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 spacing's. 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 mechanize both the tillage and sowing processes. By completing planting and sowing as soon as possible following the harvest of previous crops, you may maximize 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 mechanization, 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.

II. 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 practices 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 utilized in India are the subject of this essay.
- Mahesh R. Pundkar and A. K. Mahalle is presented review provides brief information about the various types of innovations done in seed sowing machine available for plantation. The seed sowing machine is a key component of agriculture field. The performance of seed sowing device has a remarkable influence on the cost and yield of agriculture products.
- Presently there are many approaches to detect the performance of seed-sowing device Laukik P. Raut and et. al., studied to meet the food requirements of the growing population and rapid industrialization, modernization of agriculture is inescapable. 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 the unit cost of production through higher productivity and input conservation.
- D. Ramesh and H. P. Girish Kumar presented review provide brief information about the various types of innovations done in seed sowing equipment. The basic objective of sowing operation is to put the seed and seed in rows at desired depth and seed to seed 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 agro-climatic conditions to achieve optimum yields. Seed sowing devices play a wide role in the agriculture field.
- Pranil V. Sawalakhe and et. al., are investigated the 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 Paper deals with the various sowing methods used in India for seed sowing and seed placement.

III. OBJECTIVES

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 varieties 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.

IV. REQUIREMENT OF COMPONENTS

1. Main shaft: A shaft is a rotating machine component that transmits power from one part to another or from a machine that creates power to a machine that absorbs power. The main shaft carries the dispensing wheel and crank on it, which is manufactured of C.I. Power is transferred from the ground wheel to main shaft by means of a chain drive. The main shaft is mounted on bearings at the end. 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.



2. Chain & sprocket: 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

3. 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

4. Hopper: Hopper, a frustum of a pyramid 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.

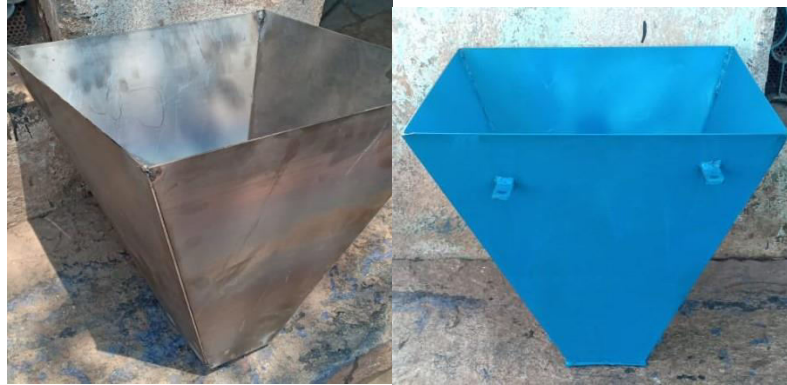


Fig: Hopper

5. Seed Dispenser wheel: 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. Seed hole dia 15 mm (for ground nut seed).



Fig: Seed Dispenser wheel

6. 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

7. Bearing: A bearing is a machine element that constrains relative motion to only the desired motion and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or the directions of the loads (forces) applied to the parts.



Fig: Bearing

8. Leveller: Leveler is a device attached at the rear end of the machine, which is used to level the soil which ploughed after sowing the seed into it. It is just dragged on the ground, above the soil.



Fig: Leveller

V. ASSEMBLE MODEL



Calculations of Sowing Machine:

- Speed ratio of ground wheel to dispensing wheel is given by,
Speed ratio = $Z2/Z1$, where $Z1$ – No. of teeth on sprocket mounted on ground wheel,
 $Z2$ - No. of teeth on crank of dispensing wheel.
 $= Z2/Z1 = 44/18 = 2.44$

For every 1 rotation of ground wheels, the seed dispensing wheel rotates 2.44 times.

- For demonstration purpose we are using dispensing wheel of groundnut seed Circumference of wheel = $2 \pi r = 2 * 3.14 * 120 = 754$ mm, therefore, when the ground wheel completes one rotation 754 mm linear distance is covered on ground.

- The seed spacing for groundnut is 140 mm.

Number of groves on the wheel (dispensing wheel) = Circumference/seed spacing = $754/140 = 6$ Therefore 6 groves are required for groundnut.

- The seed spacing can be changed by changing seed dispensing wheel.

For different seed, dispensing wheels with different groove sizes can be used.

- Volume of hopper- The hopper is made up of frustum of a square pyramid, whose volume is given by,

$$\begin{aligned} \text{Volume of hopper (V)} &= (1/3)h(a^2 + b^2 + ab) \\ &= (1/3) \times 380(400^2 + 110^2 + (400 \times 110)) \\ &= \text{mm}^3 \end{aligned}$$

VI. CONCLUSION

While concluding this report, we feel quite fulfilled in having completed the project assignment well on time, we had enormous practical experience on fulfillment of the manufacturing schedules of the working project model. We are therefore, happy to state that the in calculation of mechanical aptitude proved to be a very useful purpose. Although the design criterions imposed challenging problems which, however were overcome by us due to availability of good reference books. The selection of choice raw materials helped us in machining of the various components to very close tolerance and thereby minimizing the level of balancing problem. Needless to emphasize here that we had left no stone unturned in our potential efforts during machining, fabrication and assembly work of the project model to our entire satisfaction to solve the problem in agricultural field for social welfare. This manual machine has considerable potential to greatly increase productivity. The main task now is to promote this technology and have available to farmers at an affordable price. The manual machine can be readily made from local components in workshops. The only specialized items required which can be sourced at an inexpensive price from local promoter can easily be manufactured. By using of this machine, achievement of flexibility of distance and depth variation for different machine in farming is possible. In this way we conclude that, the different operation can be performed at a time without polluting the environment. Hence, we selected the topic “MANUAL SEED SOWING MACHINE” to contribute for sustainable agricultural machine. The various components required for building the agricultural equipment has been designed as planned. The single system which can perform multi operations like Sowing and inter cultivation. It will reduce external charges like fuels; electricity etc. And this will be helpful for poor farmers. It will be single system which contains multi attachments and can be easily assembled and dismantled comfortably. All the fasteners used in the equipment are of the same size. The equipment weight is around 10 to 12kg (Excluding attachment) thus it can be carried easily in farmland. The equipment can do the work of most of labor a day which reduces the labor cost of the farmer.

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