International Journal of Innovative Research in Engineering
Volume 3, Issue 1 (January-February 2022), PP: 53-58.
www.theijire.com
ISSN No: 2582-8746

Design and Analysis of Manual Seed Sowing Machine

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How to cite this paper: S. Sudhakar[1], S. Saran Raj[2], P. Pravin[3], "Design and Analysis of Manual Seed Sowing Machine" IJIRE-V3I01-53-58.

Abstract: *This project is about a seed sowing system with a fitted plough that can be conveniently adjusted with the aid of a bolt and nut. The plough can reach a depth of around 5- 8 cm with the attachment. When the plough becomes corroded, it can be quickly replaced. The seed sower that has been attached sow's seeds using a sowing disc that is installed in the seed chamber and rotated by a spinning wheel. A sand leveler has been installed in the system to cover the sowed area after each sow. The time it takes to sow seeds has been found to be greatly reduced using this process, saving labour costs and manpower.*

Key Word: *Plough, Seed disc, Seed chamber, Sand leveler.*

I. INTRODUCTION

Agriculture is the foundation of India's economy. Cropping is an important and time-consuming task for all growers, and since it is so time-consuming on a large scale, it necessitates the hiring of additional staff. As a result, agriculture machines were created to minimize human effort. The farmer would have to devote more time to planting. However, they have a limited period of time. As a result, more manpower is needed to finish the job in the allotted time, which is more expensive. During manual planting, there is even more waste. As a result, there is a need to create a machine that will assist farmers in reducing their efforts while sowing seeds. The seed disc sows the seeds at the proper seeding rate and depth, ensuring that the seeds are covered by soil. This planter is very simple to use hence, unskilled farmer is also able to handle this machine. We simplified the design also made it cheaper and affordable to every rural farmer.

II. LITERATURE REVIEW

The D.A. Mada, Mahai, [2013], The author of this research paper has listed the magnitude of automation in the agricultural sector by providing some examples. The paper concluded that a multifunctional vehicle for pre and post harvesting was needed. We have used this as the foundation of our testing and will make further improvements in the production of our multipurpose agricultural vehicle.

V.K. Tewari A. Ashok Kumar, Satya Prakash Kumar, and Brajesh Nare [2012]. In this research paper, the author has done a case study on farm mechanisation in West Bengal, which is part of India, and it gives a specific status on availability and development in India. This ensured that we will take the correct actions as opposed to the actual ones.

F.A. Adamu, B.G. Jahun, and B. Babangida [2014], The authors of this paper call our attention to the success aspect of a power tiller. The preference for a light weight power tiller was the highest of those polled. Such criteria as fuel efficiency and field capability are also addressed. We take these considerations into account when developing a sustainable multifunctional agricultural vehicle.

This research paper by Kyada A et al. presents the concept and construction of a manually operated seed planter system. They introduce the goal of seed planter machine design, factors influencing seed emergence, and some mechanisms in this. The primary goal of the sowing process is to position the seed and fertiliser in rows at the correct depth and crop-to-seed spacing, cover the seeds with soil, and provide proper compaction over the seed. The suggested seed-to-seed spacing and depth of seed placement for optimum yields differ by crop and agro-climate conditions. We may conclude that mechanical variables such as seed depth uniformity and seed distribution uniformity along rows have an impact on seed germination.

Kannan A et al. introduce a configuration change in a multipurpose sowing machine in this research paper. In this, they argue that for sowing purposes, we import equipment that is large and expensive. To avoid this, they created a multipurpose sowing machine that includes a hopper, seed metering mechanism, ground wheel, power transmission system, seed distributor, and tiller. They build the model using PRO-E tools. Actually, the operation is very simple: as the tiller rotates, it immediately transmits motion to the ground wheel, which is attached through the main shaft. Within the hopper is a disc of scoops on a main shaft. When the ground wheel rotates, the main shaft rotates as well, thanks to the power transmission mechanism. The scoops take the seed from the hopper and deposit it inside the seed distributor. The tiller is in close touch with the stone.

This research paper represents "Design & Implementation of Multi Seed Sowing Machine" by Marode A et al. This paper provides different types of sowing machines. Broadcasting is one of three forms of seed sowing. A plough is used to create a pattern of linear cuts known as furrows in a field. Manual broadcasting is then used to plant the field by tossing the seeds over it. As a result, the field was cultivated loosely in rows, but with a significant number of plants. The method of broadcasting is where seeds are dispersed uniformly on the soil with the aid of one's hands.

Prof. P.S.Gorane, Patil Nikhil, Patil Shubham, Pawar Ganesh, and Raut Madhur designed and built a seed sowing machine and a fertiliser sprayer. Filling the seed and fertiliser manually, then manually moving the system to give motion to the wheel. The fertiliser sprayer is powered by a battery. The drive moves the seed sowing mechanism, then the seed hopper and shaft, and the digging process is completed.

Raut madhurai, Prof.P.S.Gorane, Pawar ganesh, Patil shubham, and Patil nikhila developed the Multipurpose Seed Sowing Machine. By moving the system, motion is given to the wheels manually. Drive motion to seed sowing mechanism and fertiliser delivery mechanism Manually filling the seed hopper and shaft. After the digging process is completed and fertiliser is applied, a single slider crank system and piston cylinder structure are used.

Rajeshkumar. R, Pramjin. P, Ramu. P, Rajavel. S. Design and Fabrication of Seed in Planter by Energy Conversion. This seed plantation machine has a lot of potential for growing planting productivity. Until recently, the tractor was the primary traction unit for nourishment in farming. This seed planting machine's purpose will be fulfilled with its adaptation. As a result, there is a need to adopt this technology to make it accessible to small-scale farmers.

III. EXPERIMENTAL SETUP

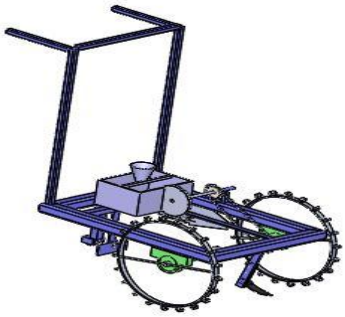
At the beginning we have gone through various research papers to get an idea of this project. Next, we have finalized suitable materials for manufacturing the product. In that seed sowing machine, there is a hopper it contains the seeds that will be rooted in the soil. The will the capacity, the less often the hopper must be refilled during the operation. And then a seed storage tank is a necessary part of the scheme. And is designed in compliance with the weight supported by the machine as well as the necessary planting capacity. This section has been repaired. The seed sowing disc is arranged at the bottom of this pool. This disc distributes the seeds, as only one seed fall from the tank with every full rotation of the spinning circle. In addition, the number of seeds that fall from the tank varies according to the specifications. This disc uniformly opens the path to the seed, allowing for smooth and accurate planting. The disc attached to the tank's bottom allows one seed to be planted during one spin of the wheel. A seed sowing disc is also included in the above figure. The buckets are attached to the disc with screws. These buckets are somewhat similar to Pelton buckets in half form. Since these are screwed to a disc, their size varies according to the diameter of the seed and the appropriate distance between the seeds. The cultivator's job is to tip the soil to the correct depth so that the distributer machine can sow the crop. Spike wheels are used to avoid slippage and to transform linear animal drawn strength into rotational mechanical energy. The total setup can be attached with a vehicle to plough, sow seeds, and to close the soil with the help of a furrow closer.

Fig.1: Seed Sowing Machine Setup.

IV. WORKING PROCEDURE

The drawing of the sowing machine is seen in the image below. Both physical constraints and parameters are taken into account when constructing the mechanism. As a result, this machine will plant the seeds in the proper manner.

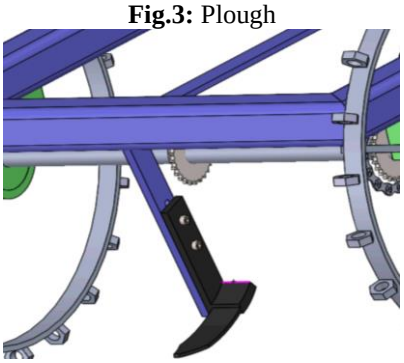
Fig.2: Design of Seed Sowing Machine



A plough or plough is a field implement used to loosen and turn the soil prior to sowing seed or planting. Ploughs were historically pulled by oxen and horses, but tractors are now used on modern farms. A plough's frame may be made of wood, iron, or steel, and it has a blade fixed to it to hack and loosen the dirt. We've built a plough that is adjustable and replaceable

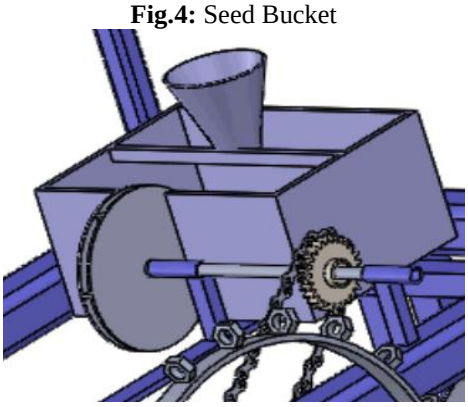
when it corrodes.

Fig.3: Plough



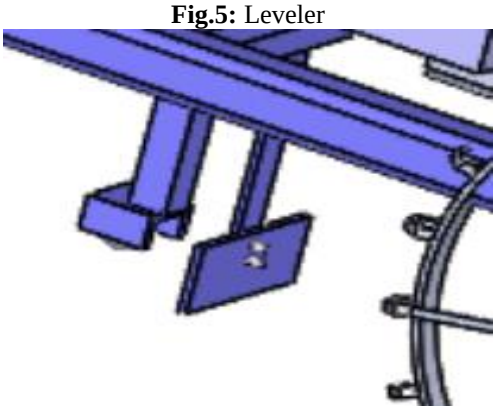
Seed bucket that stores seeds and distributes them over a certain distance using a seed disc.

Fig.4: Seed Bucket



A sheet metal plate is used as a mud closer and leveler, and a long bolt and nut is used to drive the leveler up and down. The leveler is not powered; instead, it is initially set to the desired level; the leveler closes the soil in the sowed soil and levels the ground.

Fig.5: Leveler



The machine will be installed in a vehicle. The hopper will be filled with seeds. By using bolt and nut the plough can be adjusted. Then we can pull the machine alongside the vehicle. The seeds will be dropped on the sand by the seed disc while the wheel rotates. A leveling process will be performed to close the seeds with the sand.

V. CALCULATION

Distance Between Two Seeds:

Since we kept the gear ratio between the rear wheels and the seeder at one, one revolution of the rear wheel would send one revolution to the seeder system.

Since the radius of the seed disc is 0.10mm, the distance (D) travelled for one revolution of the seed disc is given by,

$$D = 2 \times \pi \times \text{radius of seed disc}$$

$$D = 2 \times \pi \times 0.10$$

$$D = 0.628 \text{ mm; } D = 6.28\text{cm (approx.)}$$

There is a significant distance between two seeds. As a result, we must have two slots in the seeder/profiler to reduce the gap between two seeds. As a result, if two slots are given, the gap between two seeds would be 6.28cm.

Moment:

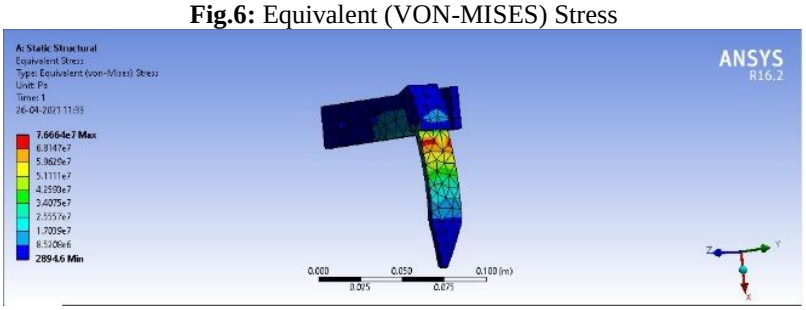
During the sowing process, the cultivator-machine joint will be subjected to force. The moment working on the cultivator's joint is,

Moment = Shear force × perpendicular distance
Moment = 300 × 0.65
Moment = 195 N-m

VI.ANALYSIS

Equivalent (Von- Mises) Stress:

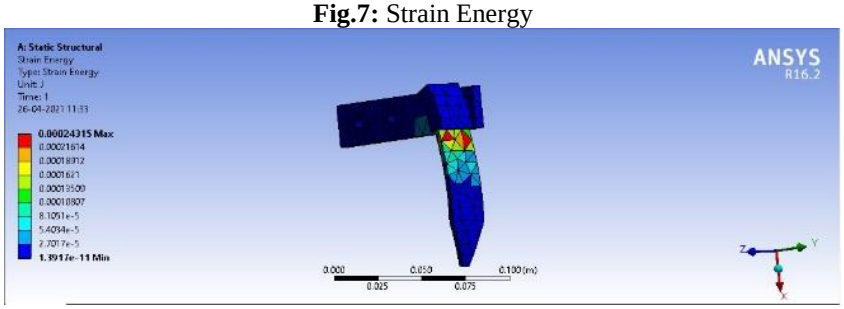
Fig.6: Equivalent (VON-MISES) Stress



The illustration above depicts the Equivalent (von-Mises) stress in the plough field. The file has been imported, and the material properties have been set to mild steel, as well as the mesh order. The material has been given the appropriate load conditions, and finally rendering has been completed. This whole procedure was carried out in the Ansys software. The maximum stress is acting at the center of the plough in this case. It can withstand a high stress of 7.6664 e7. And the tip and other sections of the plough are subjected to the least amount of stress. The smallest amount of stress acting on it is 2894.5

Strain Energy:

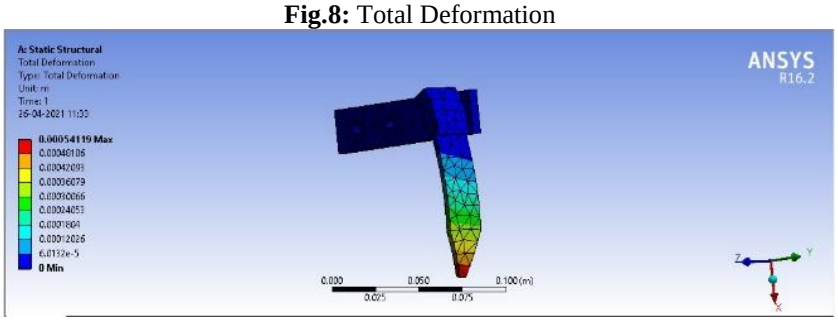
Fig.7: Strain Energy



The illustration above depicts the Strain Energy in the plough field. The file has been imported, and the material properties have been set to mild steel, as well as the mesh order. The material has been given the appropriate load conditions, and finally rendering has been completed. This whole procedure was carried out in the Ansys software. The maximum strain energy is acting at the centre of the plough in this case. It can withstand a high strain energy of 0.00024315. And the tip and other sections of the plough are subjected to the least amount of strain energy. The smallest amount of strain energy acting on it is 1.3917e-11.

Total Deformation:

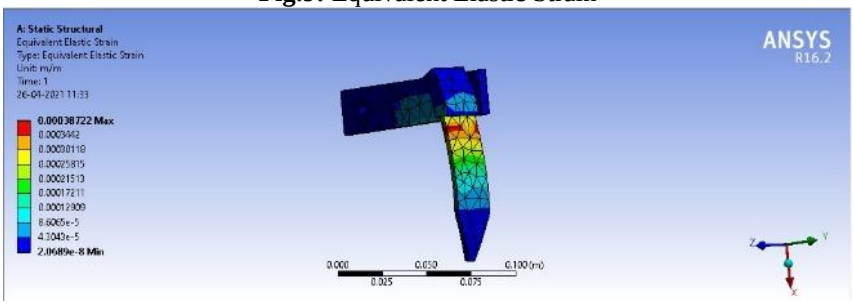
Fig.8: Total Deformation



The illustration above depicts the total deformation in the plough field. The file has been imported, and the material properties have been set to mild steel, as well as the mesh order. The material has been given the appropriate load conditions, and finally rendering has been completed. This whole procedure was carried out in the Ansys software. The maximum deformation is acting at the tip of the plough in this case. It can withstand a high deformation of 0.00054119. And other sections of the plough are gradually decreasing and subjected to the least amount of deformation. The smallest amount of total deformation acting on it is 6.0132e-5.

Equivalent Elastic Strain:

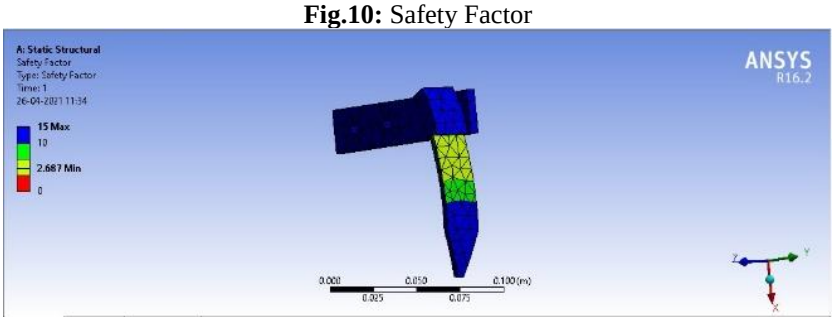
Fig.9: Equivalent Elastic Strain



The illustration above depicts the equivalent elastic strain in the plough field. The file has been imported, and the material properties have been set to mild steel, as well as the mesh order. The material has been given the appropriate load conditions, and finally rendering has been completed. This whole procedure was carried out in the Ansys software. The maximum elastic strain is acting at the center of the plough in this case. It can withstand a high equivalent elastic strain of 0.00038722. And the tip and other sections of the plough are subjected to the least amount of elastic strain. The smallest amount of equivalent elastic strain acting on it is 2.0689e-8.

Safety Factor:

Fig.10: Safety Factor



The illustration above depicts the safety factor in the plough field. The file has been imported, and the material properties have been set to mild steel, as well as the mesh order. The material has been given the appropriate load conditions, and finally rendering has been completed. This whole procedure was carried out in the Ansys software. The minimum factor of safety is acting at the center of the plough in this case. It can withstand a low equivalent safety factor of 2.687. And the tip and other sections of the plough are subjected to the high amount of factor of safety. The highest amount of safety factor acting on it is 15.

VII. FUTURE SCOPE

For large field sowing, a multi-hopper, seed disc, plough, furrow closer may be attached side by side. A seed sowing system could include a water dripping device.

VIII.CONCLUSION

In comparison to the traditional method of seeding, the above project outcomes guarantee a much more effective, less time intensive, and worker friendly machine. It guarantees that you can complete the most work with the least amount of effort. This seed plantation machine has a high potential for growing planting productivity. Until recently, the tractor was the most common traction unit for agricultural nourishment. This seed planting machine's function has been fulfilled by its adaptation. As a result, there is a need to adopt this technology to make it accessible to small-scale farmers. This unit can also be constructed from raw materials, which reduces the overall expense of the project and allows it to be conveniently assembled in readily available factories. As a result, farmers can comfortably afford it. So, we believe that this machine is beneficial to the world and would like to present it to a stable world.

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