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Design and Analysis of Garlic and Onion Harvester

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Abstract— Garlic harvesting is an important part during the garlic production process. The farmers complain for the need of so many work forces for harvesting while the labor cost is getting increased and the time spent for harvesting process is too long. Although there is an alternative of imported garlic harvesting machines, those machines are not compatible with the farming environment in India. The project is mainly based on developing the garlic harvester by improving the shovel design and increasing the efficiency of the machine. This machine consists of three main parts namely, garlic digger, screener and power transmission system. This project is focusing on design and fabrication of garlic harvesting machine.

Keywords— Garlic, Onion, Agriculture, Harvester, shovel, digger, screener and power transmission system.

I. INTRODUCTION

Garlic is the cultivation crop of labour intensity, harvesting operations being an important part during its production process. Currently, the major obstacles of the garlic industry development are labour intensity, high farming time, significant losses and low efficiency. The mature production technology and equipment abroad are difficult to adapt to the actual needs in India. Garlic harvesting machine is used in few areas, such as Gujarat, Orissa, but the garlic harvester needs to be developed. Overall, the garlic mechanized harvesting technology and equipment in our country is still in the initial stages, most part of the equipment is still in initial testing stage. They need to be improved in the quality, adaptability, reliability and economic performance. Therefore, the research and development of the garlic harvesting equipment have important significance to accelerate garlic mechanized production in India.

II. HARVESTING

A. Principle

The purpose of a participatory process is to produce a harvest. A harvest is the output and can be tangible and intangible, collective and individual. ... Taken as a set of practice principles (heuristics) these can be used as the first forays into designing a strategy for harvesting from participatory process.

B. Harvesting Methodologies

There are several types of harvesting methodologies used in garlic harvesting. The most commonly used methodologies in harvesting are as follows:

i. Upending
ii. Digging
iii. Gathering
iv. Conveying
v. Clearing
vi. Garlic
vii. Bulb
viii. Collecting

III. WORKING PRINCIPLE

Mechanically handling a garlic harvest is very difficult as the bulbs are very sensitive to direct sun exposure and tend to turn blue. Therefore, garlic has to be rapidly dug up, topped, and protected from the sun. It is obvious that this process is difficult to stick to without a sufficient workforce. Sophisticated systems enabling the mechanical treatment of garlic can be found.

Advantages

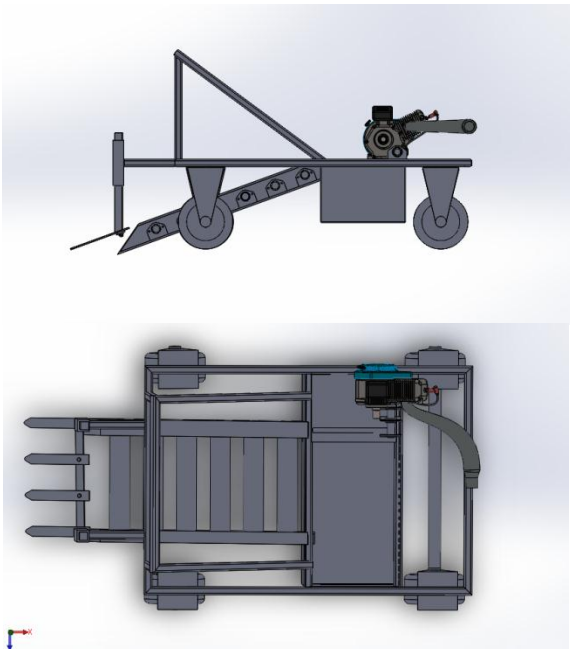
1. Cultivation time reduces.
2. Improvement of damage reduction.

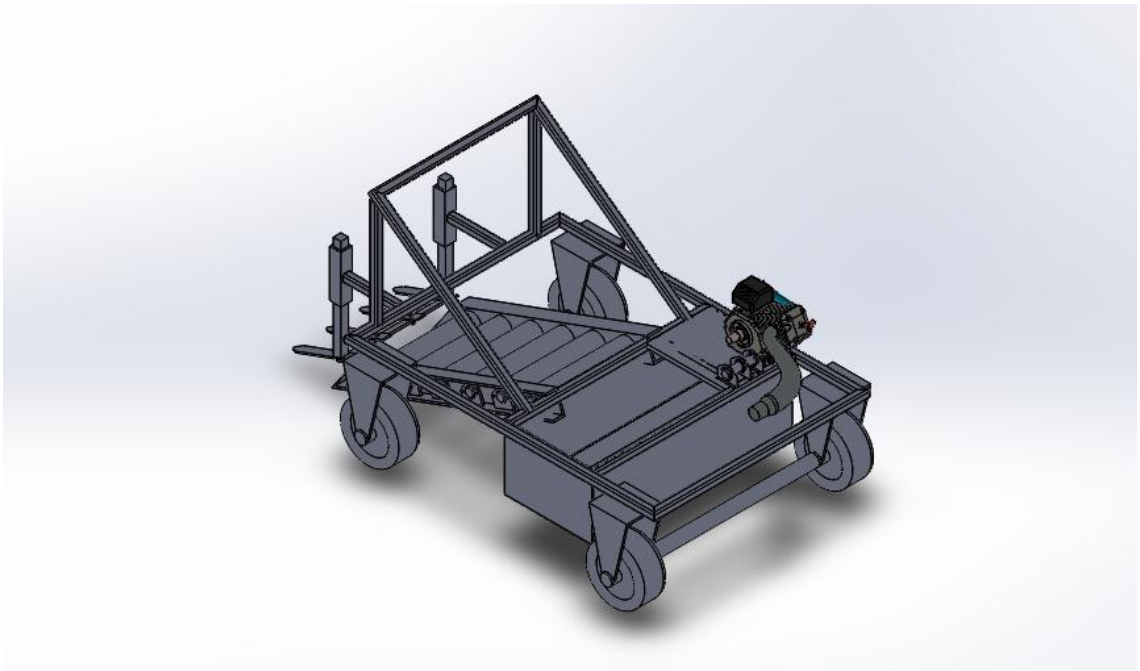
3. Reduces the effort of human power.
4. Cultivation

Disadvantages

1. Inadequate storage facility.

Design





IV DESIGN CALCULATION

Bearing design;

Diameter of the shaft (D) = 40mm
Static load (Co) = 2200 Kgf = $22*10^3$ N
Dynamic load (C) = 3200 Kgf = $32*10^3$ N

Calculation

$$\frac{fa}{fo} = \frac{1500}{32000} = 0.04$$

From PSG Data book page no 4.4

e = 0.24

$\frac{fa}{fr} = \frac{1500}{2500} = 0.6$

From PSG Data book page no 4.4

X = 0.56, Y = 1.23

From PSG Data book page no 4.2

S = 1.2

Equivalent Load:

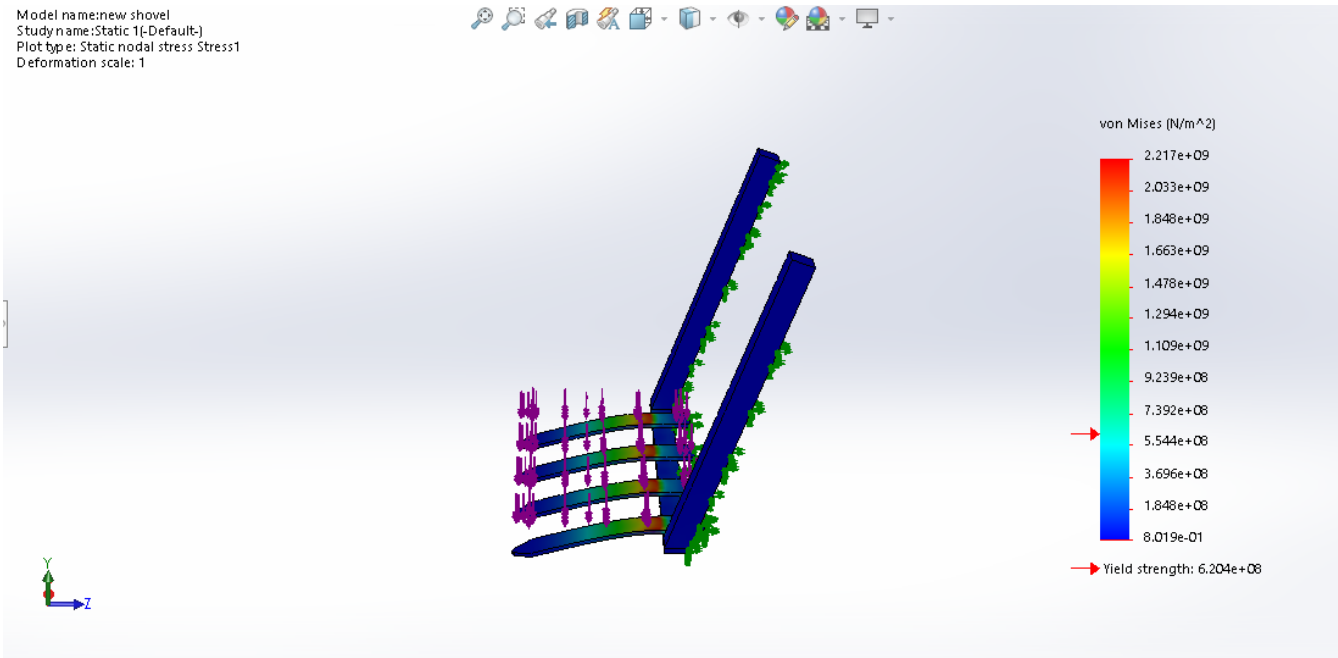
P = (X*Fr + Y*Fa)*S
P = [(0.56*2500)+(1.23*1500)]*1.2
P = 3894 N

C/P Ratio:

From PSG Data book page no 4.6

C/P = 5.53
C = 21533.82 N

∴. The selected bearing is suitable (SKF6308)



V.CONCLUSION

Through analysis of the harvesting characteristics of the replant crops, a garlic harvester suitable to separate the garlic from the replant crops has been designed. A separation mechanism and a positioned cutting mechanism have been designed to separate garlic and keep the length of the straw remaining the same. From theoretical analysis and modeling analysis, optimal component parameters have been designed.
Field experiments showed that the damage rate was 0.43%, the missing digging rate was 0.96%, and the miss cutting rate was 1.41% when the harvester working in the first gear harvest speed.When working in the second gear, the harvesting speed was faster but the harvesting effect was poor. Therefore, the harvester works best when working in the first gear.
By further improving the digging shovel device, harvesting results can be better, harvesting efficiency can be higher. In addition, the harvester is small in size and suitable for single-row garlic harvesting and needs to rely on the tractor to drive. It can be considered to make the harvester work autonomously without using a tractor, which is easier to operate.

REFERENCES

1. HuZ.C.,WangH.O.,(2007),Summary of mechanized cultivation and processing of garlicin America, Journal of Anhui Agricultural Sciences,Vol.35,Issue13,pp.4059-4061,Anhui/CHN.

2. F.Haitao,"Analysis of the status quoofpay Haitao harvest mechanization in Jinxiang county garlic", AraofAgriculturalMachinery,vol.8,p.8,2015.

3. G.Qinghai, and C.Sigang, "Research and development of front type garlic harvester", Hebei Agricultural Machinery, vol.12,pp.13-15,2015.

4. Z.Zhongyu, and W.Jing,"YanmarHZ20self-propelled garlic arvester technology and benefit analysis", Agricultural Equipment Technology, vol.42,no.2,pp.36-37,2016.

5. X.Wenyi,Z.Hua,Z.Zhiqi,Z.Jin,andC.Zhongkai,"Design and experiment of small garlic combine", Journal of Agricultural Mechanization Research,vol.26,no.2,pp.1-2,2016.