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# Design and Analysis of Blade in Groundnut Harvesting Machine

Ashish chougale[1], Prashant Mane[2], Prashant Borkute[3], Suraj Thorat[4], Rushikesh Sawant[5], Sachin Chandapure[6], Prashant Pandav[7]

[1,2,3,4,5,6] Students, D.Y. Patil College of Engineering and Technology, Kolhapur, Maharashtra.

[7] Professor, D.Y. Patil College of Engineering and Technology, Kolhapur, Maharashtra.

E-mail: ashishchougale2398@gmail.com

***Abstract:*** **Today's fast moving world and the world of technology saving time and human efforts is need of time. So in modern farming, use of power rotor, sugarcane cutter and wheat cutter has been increased. The use of groundnut harvester is also quite beneficial in saving human efforts and time and making farming a bit easy task.**

**Hence, designing, manufacturing and testing a groundnut harvester for marginal farms is our main objective. For designing such a harvester we have referred current groundnut harvester which is available in market and improved its design using solid works software. According to area the type and the content of soil, the stress which is exerted on the harvester is also different. Hence, for testing we have used ansys software.**

***Keywords:*** **ground nut harvester, harvester cutter, solid works, ansys.**

## I. INTRODUCTION

Groundnut is one of the important crop in oil refining industry. According to the survey done in 2020 45% of oil produced in oil refining industry is product from groundnut harvesting.

Currently in market there are various groundnut harvester available but the prices are quite high. In India farming in small scale is practiced more hence the farming practice in which we require less area of ground and cheaply available groundnut harvester cutter influencing is our prime object.

Andhra Pradesh, Tamilnadu, Maharashtra, Karanataka, Gujarat are five states where groundnut harvester is practiced on larger scale. According to the survey one hector land needs 100 labours per day that's why we aim to produce ecofriendly and automatic system as model for groundnut harvesting.

## II. OBJECTIVE

The objective of the paper is to define develop working model which is simple, rigid and robust in construction by comparing its mechanical properties and design analysis on ANSYS software.

## III. LITERATURE REVIEW

1] Johnson (1987) US4687064:

This patent was registered on 18th August 1987 by Johnson. It is actually an attachment for tractor or similar vehicle. In this invention a pair of rubber V belt is positioned back-to-back and synchronized with vehicle motion. The plant conveyor belts carry the harvested plants rearward and upward to cause the roots of the plants containing the peanuts to pass over a pair of picking elements.

2] Wang (1986) US4607703:

This patent was registered on the August 1986 by Wang. This peanut harvester includes truck body, two pairs of stalk straighteners, two peanut diggers, a plant feeder, tilled conveyor, a horizontal conveyer, a peanut stripper and a peanut

collector. By using this harvester soil can be automatically dug, lifted, stripped, screened and finally picked peanuts are collected into the bags.

3] Bharti (2009)

Harvesting may sometimes become a problem especially when the crop has passed the stage of full maturity and the soil has hardened. In this case, it is customary to lift the plants by loosening the soil either by working a hand hoe, a plough or a blade harrow along the plant rows. If after lifting the crop manually it is observed that a good percentage of the pods have been left in the soil, the same implements may be used to pick the leftover pods.

## IV. BLADE

The upper and lower part to support hole blade attach them with. The force from ground cannot destroy the blade. These we used to attach them with close distance. The material we used blade on basis of studies. As per tensile stress and compared on other material suitable means of cost, manufacture cost, yield stress there we represent the 2D solid work drawing of blade

MPa

| | |
|---|---|
| Granite | 14-50MPa |
| Diubuse | 25-60MPa |
| Basalt | 20-60MPa |
| Slate | 15-30MPa |
| Quartzite | 20-60MPa |
| Sandstone | 8-40MPa |
| Shale | 3-30MPa |
| Limestone | 10-50MPa |
| Gravel | 200-600kPa |
| Sand | 100-300kPa |
| Very soft clay | 0-25kPa |
| Soft Clay | 25-50kPa |
| Medium Clay | 50-100kPa |
| Stiff clay | 100-200kPa |
| Very stiff clay | 200-400kPa |
| Hard clay | >400kPa |

Blade material-stainless steel 313

Dimensions

Horizontal blade : 656mm

Width of blade : 4 mm

Vertical L section : 700mm

Horizontal plate :556mm

Arms plate :490mm

Width for all plates :4mm

Material Properties

Maximum stress : 607 MPa

Allowable stress : 40.54Mpa

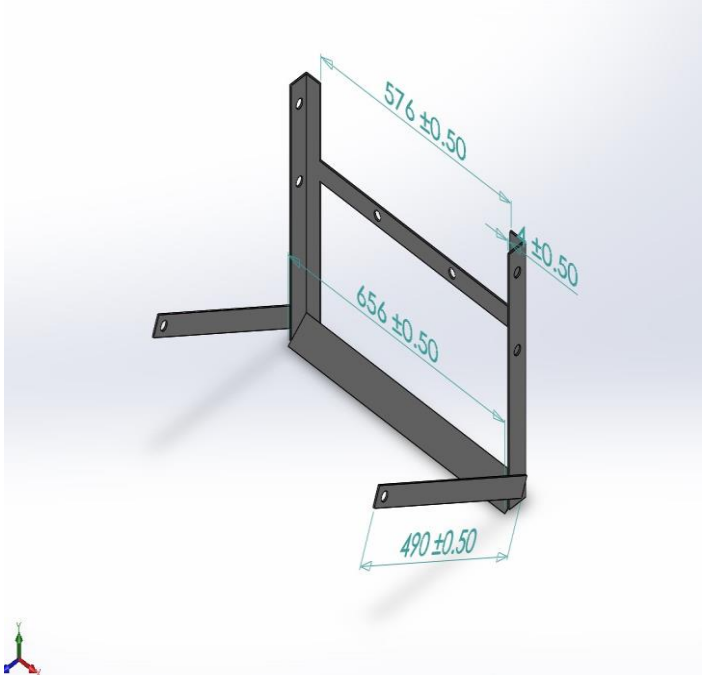


**Fig.1. 2D CAD model of blade**

The blade is analyzed in ANSYS software

Boundary Conditions:

The side of plate are which is connected to main blade is fixed with a horizontal support and other side of the blade which is connected to arms plate is provided with a vertical force in z-direction.

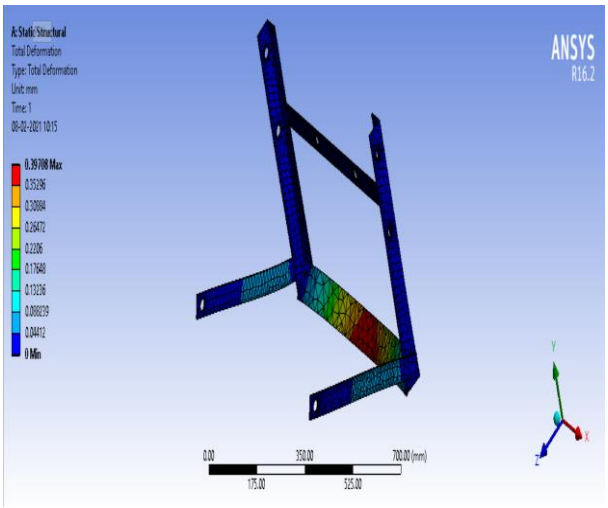


**Fig 2. Ansys model of blade**

As consider from above result the maximum stress on blade is 33.47MPa which is less than allowable stress 40 MPa. Hence, the design is safe on applied loads

## V. CALCULATIONS

a) SHEAR STRESS CALCULATION

Stress =Force/Area;

Area of Rectangular plate

=L*B

=656*42624mm.sq.

Stress =500/2624
=0.4054N/mm sq.
=40.54. MPa

b) STRAIN CALCULATION

Youngs modulus = stress/ strain

Stainless steel: -
Strain = stress/ young's modulus
= 0.19054/200000
=9.527*10^-4

Structural steel: -

Strain=Stress/young's modulus
=190.54/200000
=9.527*10^-4

Cast Steel: -

Strain =Stress/Young's modulus
=190.54/203000
=9.386*10^-4

Aluminum alloy

Strain=Stress/Young's Modulus
=190.54/73800
=2.58*10^-3

Cast iron

Strain=Stress/ Youngs modulus
=190.54/171000
=1.11*10^-3

c) Factor of safety

= Ultimate stress/Working stress
=505/190
=2.65

## VI. CONCLUSION

We have analyzed the blade of groundnut harvesting machine with the help of Ansys software. For this analysis we have taken different kinds of materials and found that steel is suitable material according to strength and cost of as compared other material this design and analysis is very help to manufacturing the machine in economic way because as compared to traditional method it will be worked more faster so ultimately save the time and reduce labors requirements.

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