DESIGN AND OPTIMISATION OF AGRICULTURE GRAIN CUTTING MACHINE

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Abstract

The aim of our project is to replace the conventional harvesting process with manually operated agricultural reaper vehicle. Here the cutter blades are used to cut the grains and collect those on the frame. This will help the small land holders for harvesting varieties of crop in less time and at low cost by considering different factors as power requirement , cost of equipment, ease of operation , field condition , time of operation. The operating, adjusting and maintaining principle are made simple for effective handling by unskilled operators.

I. INTRODUCTION

Agriculture is demographically the broadest economic sector & plays a significant role in the overall economy of India is necessary. The main purpose of mechanization in agriculture is to improve the overall productivity and production. About 83.29% of the Indian Farm families have land holdings less than 2 to 3 acres. For them it is not required nor economical to purchase a full featured existing cultivating machines. Thus there is a need for smaller efficient multipurpose cultivating machine which would be more accessible & also considerably cheaper. The idea is to create the machine which will reduce the Labour & the cost required to cultivate crops. This machine has a capability and the economic value for fulfilling the needs of farmers having small land holdings(less than 2 acres). This machine is cost effective, easy to maintain & repairs for the farmers.

Farming is most widely followed profession in India. Agricultural products contribute a major portion to our economy. Engineering science has brought tremendous changes in traditional methods of agriculture by sowing, planting, irrigation, fertilizer spraying, harvesting, etc. However to increase our economic condition, we must increase the productivity and quality of our farming activities. Nowadays very few skilled labors are available for agriculture. Because of this shortage the farmers prefer to use reaper harvesters These reapers are costly and only available of very large scale farming. However, agriculture groups make these available for rent on an hourly basis. But the small holding farm owners generally do not require the full-featured combine harvesters. Also, these combine harvesters are not available in all parts of rural India due to financial or transportation reasons. Thus, there is a need for a smaller and efficient combine reaper which would be more accessible and also considerably cheaper.

II. RELATED WORK

Vignesh et al**.,** In this literature survey after modification of automatic operated reaper it work continuously and gives more efficiency than the machine before modify. Conveying mechanism now help to stop clogging and decreases the cutting losses. Continuous working leads to harvest crop in less time with minimum man power. The automatic operated reaper is high labour saving equipment.The cost of reaper is low so it is affordable to small farmers. The field efficiency is satisfactory which more than 66%, it increases from 59% due to its modifications.

Manjeet Prem et al., From the literature reviewed, it is clear that reaper is most important for timely harvesting of field crops. Manually operated harvesting equipment's are available, ground wheel used as power source to operate the cutter, but available traction force in the ground wheel is not sufficient to cut and convey the crop. Also, available reaper (self propelled and tractor mounted) in the market is high cost and they are not eco-friendly. Due to high initial and operating cost, small and marginal farmers cannot adopt it. Hence, an attempt is, therefore required to low cost and eco-friendly battery powered reaper, this type of reaper can easily be operated by battery, only single person required for pushing the machine forward in less economy, easily affordable for farmers for keeping the better farming

A R Bhabad et al, This designed efficient reaping machine which will counter the problem of cutting corn plants manually for small scale farms. It can be concluded that the machine is comparatively compact and easy to handle. This machine is able to run of field effortlessly and efforts of farmer are reduced. The cost of reaping using this machine is considerably less as compared to manual reaping. Thereapers available in market are suitable for large farms so this can be best reaper for the farmers with small field.

Suwipong Hemathulin et al., The design of rice leaf cutter is based on the principles of reference and design of the theories and research related to the combine harvester. To test the efficiency of the rice leaf cutter was compared with the cutting rice leaves using a lawn mower. show rice leaf cutter can reduce the time to work it down. Farmers are easy to work and reduce fatigue. the measured vibration values compared to the vibration values of the combine harvester are likely to be in the same direction. compared the cost of traditionalrice cultivation without cutting leaf. The cost of rice leaf cutting can reduce the cost of rice production by 640 Baht per Rai and increase rice yields.

III OBJECTIVES

The main objective of the project is:

- To replace the conventional harvesting operation.
- To minimize the harvesting time.
- To decrease the labour cost during harvesting.
- To help small-scale farmers in India and meet an increased demand for local grains

IV WORKING PRINCIPLE

When the motor is turned on , the shaft connected with the bearing starts to rotate providing the wiping mechanism to the blades. One blade is fixed and the other blade moves back and forth which therefore cuts the crops. The bevel gear arrangement is used for activating the shaft in which the collecting setup was fixed . It pulls the crops and gets collected in the frame. The harvested crops can be further removed from the frame

V.DIAGRAM

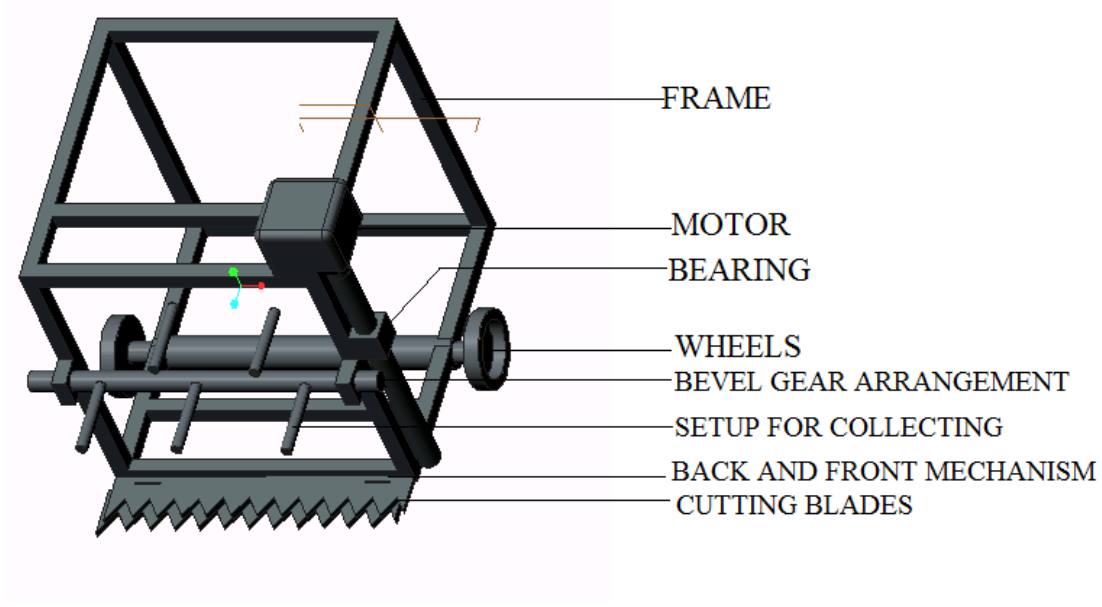

Figure 1. 3D Diagram

VI. DESIGN CALCULATION

CALCULATION FOR FINAL SPEED &TORQUE:

Power of motor= P = 2000watt.

$P=2\pi NT / 60$

Where,

N= Rpm of motor = 2650 rpm

T =Torque transmitted

$2000 =2\pi x\ 2650\ xT / 60$

T = 7.2N-m

T = 7207 N-mm

T_1=7207 N-mm

Now, T2 is the maximum torque among all shafts, so we will check shaft for failure here.

$T_2=\pi / 16\ x135xd^3$

Assume T_2=14414N-mm

$d^3=14414\ x\ 16/\ 3.142\ x\ 135\ d$

$=3\sqrt{543.7}$

d =8.16

Say, d = 9 mm

But we are using 20 mm shaft so design is safe.

For 20mm Shaft diameter we take standard bearing no. P204

VII WORKING MODEL

Figure 2 Working model

VII. CONCLUSION

The cutting of the grains through machine rather than cutting it manually or using large machines reduces the cutting time , reduces the cost needed for cutting and helps the small scale farmers with more comfort. This machine can be easily transported to the harvesting field and it can also be kept within the field due to its compact size.

VIII REFERENCES

1.Laukik P. Raut, Vishal Dhandare, Pratik Jain, VinitGhike, Vineet Mishra**, "**Design, Development and Fabrication of a Compact Harvester", International Journal for Scientific Research & Development| Vol. 2, Issue 10, 2014 | ISSN (online): 2321-0613

2.Government of India, "Indian agricultural statistics 2015-16", Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics & Statistics, New Delhi

3.Christopherboyle, Ian Jutras, Christopher Molica, Earl Ziegler R., " Designing a Small-Scale Grain Harvester: A Tool for Urban and Peri-urban Growers" April 28, 2012