



DESIGN AND FABRICATION OF HAND OPERATE MULTI PLATE CROP CUTTER AND WRAPPER BY USING SOLAR POWER

S. Elavarasan¹, N. Gayathri², V. Gopikrishna³, A. Dineshkumar⁴, J. Thavamani⁵

¹Assistant professor, ²⁻⁵UG Scholars,

Narasu's Sarathy Institute of Technology, Salem, Tamil Nadu

ABSTRACT

Agriculture is the spine of India and maximum advanced supply for economy. This venture is to assist small scale farmers to satisfy an improved call for neighborhood grains, through designers a crop reaper and wrapper gadget to reap grains extra effectively. This observe will cognizance on smooth to reap numerous kinds of vegetation in much less time and additionally low value. Considering different factors which include strength requirement, value of equipment, ease of operation, discipline situation, time of operation and climate situation etc., are principal purpose for bad cultivation. In our project, we're making plans to introduce the changed reaping machine to conquer present issues and delivered a crop binder on this machine. The operating, adjusting and keeping are made easy for powerful handing via way of means of unskilled operators. Here, we're providing this interest via the prototype version of agricultural machine additionally displaying a wrapper setup withinside the 3-D software program with operating condition.

Keywords: Solar power, Paddy cutter, Reaper and binder machine.

1. INTRODUCTION

Farming is maximum extensively observed career in India. Agricultural merchandise makes a contribution a prime element to our economy. Engineering technology has added super modifications in conventional techniques of agriculture viz. sowing, planting, irrigation, fertilizer spraying, harvesting etc. However, to growth our financial condition, we have to

growth the productiveness and exceptional 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 integrate

harvesters. Also, those integrate harvesters aren't to be had in all components of rural India because of monetary or transportation reasons. Thus, there may be a want for a smaller and green integrate reaper which might be greater reachable and additionally notably cheaper.

2. LITERATURE REVIEW

A. R. Bhabad (April 2017) et.al. This designed green reaping system in an effort to counter the hassle of slicing paddy manually for small scall farms. It may be concluded that the machine is relatively compact and smooth to handle. This machine is capable of run of area results easily and efforts of farmer are reduced. The fee of reaping the use of this machine is notably much less as compared to guide reaping. The reapers to be had in marketplace are appropriate for massive farms so this will be great reaper for the farmers with small area.

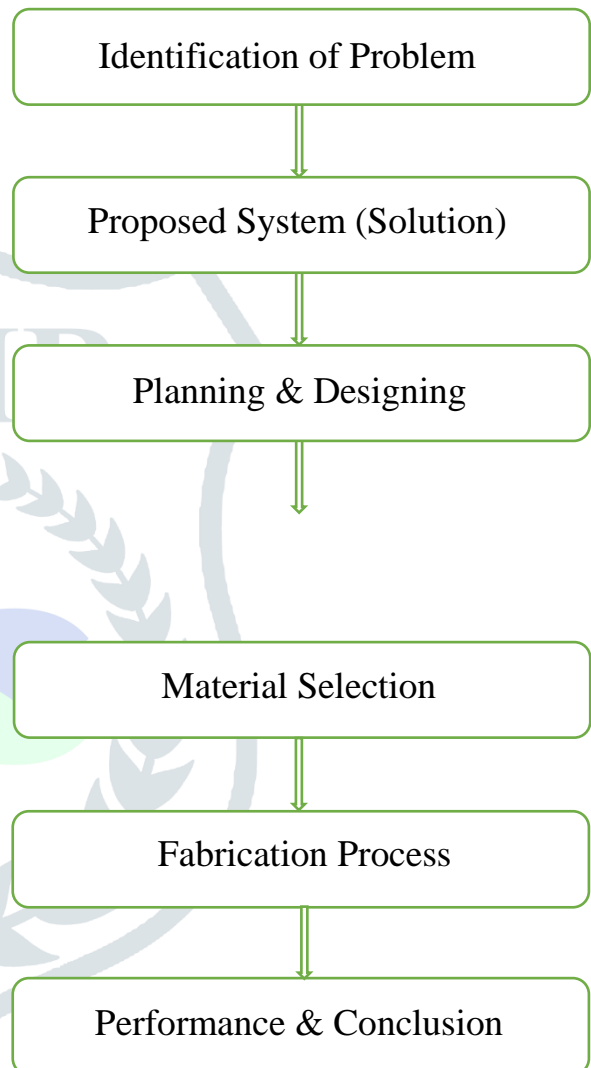
N. Dileepan (2018) et.al. By doing all of the look at it's far clean that the crop cutter and amassing machine could be very clean to assemble its operating is likewise quite simple and cheap. This machine is capable of run results easily for that reason the usage of this machine. The value of this machine extensively much less as evaluate to guide grass cutter. The achievement of this machine relies upon on how the farmer uses this machine.

Vignesh (March 2018) et.al. After change of computerized operated reaper, its paintings constantly and offers greater performance than the machine earlier than modify. Conveying mechanism now allows to forestall clogging and reduces the reducing losses. Continuous operating leads to reap crop in much less time with minimal guy power. Based on evaluation of consequences following and are drawn. The computerized operated reaper is excessive labor-saving equipment. The value of reaper is low so it's miles lower priced to small farmers. The subject performance is

pleasant which greater than 66%, it will increase from 50% because of its modifications.

3. METHODOLOGY AND MATERIAL SELECTION

The Machine's version is designed primarily based totally at the call for a



compact and within your budget reaper. This call for is considered via way of means of consulting the existing state of affairs of paddy harvesting we determined to put together a version of paddy reaper with compact creation as a way to be usually appropriate for farmers having small and agriculture. The machine prototype might be within your budget and maximum handy for slicing paddy stalks and different comparable flowers having equal or much less shear energy than paddy.

A. Problem Identification

Now pollutants are a main problem for complete world. In gas crop cutters because of the emission of gases its end result offers pollutants.

Also, currently in rural areas, there may be a scarcity of hard work to be had for agriculture harvesting. To keep away from this scarcity of labor the farmers have to transport on and begin the usage of machineries for harvesting.

The harvester has excessive preliminary value which can't be afforded via way of means of low scale farmers.

B. Objectives

The foremost goal of the mission is to reduce the vegetation in a greater green way.

The layout of the mission is easy and an element for the crop reaper is without difficulty available.

To fabricate the crop reaper with the chosen fabric with value effective.

Since sun electricity is used that is a renewable electricity it's miles reasonably-priced and much less maintenance.

To lessen guy strength with inside the crop binding and time consume.

C. Component Selection

- Cutting tool
- Chain sprocket
- Toggle switch
- Solar panel
- DC motor
- Battery
- Wheel
- Machine frame
- Thread

4. CALCULATION

Design calculation is accomplished in step with the want of the consumer preserving in thoughts the protection of the farmer and to layout a powerful version with all requirement of the farmer.

A. Blade Calculation

Speed, N	=	100 rpm
Density, ρ	=	7992 kg/m ³
Thickness, t	=	1 mm
Gravity, g	=	9.8 m/s ²
Weight, W	=	1.4 N
Velocity, ω	=	$2\pi N/60$
Breadth, b	=	40 mm
Length, l	=	450 mm
Volume, V	=	$1.8 \cdot 10^{-5} \text{ m}^3$
Blade mass, m	=	0.14 kg
Torque, T	=	315 N-mm
Power, P	=	18 watts

B. Electric Motor Selection

- | | | |
|----------------------|---|---------|
| a) DC Motor Speed, N | = | 850 rpm |
| b) Power, P | = | 18W |
| C) Voltage, V | = | 12V |

C. Motor Torque

a) Torque, T

$$\begin{aligned} \text{Torque, } T &= (P \cdot 60) / (2 \cdot 3.14 \cdot N) \\ &= (18 \cdot 60) / (2 \cdot 3.14 \cdot 850) \\ &= 1.7197 \text{ Nm} \end{aligned}$$

$$\text{Torque, } T = 1719.7 \text{ N-mm}$$

b) Shaft is made up of mild Steel

Shear stress limitation is 42 MPa

D. Electrical Power Equation

$$\text{Power, } P = I * V \Rightarrow I = P / V$$

$$I = 18 / 12 = 1.5 \text{ A}$$

$$I = 1.5 \text{ A}$$

E. Cutter Frame

Blade Weight	=	2.5 kg
Motor Weight	=	2 kg
Battery Weight	=	2.5 kg
Solar Panel Weight	=	0.5 kg
Frame Structure Weight	=	5 kg
Additional Weight	=	2 kg
Allowance limit of Weight	=	60 kg

$$\begin{aligned} &2 \text{ Blades} + 2 \text{ motors} + \text{Battery} + \text{Solar Panel} \\ &+ \text{Frame Structure} + \text{Additional Weight} \\ &= (2 * 2.5) + (2 * 2) + 2.5 + 0.5 + 5 + 2 \\ &= 19 \text{ kg} \end{aligned}$$

Machine Weight = 19 kg.

5. RESULT AND DISCUSSION

A) Wrapper Technology

Wrapper or Binder, system for reducing grain and binding it into bundles, as soon as broadly used to reduce small grain including wheat. The first patent turned into issued on a self-tie binder in 1850. The horse-drawn wire binder, first advertised in 1880, remained the leader approach of harvesting small grain at some point of the early a long time of the twentieth century.

Binders now a days are extra high-priced and large in size. A small-scale farmer can't have the funds for cash to shop them. So, maximum in their paintings may be in manual. It calls for extra time, cash and manpower. But our wrapper is small in size, clean to function and low-value that all and sundry can have funds for. Fig 5.1 is a 3-D simulation of wrapper that we designed.

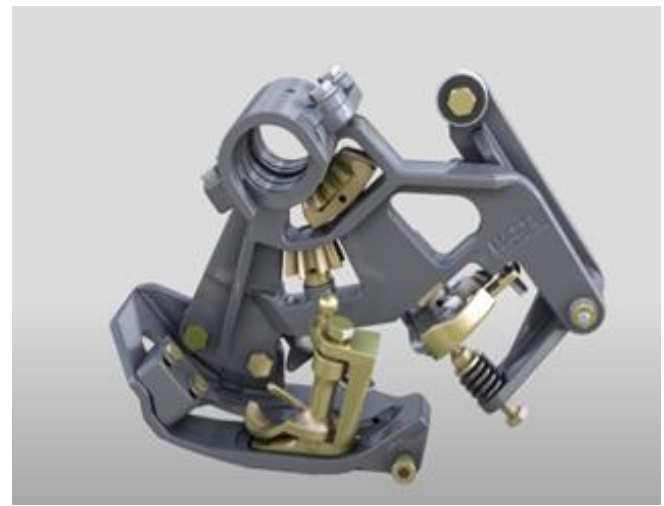


Fig 5.1. Wrapper simulation

B) 2D simulation of Crop Reaper

The paddy crop reaper system has been evolved to reap the grains of wheat, rice, maize, livestock feeds etc. The system includes DC motor, battery, chain sprocket, sun panel, toggle transfer are the important components. A trolley dependent automobile has constructed the usage of the L-phase of system frame. The wheels are coupled to the lateral aspects of frame. The slicing device is composed movable and glued component had been organized on the front quit of the system. Fig 5.2 shows the 2D simulation of crop reaper that we designed.

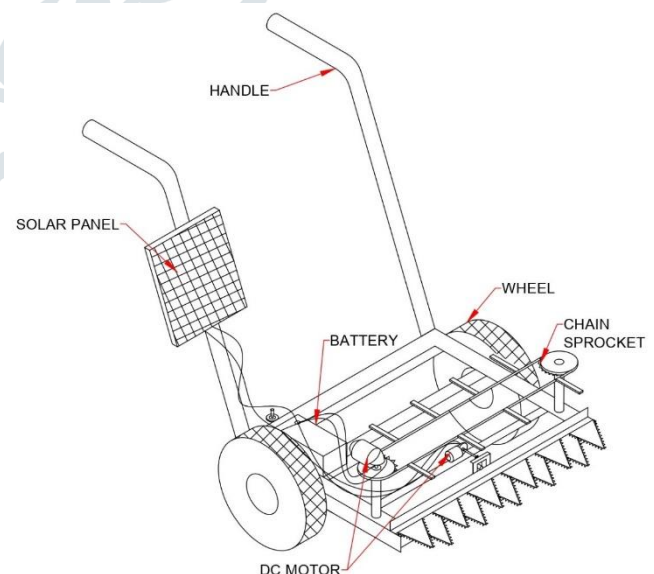


Fig 5.2. Crop Reaper 2D simulation

C) 3D Simulation of Crop Reaper

The conveyor chain is assembled over the reducing tool. There are equipment

vehicles is used to perform this machine, one is attached to cutter and different to chain conveyor. The electricity deliver for motor is taken from solar power in which it's saved in 12V lead acid battery. Both the motor receives ON/OFF via way of means of actuating the toggle switch. Fig 5.3 represents 3D simulation of crop reaper that we designed.

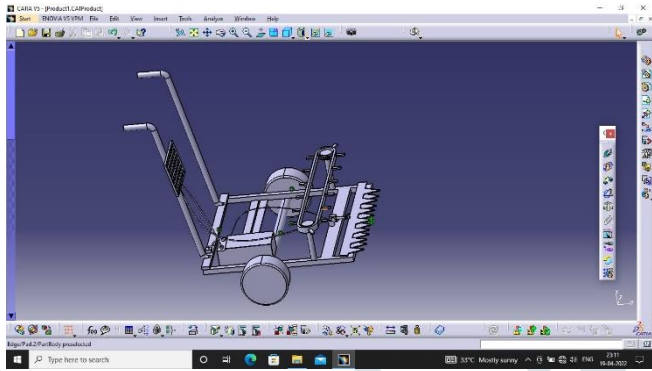


Fig 5.3. 3D Simulation of Crop Reaper

D) The Machine

The machine has moved into farm through manually whilst harvesting the plants.

The plants have been cutted and accumulated at lateral aspect via chain conveyor while motor receives ON. Fig 5.4 shows the crop cutter machine that we designed and actuated.



Fig 5.4. Crop Cutter

6. FUTURE SCOPE

The machine version is designed primarily based totally at the call for a

compact and within your means reaper. This call for is considered via way of means of consulting farmers in person, for his or her issues and requirements. Taking under consideration the prevailing state of affairs of paddy harvesting we determined to put together a version of paddy reaper with compact production in an effort to be on the main appropriate for farmers having small and for agriculture. The machine prototype may be within your means and maximum handy for slicing paddy stalks and different comparable vegetation having identical or much less shear energy than paddy. Harvesting is the manner of accumulating a ripe crop from the fields.

7. CONCLUSION

This designed green reaping system with a purpose to counter the trouble of reducing paddy vegetation manually for small scale farms. It may be concluded that the system is relatively compact and clean to handle. This system is capable of run of discipline result easily and efforts of farmer are reduced. The value of reaping the usage of this system is notably much less in comparison to guide reaping. The reapers to be had in market place are appropriate for huge farms so this may be exceptional reaper for the farmers with small discipline.

They are absolutely agriculture purpose, a completely beneficial tool that is quite simple in construction. It is used to preserve and renovation lawns in gardens, schools, colleges etc. We have made a few modifications withinside the current machine to make its utility less complicated at decreased cost. Our primary purpose in pollutants manipulate is attained through this.

8. SUGGESTION

The suggestions from this study are:

1. The rpm of the dc motor and the capacity of lead acid battery be in need enhancement for cutting of more crops faster than normal time.

2. Power efficiency of the battery needs to be improved for long duration during field work.

9. ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my guide and our institution who gave me the golden opportunity to do this wonderful project on the topic (Design and fabrication of hand operate multi plate crop cutter and wrapper by using solar power), which also helped me in doing lot of advancements and I came to know about so many new things. I am really thankful to them.

10. REFERENCES

1. R. Bhabad (April 2017) et.al. "Design and Fabrication of Agricultural Crops Reaper" International Journal for Research in Applied Science & Engineering Technology, volume 5, issue 6.
2. Tesfaye Olana Terefe (August 2017) et.al. "Design And Development of Manually Operated Reaper Machine" International Journal of Advanced Research and Publications, volume 1, issue 2.
3. Roshan Ghodkhande (2018) et.al. "Design And Fabrication of Crop Cutter Machine" JIARIIE, Volume 4, issue 1.
4. N. Dileepan (2018) et.al. "Design and Fabrication of Semi-Automatic Crop Cutter with Hybrid Power" International Journal of Engineering Research & Technology, volume 6, issue 4.
5. Vignesh (March 2018) et.al. "Design and Fabrication of Agricultural Reaper" International Journal of Recent Trends in Engineering & Research, volume 4, issue 3.
6. Shravan U. Burade (April 2018) et.al. "Design and Fabrication of Agricultural Crop Reaper" International Research Journal of Engineering and Technology, volume 5, issue 6.
7. C J Manjunatha (May 2018) et.al. "Study and Fabrication of Solar Powered Multiple Crop Cutter" International Journal of Innovative Research in Science, Engineering and Technology, volume 7, issue 7.
8. "Fabrication and performance test of an Ultraportable Crop cutter" Mr. G Maruthi Prasad Yadav, GMD Javeed Basha IJRSET Volume 2.
9. Vilas s. Gadhawe, Pravin P. Gadsing, Yogesh K. Dike, Anil S. Jaybhaye, Pooja A. Londhe, Praveen K. Mali, "Design, Development and fabrication of Multi Crop Cutter Powered by Electric Motor", International Journal of Application or Innovation in Engineering & Management (IJAIEM), Volume 6, Issue 5, pp. 104-112, May 2017.
10. Zakiuddin S K. S, "Design and development of the human energized chaff cutter", New York science journal.