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Design and Fabrication of Crop Reaper

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Abstract: ***Crop harvesting is the important part in agricultural field. The use of crop reaper in country can minimize the product cost which will be result in economic development of agricultural production. This paper is providing the design and fabrication of mechanically operated crop reaper machine. In the current situation in our country there are not more proper cost effective crop reaper and most of the farmers are using manually traditional crop cutting mechanism, the traditional use of harvesting mechanism is more un intresting, time consuming and not able to develop the agricultural sector as needed. Depending on the problem stated in existing crop reaper to satisfy the need of farmers and to meet the requirement of the objective of the problem. This paper addresses a Crop cutting Machine which is fabricated with very simple mechanisms at very low cost. Cutting of crop is one of the important agricultural operations which demand considerable amount of Labour.***

The availability and cost of labour during cutting season are the serious problem. The Shortage of labour during harvesting season and vagaries of the weather cause great losses to the farmers it is therefore, essential to adopt the mechanical methods so that the timeliness in cutting operation could be ensured.

The use of mechanical harvesting device has been increased in the recent years. Farmers using reapers or combines to harvest their crops but these means especially combine; these are very costly making it un-affordable to most of the small farmers. Although, some manual operated reapers were developed.

But, due to limitations of manual power, none of them become popular as the power available for transportation of the machine as well as cutting and conveying of the crop was not sufficient. In this research, we are study and fabricate a Crop Cutting Machine at very low cost and techniques were carried out.

I. INTRODUCTION

Agriculture is the backbone of India. In India agriculture farmers has facing serious challenge like insufficient agricultural labour, in highest working seasons but also in normal time. This is mainly for increased nonfarm job opportunities having higher wage, migration of labour force to cities and low status of agricultural labours in the society. In India two type of crop cutting like as manual method (conventional method) and mechanized type of crop cutter. The crop cutting is important stage in agriculture field. Currently Indian former used conventional method for crop cutting i.e. cutting crop manually using labour but this method is very lengthy and time consuming To design and analysis the crop cutting Machine which is help to the Indian farmer to small farm. It will reduce the cost of crop cutting in field. It will help to increase economical standard in Indian former. The design of the crop cutting machine will be presented by using CATIA software. This machine has the capability and the economic value for fulfilling the needs of farmers having small land holdings. This machine is cost effective and easy to maintain and repair for the farmers. The machine model is designed based on the demand for a compact and economical reaper. This demand is taken into consideration by consulting farmers in person, for their problems and requirements. The mission is to create a portable, user-friendly and low cost mini harvester reduce the labour required to cut crops. This machine has the capability and the economic value for fulfilling the needs of farmers having small land holdings. This machine is cost effective and easy to maintain and repair for the farmers.

II. LITERATURE REVIEW

1. Godfrey P. Caldwell and Nigel W. Meek- The present invention relates to “crop cutting apparatus” and is concerned in particular, but not exclusively, with mowing apparatus suitable for cutting grass and other fodder crops. 2. Ingo Boeing and Andreas Haffert- The present invention relates to an “agricultural harvesting machine”.

For the operator of a harvesting machine, it is imperative that the parameters of the machine components be set correctly in order to ensure that a harvesting process is attained that reaches a desired harvesting goal to be attained at the end of the harvesting process chain.

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A. Problem Statement

Manual labor takes time and is not effective as they can work for 3-4 hours at a stretch. Even if the land holding is small, it takes two or three days to completely harvest the crop. High costs of machines and maintenance, nonavailability of appropriate agricultural machines and equipment that cater to and suit the requirements of small scale farmers

B. Aim and Objective

To formulate an idea to suit our required functionality that is to reap the crops. To develop the idea to suitable mechanical principles and to design the idea into practice. To fabricate the design and the selected material which are cost effective.

III. DESIGN OF MACHINE

An To design any machine or machine part the first thing is to The first stage of the design process is to understand the perspective of the target customer to identify and address the problem at hand.

A. Design of Frame

Scotch yoke Mechanism

The Scotch Yoke is a mechanism that converts the circular motion of a crank into reciprocating motion, or vice versa. Disc rotates with the help of engine by bevel gear and shaft. Slot reciprocates sliding mechanism which is linked to the disc.

Diameter of disc=160mm

diameter of disc = cutting stroke

Cutting stroke length=160mm

Cutting Speed

machine RPM=1000

Angular velocity, $\omega=2\Pi N/60$

$$\omega=\frac{2\Pi 1000}{60}$$

$\omega=104.71$ rad /s

linear Velocity, $V=r.\ \omega$

$=0.08*104.71$

$V=8.37$ m /s

IV. MATERIAL SELECTION

A. Material for Fabrication

Plate – Mild Steel

Frame square pipe-Mild steel

B. Standard Parts Used

Bevel gear – Carbon steel

Shaft- Mild steel

Pulley- Mild steel

Pedestal bearing-

Belt – Rubber

Wheel

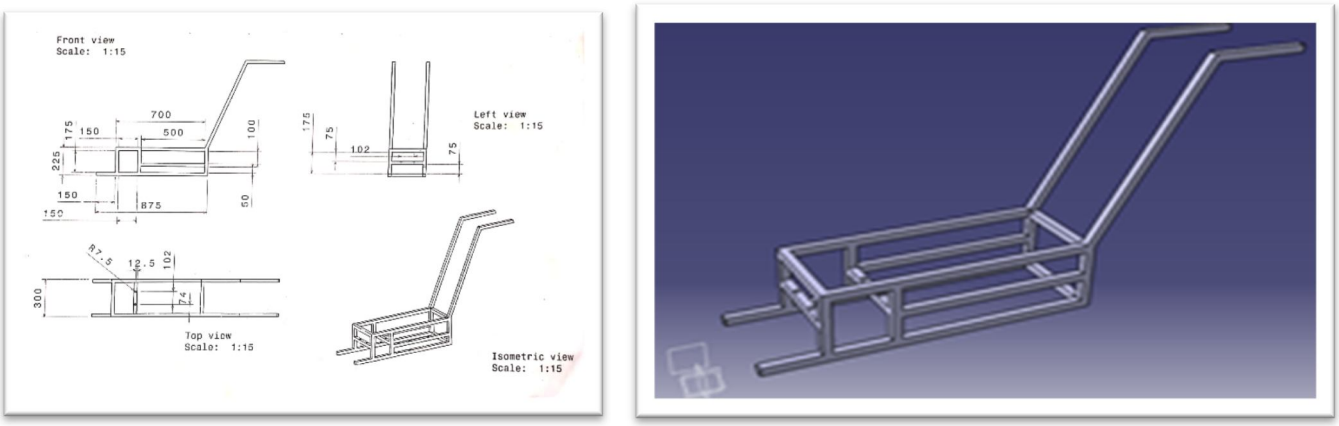
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V. FABRICATION

A. *Machine Components*

1) *Machine Frame:* The whole frame is made up of mild steel square pipe. The required frame must be in light weight and able to sustain weight of petrol engine. This crop cutting machine having dimension 875× 300 ×225 (l × b × h) mm is fabricated. For fabrication purpose the mild steel angle section is use to built the frame



Dimensions of Machine Frame

2) *Pedestal Bearing*

Bearing is a mechanical element that permits relative motion between two parts, such as the shaft and the housing, with minimum friction. The functions of the bearing are as follows:

a) The bearing ensures free rotation of the shaft or the axle with minimum friction.
b) The bearing supports the shaft or the axle and holds it in the correct position.
c) The bearing takes up the forces that act on the shaft or the axle and transmits them to the frame or the foundation.



3) *Bevel Gear*

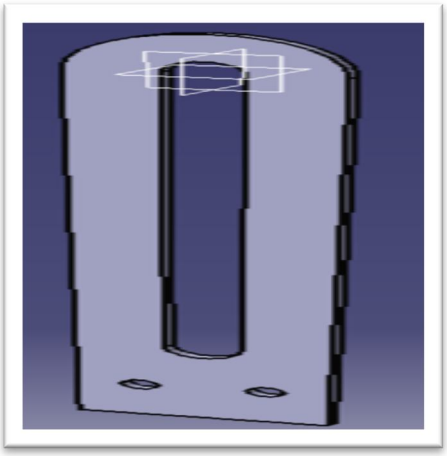
Bevel Gearbox: Bevel gearbox is used to change the direction of motion by 90˚. This type of gearbox is used because there was a need to transmit power to mechanisms i.e. scotch yoke mechanism.

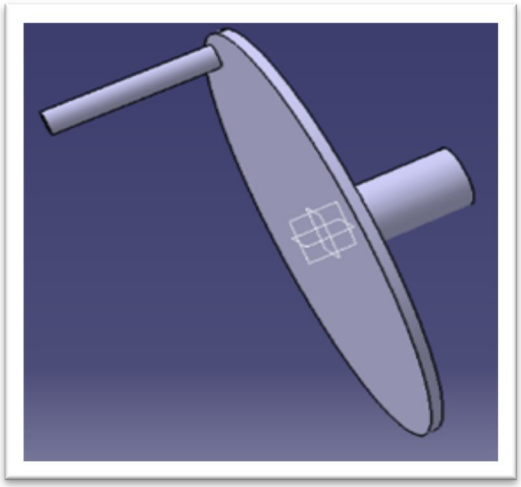


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4) Scotch Yoke Mechanism

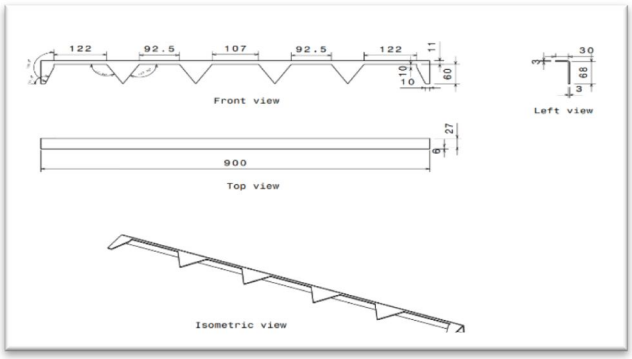
Various mechanism is used for converting rotary motion into linear motion but we use scotch yoke mechanism because it gives quick return stroke. The Scotch yoke (also known as slotted link mechanism) is a reciprocating motion mechanism, converting the linear motion of a slider into rotational motion, or vice versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating part.

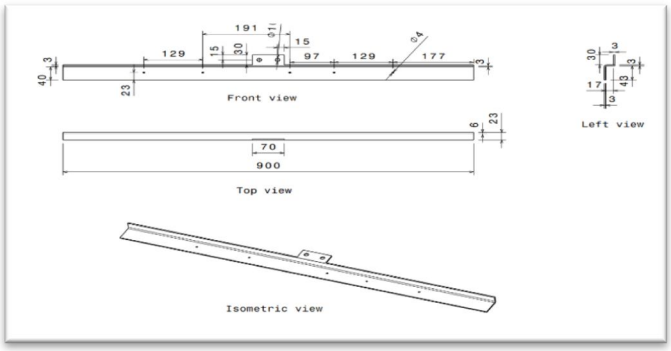




5) Cutter Assembly

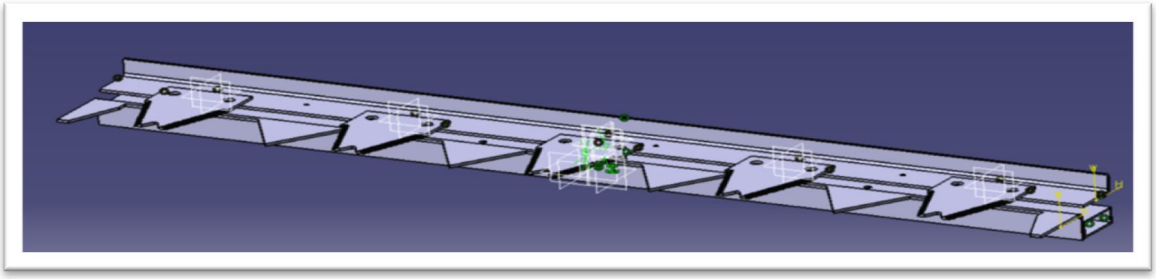
Cutter assembly consists of a sliding and stationary cutter plate. A 3 mm thick plate is used to give a support at teeth. In this project the idea is to make the mechanization of small scale crop cutting machine. The machine focuses to combination of cutting and collecting the crop for small scale farmers. Different parts of a machine will be mounted on strong chassis. The wheel will be attached to this chassis. The petrol engine is mounted on the chassis which provides the power to the wheels to move by chain drive and gear.





Lower fixed Blade

Upper moving plate



Cutter Assembly

6) Engine

This machine is powered by 2.2 HP, 1000 rpm 2 stroke petrol engine.
The engine mounted at top of the machine frame



Engine

B. Fabricated Machine









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VI. MACHINE SPECIFICATION

Component Name	Description
Engine	2.2 HP, 1000 rpm 2 stroke petrol engine
Gear Box	4 Bevel Gear are used
Pedestal Bearing	To support the shaft and smooth moving of shaft
Pulley	2 pulleys used
Scotch Yoke mechanism	To convert rotary motion into linear motion
Cutter Blades	Fixed Blade, Moving Blade

VII. RESULT

A. Manual Harvesting Cost

Amount paid to the labour for one day = Rs.300 per labour
Total number of labour required in general to Harvest 1 acre farm=6
Total amount paid to the labour=6*300=Rs.1800
Total cost in one day=Rs.1800

B. Harvesting cost using Crop Reaper

Quantity of petrol require for 1 to 1 acre = 4 litre
Cost of petrol per litre = Rs.121
Total cost of petrol for 1 acre farm for a day = 4*121
=484
Amount paid to the labour = Rs.300
Total cost = Total cost of petrol + Amount paid to the labour + Maintenance
=484+300+150
=934
Amount saved by one day =1800-934
=Rs.866

C. Advantages

Reduce the human effort- Crop harvester is mostly design for reduce the human effort in which only one operator can be operate or handle the machine. While the machine will begin there not required more than one or two worker.

1) Reduce the cost- In the agriculture for cropping the Wheat and Soyabean. It can cut at cheapest prices because it saves the worker cost.
2) Reduce the time- When worker is cutting the crop they have more time for cutting but when the use of the crop cutter harvester they increase the capacity of the working and cutting and it can possible the maximum cutting within minimum time.
3) Easy to handle-Crop cutter machine is easy to handle and we can easily start the machine.
4) Unskilled worker can operate- No skilled person required for operating this machine.
5) Safety to use- during the working if any problem occurs in the machine we can easily find it.
6) Adjustable Cutting Mechanism- The Cutting mechanism of this machine is adjustable. We can remove this mechanism very easily so it can be change, repair and replace with other mechanism also.

D. Disadvantages

1) It can't cut Heavy weight crops.
2) Water is harmful for this.
3) Exhaust gases of engine is Harmful for environment.

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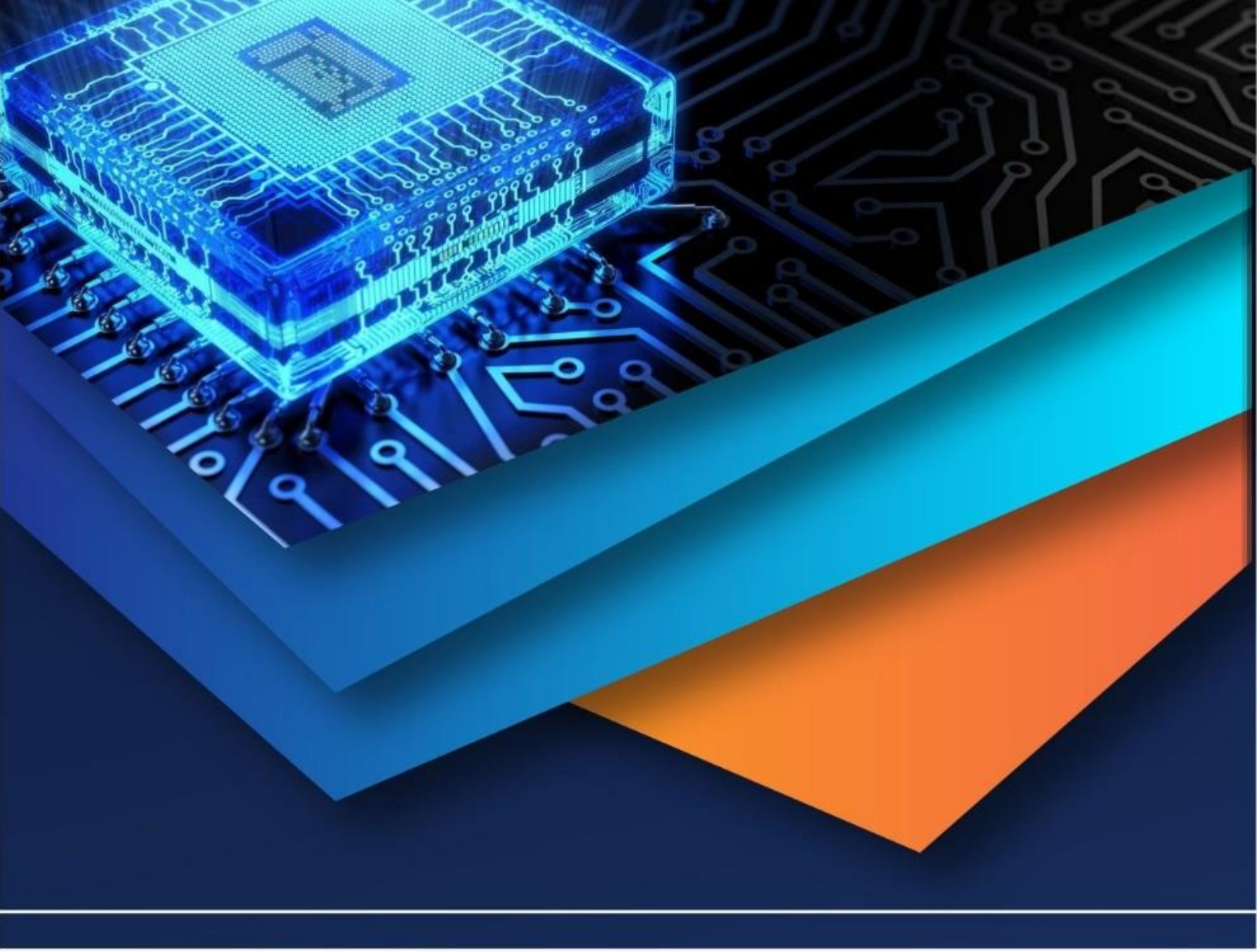
VIII. CONCLUSION

The purpose of the project is to fabricate a machine to carry out the operation like cutting and gathering which should be helpful for the farmers have less and marginal land by the observation of the results and discussion. We met the agricultural officer and take details from them. The variation between manual method, harvesting method and crop reaper method are described below: The labours required for the crop reaper method is less than manual method and equal to the harvesting method. Further, the harvesting method cannot suitable for the small scale farmers as it is economically not feasible. The time duration required for the crop reaper method is less than the manual method and more than the harvesting method. The cost required for the cutting the crop of one acre land is also less by using the crop reaper method The crop cutting machine to develop is just concept. It innovative three stage crop cutting machine ling the like as cutting the crop, Reaping, and winnowing. In this paper to design and analysis different cutting equipment like as roller crop cutting and cutting blade. The machine can be run on petrol engine. The machine operated by single labour. The machine will eliminate the labour problem in peak session for crop cutting period. This machine is helpful for the both the small as well as big farm. Based on literature review, We have concluded that many have worked on comparison and performance evaluation of reaper machine on favour of manual harvesting, semi operated and automatic operated.

1) Labour requirement is reduced.
2) Time consumed is less.
3) Crop cutting cost is reduce.
4) Useful for small scale farmers.

REFERENCES

[1] Manjunatha, M.V.; Masthana, B.G.; Shashidhar, S.D. and Joshi, V.R. (2009). Field performance evaluation of vertical conveyor paddy reaper. Karnataka Journal of Agricultural Sciences. 22(1): 140-142.
[2] Jain, A.J.; Karne, S.; Ratod, S.L.; Thotad, V.N. and Kiran, P. (2013). Design and fabrication of small scale sugarcane harvesting machine. Int. Journal of Mechanical Engineering & Robotics Research. 2(3):204-210.
[3] Dange, A.R.; Sahu, B.; Nayak, R.K. and Salam, D. (2015). Mechanization of harvesting operation of rice and wheat in Uttar Bastar Kanker district of Chhattisgarh state. Journal of Agriculture, Forestry and Environmental Science. 1(2):58-59
[4] Gokul P. Paudela, Dilli Bahadur kca, Dil Bahadur Rahutb, Narayan P. Khanala, Scott E. Justicea,Andrew J. Mcdonaldc(2019) "Smallholder farmers' willingness to pay for scaleappropriate farm mechanization: Evidence from the mid-hills of Nepal" www.elsevier.com/locate/techsoc
[5] Tesfaye Olana Terefe, "Design and Development of Manually Operated Reaper Machine", IJARP, Volume 1 Issue 2, August 2017, pp. 15-21. [7] V. B. Bhandari, Machine Design Data Book, Second Edition, mcgraw Hill Eduction, India, 2000.
[6] https://en.wikipedia.org/wiki/Quick_return mechanism
[7] https://en.wikipedia.org/wiki/scotch yoke mechanism
[8] https://en.wikipedia.org/wiki/Gear



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