

DESIGN AND ANALYSIS OF CROP CUTTER

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Abstract: This title presents the concept for design and analysis of crop cutter. The crop cutting is important stage in agriculture field. Currently in India farmer used conventional method for the crop cutting i.e. the conventional method for crop cutting is as manually cutting using labour but this method is lengthy and time consuming. This project aim is to design and analysis of small field crop cutter machine for small height crop. To analysis cutting roller and horizontal cutting blade by using Pro-e and anises software. The machine consists of petrol engine to operate cutting roller and blade. When compare to manual crop cutting by and this machine has a capacity to cut the crop in faster. This machine to helpful for both the small as well as big farm.

Keyword: Manual method, Mechanized method, Peak working, Crop cutting.

1. INTRODUCTION

Agriculture is the backbone of India. In India agriculture has facing serious challenges like scarcity of agricultural labour, in peak 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 farmer 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 cutter machine which is help to the Indian farmer which is in ruler side and small farm. It will reduce the cost of crop cutting in

field. It will help to increase economical standard in Indian farmer. The design of the crop cutting machine will be presented by using KERO drawing software. The force analysis on the cutter blade. The force analysis on the roller cutter blade by using ANSYS 14.0 software. This rendered the cutter safe from the cutting forces

2. PROPOSED SYSTEM

2.1 Field Survey

Present method of Crop cutting is important stage in agriculture field. Currently Indian farmer used conventional method.

- Manual methods of crop cutter.
- Crop cutting by using mechanized.

2.2 Manual method of crop cutting

To the cutting and threshing machine for seed separation this method the crop are remove as mentioned in the traditional method. These method crops are tied together to form a bundle. These bundles are garnered and taken to threshing machine. This machine separates the seed from the crops.



Manual method (conventional method)

2.3 Combine crop cutting machine

The combination of crop cutting machine is to combine the three operations like as cutting, reaping and winnowing into single process. It is combination of crop cutting machine most of the economically labour saving.

3. METHODOLOGY

Methodology is the systematic, Theoretical analysis of the methods applied to a study or to the theoretical analysis of the method and principles associated with branch of study.

1. Studying the present mechanisms.
2. Field Survey
3. To identifying the potential problem.
4. Problem definition.
5. Literature review.
6. Design of crop cutter.
7. Calculation.
8. Analysis using FEM method.
9. Fabrication.

4. Studying the present mechanisms.

Background

A) Agricultural farm Machinery and Equipment:

Manual labour takes time and is not effective as they can work for 3 to 4 hours at a stretch. Even if the land holding is small, it takes two or three day completely harvests the soybean crop. Also the planting is not done with proper care. The machine focus the project is to make combination of harvesting and collecting machine for the small scale farmers in India who have land holding less than two acres, to harvest grain more efficiently.

The level of mechanization has been increasing steadily over the year of the joint efforts made by the Government and the private sector. As a result of different programs implemented by the Government of India over the years, the total farm power availability is estimated to have increased from 0.295kw/ha in 1971-72, 1.72kw/ha in 2010-11.(1)

B) Land holding.

Even though the a adoption of farm mechanization is increasing in India, it is mostly region specific. Farm mechanization has very low growth rate in regions such a hilly and sloppy land.The decreasing trend in operational land holding is also observation the growth of agricultural mechanization. High costs of machine and maintenance, non-availability of appropriate agricultural machines and equipment that cater and suit the requirement of small scale farms, non- availability and difficulty in getting bank credit and small land holding are some of the factors that hinder farm, mechanization and force farmers to follow the traditional ways of agricultural operation. The use of farm machinery is also dependent on infrastructure and services available in the rural areas. India continues to be fed by its marginal and small farmers. Their holding (those below two hectares) taken together account for 84.97% of total holdings in 2010-11 compared with 83.29% in 2005-06, the combined area under these myriad farmed plots is 44.31% of the country's total farmed area (it was 41. 14% in the 2005-2006) (1)

5. Literature review

- a. Various approaches have been proposed for improving mechanized type of crop cutter in agriculture field. Designing a reaper machine to harvest grains more efficiently. The research

work focusing on harvesting operation to the small land holder to cutting varieties of crop in less time and at low cost by considering the factor as power requirement, ease of operation , field condition , time of operation and climatologically condition. By the study Mr. P. B. Chavan, Mr. D. K. Patil, Mr. D. S. Dhondge (2)

- b. To increase the productivity and profit. How to cutting reduce the cost and how to solve the problem comes from workers. It is fabricated for cutting various crop varieties during the time cutting to the “FABRICATION AND PERFORMANCE TEST OF AN ULTRAPORTABLE CROP CUTTER by G Maruthi Prasad Yadav , GMD Javeed Basha (3)
- c. This fabrication model small scale sugarcane harvesting machine consists petrol engine and mechanisms are used in this machine to compare to manual harvesting by using this machine has capacity to cut sugarcane in faster rate and economical. This study done by the Adarsh J Jain, Srinivas Rarod, Vinay N Thotad and Kiran (4)
- d. In this research work was made to investigate the cutting energy and force required for the pigeon pea crops. The commercially available blade it has been attached to the lower end of the arm of pendulum type dynamic tester which cut the stalk at 90° to the stalk axis with knife velocity ranging between 2.28m/s to 7.23 m/s the diameter of stem at 42.6 % (wb) moisture content. The cutting force is directly proportional to cross sectional area “stem cutter was deign and developed by Atul R. Dange, S. K. Thakare, I Bhaskarao and Umarfarooq momin. (5)

6. Design of crop cutter.

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.

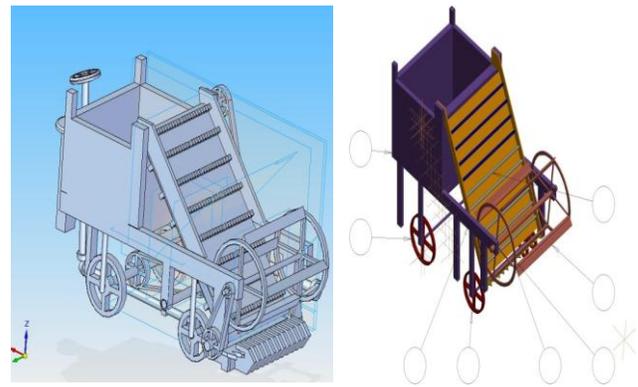


Table -1: Part list (for crop cutter)

INDEX	PART	QTY
1	CONVEYOR	1
2	CONVEYOR_BAR	10
3	CUTTER	1
4	CUTTING_BLADE (ROLLER)	4
5	CUTTING BLADE	16
6	FRONT WHEEL	2
7	MAIN FRAME	1
8	REAR WHEEL	2

These mechanisms to provide the power the cutter by using the belt drive to the roller cutter and cutting blade. The power transmitted engine to cutter shaft by using belt drive and pulley.

4) CALCULATION

Calculation for open belt drive and shaft of the rolling cutter

Table -2: Calculation for open belt drive

Sr.No.	Cutter equipment	Parameters	Value
1	Open belt drive	Power	P = 1.67 HP, 1245.31 Watt.
		velocity	V = 1.308 m/sec
		Coefficient of friction	$\mu = 0.3$
		Angle of lap	$\theta = 2.96$ rad, 170°
		Tension on the tight side of	$T_1 = 1478.07$ N

		the belt	
		Tension on the slack side of the belt	$T_2 = 526$ N
		Length, width, and thickness of the belt	L = 2.055M, b = 80mm, t = 10mm
		Bigger pulley diameter	$D_1 = 250$ mm
		Smaller pulley diameter	$D_2 = 100$ mm
2	shaft	Diameter of the shaft	d = 38mm
		Length of the shaft	L = 820
		Allowable shear stress	$\sigma_{yt} = 527$ N/mm
		Bending stress	$\sigma_{ut} = 540$ N/mm
		Factor of safety	2

5 RESULTS AND IMPLEMENTATION

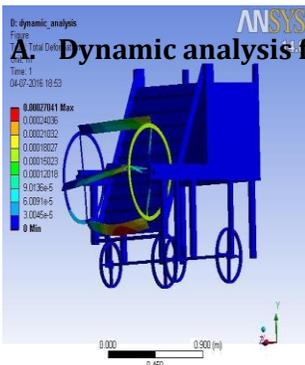
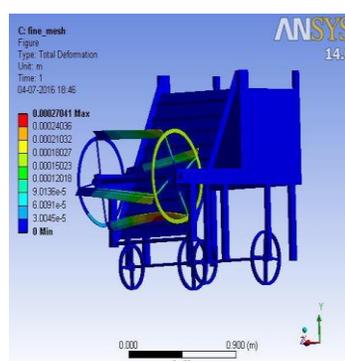
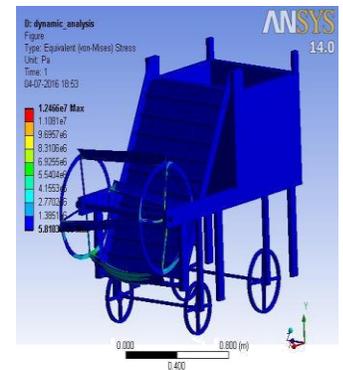
From the observation on rolling cutting blade and cutting blade, it is understood that all the problem with the material property and design.

At first the study of the cutters has to carried out. After feasibility study of blades. We have to design the existing and the proposed design using the modeling softer ware KERO. After the modeling process the analysis of the existing and modified design with varying material property will be made.The material property for these steel tabulated below.

Sr.N o.	Material name	Elastic modulus	Passion ratio	Density
1	Mild steel	2.10×10^5	0.3	7.89×10^{-9}

Table -3: Mechanical property of Mild steel.

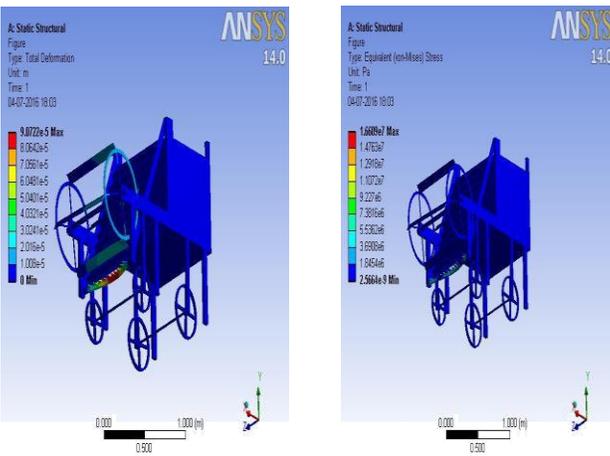
B. Static analysis for rolling cutting blade.



A Dynamic analysis for rolling cutting blade.

The static analysis and dynamic analysis on the rolling cutting blade is done. The force generated for the static analysis van misses tress is $1.2466e+007$ Pa and the deformation of the blade is $2.7041e-004$ m. In this way rolling cutting blade is safe

A. Dynamic analysis for cutting blade



6. CONCLUSION

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 labor. The machine will eliminate the labor problem in peak session for crop cutting period. This machine is helpful for the both the small as well as big farm.

The static analysis on the cutting blade is done. The van misses stress $1.6609e+007$ and deformation of the cutting blade is $9.0722e-005$ m. In the way cutting blade is safe.

7. REFERENCES

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