

# Design and Fabrication of Mini Sugarcane Harvesting Machine

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**Abstract** - sugarcane is one of the important crop over world-wide that depends on it in many things (sugar, Bio-gas, ethanol etc.). The harvesting of sugar can is fatigue work and main problem is shortage of labors. And also this modern world required modern technics in agricultural problems. So we have design and fabricated a machine which helps to cut sugarcane without fatigue and with less labor which ultimately reduce cost, saves time. This machine is user friendly any one can handle in any working conditions. We design the machine in such way that no skilled operator is required.

## I. INTRODUCTION

Sugarcane is a major crop in any countries. Sugarcane is most source of sugar in India and holds a conspicuous position as a cash edit. Sugarcane gives crude fabric for the moment biggest agro-based industry after textile.

Our project mainly focused on the key problem “the hectic work done by farmers to cut sugarcane”. This machine helps farmers to cutting sugarcane faster than time assume by manual cutting. The principle of operation is really simple we use an engine (Moped button start engine) fixed on frame the output shaft of engine is connected to chain sprocket wheel and is attached to the differential. Differential is further connected to cutter and to cut the sugarcanes the farmer is responsible to feed rate. The main task we face while working on project is the selection of cutter and as per every block height where sugarcane exist. The reason of this outlined machine is to at least cut sugarcane in least time and diminish difficult work of labors. As today's time there is need of accessibility of labors moreover exorbitant. Harvesting sugarcane cutting is truly torment full work.

## II. LITERATURE REVIEW

1] Mr.rohit j. Masute, Dr. sharad S. Chaudhari and Prof. S.S.Khedkar. –

This project aims to design and fabricate small scale sugarcane harvesting machine for sugarcane harvesting to again duce farmer's effort and to increase production of agricultural products. Machine consists of petrol engine and different mechanisms are used in this machine. When compare to manual harvesting by using this machine has a capacity to cut canes in faster rate and it is economical. The machine is helpful for both whom having small and big farms. The minute scale sugarcane harvesting machine is designed and fabricated. After testing diminutive scale sugarcane harvester in the field it is found that steams can be cut at ground level. The cost of the machine is about Rupees 28,000 and if the farmer buys this machine, farmer can instaurate the invested money back by harvesting two and half acre. By utilizing this machine quandary of the labor crises can be minimized.

2] S. Shankar, C. Maheswari, R. Gowtham, P. Kiruba, K. Mohansrinivas –

This work aims to design and fabricate a minuscule scale portable sugarcane cutting machine for harvesting sugarcane's to truncate farmer's effort and to increment the engenderment of agricultural goods. Compared to manual harvesting, this machine has a capacity to cut canes in more expeditious rate and in economical way. This work avails in laying design substructure for any aspiring utilizer to fabricate a machine for application in their farms. Agricultural harvesting requires maximum man power, ample money and withal more time- consuming process.

3] Mohammad Zeeshan Ali, K. I. Ahmad –

The labors are experience sustained injuries due to profound accentuate on the joints and muscles of the body. And withal modern world need more

expeditious rate of engenderment of agriculture products. With prosperous completion of this project, the company Cane-can industry will be directly benefited, Design and fabrication of sugarcane cutting machine will abbreviate labor time of manually cutting the sugarcane, ascertain safety of workers working on sugarcane cutting, minimize the cost of labor involved in the cutting operation and it can cut multiple sugarcane stick in one operation.

4] Adarsh J Jain, Shashank Karne, Srinivas Ratod L, Vinay N Thotad and Kiran –

Day by day labor wages are incrementing and in the same way authoritative ordinance of agriculture products are additionally incrementing and today's world need more expeditious rate of obligation of agriculture products. By utilizing this machine quandary of the labor crises can be abbreviated. Comparing with manual harvesting only 18% of labors are required. It makes the process more rapid hence truncates most of the harvesting time and labor required to operate the machine is withal less. So, it abbreviates the labor cost. The machine is utilized by maximum number of farmers definitely farmer can surmount the labor crises quandary. This abbreviates the labor cost and process become more expeditious and facile. The productivity is additionally incremented.

5] Vahid Jamadar , Arbaz Sawar , Hemant Pol, Niraj Deshpande , Sandip Sawant , Vishnu Patil

This research paper assist to design and fabricate minuscule scale sugarcane cutting machine for sugarcane harvesting to truncate farmer's effort and to increment exhibition of agricultural goods. Compared to manual harvesting this machine has a capacity to cut canes in more rapid rate. It is economical. This design entitle to have a capacity to cut approximately half acres of sugarcane cultivated land/hr. Comparing with manual harvesting a half of harvesting time and desideratum of labors are abbreviated. The cost of harvesting is minimized by many folds when compare to manual harvesting.

### III.PROBLEM IDENTIFICATION



Fig.1: Chopper sugarcane harvesting machine

This chopper sugarcane harvesting machine is too big in size, has less requirement of labors as compare to conventional method. This machine can able to harvest a long land (means non stepped farm) within one stroke. So this machine is not suitable for cultivator how hold small lands or farms.



Fig.2: Conventional Method

As per current scenario there is shortage of labor for sugarcane cutting. The labors are experience sustained injuries due to intense stress on the joints and muscles of the body. There is less availability of machinery for small scale farms holder farmers. The existing machines are big and costly.

After we discussed the problem and planned to work on specific problem that farmers are facing problem to cut sugar cane due to shortage of labors. For this above problem we come up with a mechanism called "Mini sugar cane Harvesting Machine". This machine helps

farmer to cut the sugarcane with less time and with less labor requirement.

#### IV.WORKING

We have run the machine using very basic principles, during which we have used many core mechanical components like IC engine, Chain wheel drive, bevel gear mechanism, etc. these components are very basic and any semiskilled or unskilled person can handle this machine.



Fig.2: Engine Mounting on Chassis

As we discussed, for the better control of cutter speed we used Aactiva Engine which is 108CC. As we've already mentioned, unlike traditional automatic transmission systems, the CVT doesn't involve gears in order to work. Instead, it includes two pulley of variable dimensions that are connected through either a belt or a chain. One of the end is linked to the engine, while the other is connected to the wheels.

The belt works by taking power from the engine and delivering it to the wheel in order to set them in motion. Moreover, the pulleys are mobile, which means that they can move according to the motion they need to ensure. As they come closer to one another, the belt rides higher, thus making the diameters of the pulleys larger, and the other way around.

As engine starts it is having the power of 7HP @ 7000rpm and having torque of 8Nm. @5500rpm. The output shaft of the engine is connected with 1 inch shaft which is further linked with small chain sprocket. We have used the set of chain wheel sprocket which is used in 'Honda Shine'. The small and large sprocket wheel is connected with chain. We supposed to reduce our speed therefore we have first connect small sprocket to engine and then transmitted the power to large sprocket.

We have joint 1 inch shaft with large sprocket whose another end is fitted in one bevel gear. By considering our design we required one bevel gear assembly which transmits the power in 90°. It also transmits minimum vibrations.

This engine power is further transmitted to cutter which is designed in such a way that it will have capability to easily cut the sugarcane.

#### MECHANICAL DESIGN

Engine Specifications –

Vehicle name = ACTIVA 2009

Engine CC

(Displacement) = 102 CC

Maximum = 7 HP @7000rpm

Max Torque = 8Nm. @5500 rpm

Number of cylinders = 1

Number of gears = Automatic

Fuel tank capacity= 6 litres

Mileage = 40-50 kmpl (approx)

Electric start = Yes

All dimensions are in mm.

Small sprocket

Number of teethes = 14

Diameter = 60mm

Bore diameter = 14mm

Larger sprocket

Number of teethes = 43

Diameter = 188mm

Bore diameter = 10mm

Let,

Assume that the RPM coming from engine is 5500rpm.

Preferring given equation to find torque and rpm at cutter.

$$N1 * T1 = N2 * T2$$

Driving sprocket

RPM (N1) = 5500 RPM

Teethes (T1) = 14

Driven sprocket

RPM (N2) = ?

Teethes (T2) = 43

$$N1 * T1 = N2 * T2$$

$$\frac{N1 * T1}{T2} = N2$$

$$\frac{5500 * 14}{43} = N2$$

$$\frac{77000 * 69}{43} = N2$$

$$N2 = 1790.69rpm$$

When 5500 rpm is given at small wheel sprocket then the large wheel sprocket Will transfer the 1790.69rpm.

Torque available at 5500rpm is 8Nm..... (Engine specifications)

$$N1 = 5500rpm$$

$$N2 = 1790.69rpm$$

$$T1 = 8Nm.$$

$$T2 = ?$$

Here,

N = Speed

T = Torque

Let,

Torque available at large sprocket be (T) is x.

$$\therefore \frac{5500}{8} \times \frac{1790.69}{x}$$

$$x = \frac{5500 * 8}{1790.69}$$

$$x = \frac{44000}{1790.69}$$

$$x = 24.58Nm.$$

The Torque available at 1790.69rpm is 24.58Nm.

We have calculated the values of torque with certain values

Power: 7HP

Rpm : 7000

Then the torque will be 7.12 Nm.

Power: 7HP

Rpm : 5500

Then the torque will be 9.06 Nm.

Power : 7HP

Rpm : 1790.69

Then the torque will be 27.85Nm

After this,

The power is transmitted through large chain wheel sprocket to bevel gear with the ratio of 1:1 after this power is transferred to cutter.

∴ rpm available at cutter is 1790.69.

∴ torque available at cutter is 27.78 Nm.

### V.RESULT TABLE

Name	Conventional method	Chopper sugarcane harvesting machine	Mini sugarcane harvesting machine
1) Initial cost of machine and labors.	Approximately 5,000 among 10 labors	Machine purchasing cost 12,00,000	Machine purchasing cost 17,750
2) Time required for cutting sugar cane 1 Acre	Minimum 2 days & 10 Labor required.	4hr.required to harvest and 1 operator	1 day required to harvest, 1 operator and 2 labors required.
3) Number of labors required in each method.	Approximately 10 labors	1 operator is sufficient	3 labors at most.
4) Skilled worker required as per method.	Skilled or semi-skilled can be best suitable to harvest cans.	Skilled operator required.	Skilled operator is not required
5) Operational cost to harvest 1 Acre.	Approximately 5,000 among 10 group of labors.	The charges for 1 Acre is 15,000	2,000 petrol is required to cover 1 Acre area.

Table shows that the difference between manual and Semi-automatic machine, which is more suitable for small scale, cost effective, less time consuming among above.

### VI.CONCLUSION

From the developed concept it can be concluded that developed system will help to prevent the pain and hectic work of labors. We have designed the machine in such way that single man can easily handle or move the machine and according to size of the lanes in sugarcane farm the machine will easily adjustable between two lines

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