

# Low Cost Sugarcane Cutting Machine

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**Abstract**— In this modern world, many technologies are available for agriculture but still farmers are struggling to harvest sugarcane for their cultivation. Farmers do not show interest in buying harvesting machine since the cost of the existing machine is high. Another important problem is the requirement of skilled labour for doing harvesting. This paper is aimed at the design of a low cost sugarcane harvesting machine which operates manually. Considering the above said problems, the machine works on the principle of transfer of rotational energy from one part of the machine to another part of the machine. This uses a belt-pulley system to transfer its rotational motion from one part to another. This machine can be operated at a much faster rate and cheaper price. This work serves as an attachment to the tractor of small size. Usually the power of this tractor is in the range of 18hp - 24hp. This product uses the tractor which is readily available with the farmer.

**Key words:** Tractor, Pulley, Shaft, Bearing, Blades, Welding

## I. INTRODUCTION

In India, after cotton textiles industry the sugar industry is the second largest agro-based processing industry and it contributes more in accelerating industrialization. To increase the production, it needs quality management at all levels of activities. Indian sugar industry is global leader provided it comes out of shortage and surplus of sugarcane, lower sugarcane yield and lower recovery. The existing method of sugarcane harvesting by farmers are usually done in hand or with hand equipments. This is labor intensive usually take lot of days and the labour cost is also high. Hence, Sugarcane workers face problems such as losing energy and develop excessive stress on the joints and muscles. This system also faces safety issues because of harmful pests from plantations. But now day's technology has simplified the work and farmers can harvest more than the earlier days. Modern farms and agricultural operations work differently because of advancements in technology, including sensors, devices, machines, and information technology. These advanced devices and technologies bring to attain more profitable, efficient, safer, and more environmentally friendly sugarcane harvesting system.

The design and fabrication of small scale sugarcane harvesting machine for harvesting operation is proposed in [1]. But it requires more petrol consumption and takes more time for harvesting.

For further information on sugarcane harvesters one can refer [2]-[7].

Improvement in technology came at a huge cost. Due to this every farmer could not switch to a modern and simplified agriculture. Though it was effective it was not efficient to the one who could afford it. Our aim is to reduce the time of harvesting and increase the profit, hence we have designed a low cost sugarcane cutting machine.

The low cost sugarcane cutting machine is cheaper than the existing machine used for harvesting the sugarcane. The machine designed is manufactured as an attachment to the tractors.

The following are the advantages of the low cost sugarcane harvesting system. the advantages are (i) Less time (ii) Cheap (iii) Simple in construction and portable (iv) Easy to handle (v) easy maintenance (vi) it can be used in low horse power tractor.

## II. PROPOSED SYSTEM

This low cost sugarcane cutting machine gets its input power from the tractor. The power from the tractor shaft (primary shaft) is transferred to the shaft of the machine (secondary shaft) by means of PTO (power take off) shaft. In this mechanism the shaft of the machine is fitted with the primary pulley. The cutting blades of the machine are connected to the secondary pulley by means of bearing to the machine. The primary pulleys and secondary pulley are connected by means of a belt. As the primary shaft is rotated the cutting blade gets rotated. These rotating cutting blades are used for cutting the sugarcane in the field. This low cost sugarcane cutting machine gets its input energy from the tractor. Importance of this project lies in the very fact that it is cheaper and can be affordable by all.

### A. Block Diagram

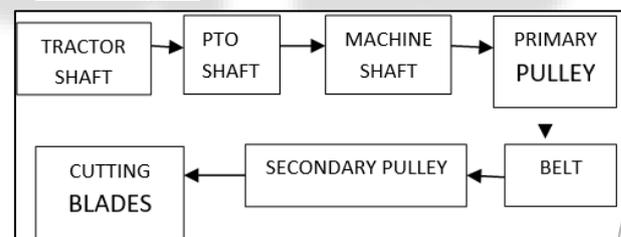


Fig. 1:

In this project there are three types of sections. Each has their own unique feature of work to do. The sections are as follows:

- 1) Outer frame section
- 2) Primary shaft section
- 3) Secondary shaft section

The outer frame is the important and main system in the project. This section is the one which supports all the other components of the project. This is to be designed in way that it can withstand the weight of all the components and also the load which will be exerted on the machine during the time of operation. This section will have the surface to house all the components.

The primary pulley section is the section where the power from the tractor is entering the machine. This pulley is attached to the frame of the machine by means of bearing which are housed inside the holder. Totally two number of bearing are used in this section. One bearing is fixed in front of the pulley and another at back side of the pulley. Thus these

bearing allow the smooth movement of the primary pulley. This section also has the PTO shaft. This shaft is used to transfer the power from the tractor to the machine. This forms a link between the shaft of the tractor and shaft of the machine. This has a hollow space which is used to house the shaft at both the sides. This shaft has a groove to correctly fit in the shaft and also pin which is used to lock the hollow space with the shaft of machine as well as the shaft of the tractor. This restricts the further movement of the PTO shaft.

The secondary pulley section is the section where the pulley and the blades are connected. Totally two number of bearing are used in this section. One bearing is fixed at top of the pulley and another at bottom of the pulley. Thus these bearing allow the smooth movement of the secondary pulley.

This pulley is connected to the blades. So as the pulley rotates the blades also rotate and thus these rotating blades are used for cutting the sugarcane in the field.

The CAD diagram of the sugarcane cutting machine is shown in fig (a)

### B. Dimension of the Machine

The dimensional details of the outer frame is given,

- Length : 120 cm
- Width : 40 cm
- Height : 55 cm
- Material used : Cast iron

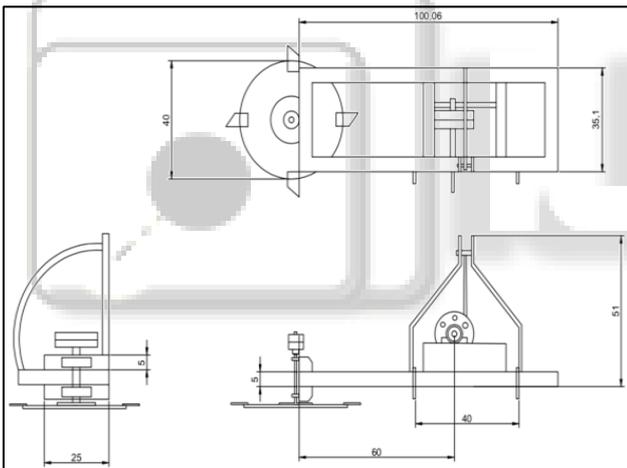


Fig. 2:

### III. PERFORMANCE OF SUGARCANE CUTTING MACHINE

- 1) Base frame
- 2) Machine shaft
- 3) Primary pulley
- 4) Secondary pulley
- 5) Bearings
- 6) Cutting blades
- 7) Support arms

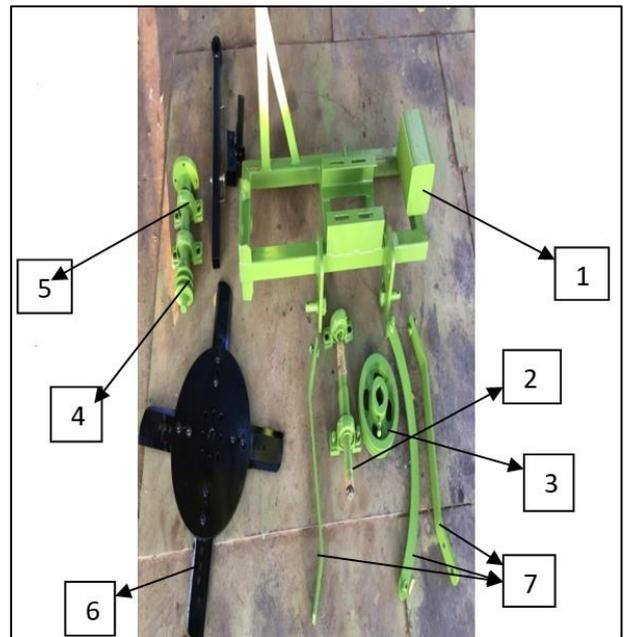


Fig 2(b): Machine Layout



Fig. 2(c): Low Cost Sugarcane Cutting Machine

At the end of the design, construction and testing, a satisfactory low cost sugarcane cutting machine having ideal mechanical advantage and a power output was fabricated using available raw materials and techniques and it is shown in fig (c). Sugarcanes were cut successfully in the field using this machine which was attached to the tractor. This machine is first kind to be developed with low product cost and implemented in the field. This machine is suitable for big or small farms.

### IV. CONCLUSION

Thus a low cost sugarcane cutting machine is designed using sugarcane unit as a small unit being attached to tractors. This machine is used for cut the sugarcane in different fields using the designed blades. It saves time and does not require more investment. This machine is suitable for big or small farms. Thus a simple design low cost sugarcane cutting machine is fabricated. This machine does not require human labour. Thus it reduces the dependency on human labour for

sugarcane harvesting. This simple design of the machine enables every person to operate it thus reducing the requirement of highly skilful operator as required for the existing machine. Thus efficiently reducing the labour cost for harvesting.

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