

Sugarcane Bud Chipper with Multi Cutter using Slider Crank Mechanism

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Abstract

This project helps to design and fabricate small scale sugarcane cutting machine for sugarcane harvesting to reduce farmer's effort and to increase production of agricultural goods. Compared to manual harvesting this machine has a capacity to cut canes in faster rate. It is economical. This project helps in laying design foundation for any aspiring user to fabricate a machine for application in their farms. It helps improve economic growth of the nation. Moreover, we use wood roller.

Keywords: Cutting Blades, Guiding Studs, Sugarcane Bud Cutting Machine, Sugarcane

I. INTRODUCTION

Agriculture is the only means of living for almost two thirds of the workers in India. The agriculture sector of India has occupied 43% of India's geographical area, and is contributing 16.1% of India's GDP. Agriculture still contributes significantly to India's GDP despite decline of its share in India's GDP. There are number of crops grown by farmers. These include different food crops, commercial crops, oil seeds etc. Sugarcane is one of the important commercial crops grown in India.

In India agriculture is facing serious challenges like scarcity of agricultural labor, not only in peak working seasons but also in normal time. This is mainly for increased nonfarm job opportunities having higher wage, migration of labor force to cities and low status of agricultural labors in the society

Approximately 80% of the world's sugar is produced from sugarcane in tropical and subtropical climates, with the remaining 20% derived from sugar beet, which is grown mostly in the temperate zones of the northern hemisphere. 70 countries produce sugar from sugarcane, 40 from sugar beet and 10 from both.

In agricultural harvesting we require maximum man power, ample money and also it is more time consuming process. In cutting process we face various problems and these are not easily solved. The design of this machine is very simple also easy to implement. In this manner we are designing the Sugarcane Cutting Machine to reduce effort and time. In sugar cane farms we are using this machine for cutting purpose. This is user friendly cutting machine; anyone can handle this machine in any working condition. Skilled persons aren't required for operating this machine.

A. Justification

In manual harvesting to cut one acre of sugarcane 15-16 labors are required they take 3 days to cut one acre. By using this machine problem of the labor crises can be reduced. Comparing with manual harvesting only 18% of labors are required, it makes the process faster hence reduces most of the harvesting time and labor required to operate the machine is also less. This machine is helpful for both small and big farmers. (Ratod et al. 2013)

To overcome these problems this project work aims to develop low cost sugarcane harvesting machine which is more efficient and having simple mechanism for cutting the sugarcane at a faster rate. (Siddaling and Ravaikiran 2015)

The purpose of developing this machine is to reduce cost and time required for sugarcane harvesting. Sugarcane harvesting machine which is economical, more efficient and cuts the sugarcane at faster rate and it will be helpful for small scale farmers,

unskilled labors can also operate without difficulty. By using this harvesting machine, we can also solve the problem of labor shortage.

B. Physical Properties of Sugarcane Crops

Blackburn described the sugarcane as a tall tropical grass with a single un-branched stem of average height in the range of 3 to 4m with a stem diameter ranges from 3 to 5cm depending on the species.

Moore and Misstated that the sugarcane is a large tropical grass that produces multiple stems or culms each of which consist of a series of nodes separated by internodes. After germination, the terminal vegetative bud of each shoot lays down a series of nodes, each with a dormant bud and one or more rows of root primordial and a growth ring. The internodes consist of sucrose storing parenchyma cells and vascular tissue. The stalk of sugarcane is the major storage area for photosynthate (sucrose) within the sugarcane plant, rather than fruit or seed structures. Stalk is also known as "millable cane". The top of the stalk is relatively low in sucrose and therefore is of little value to the mill. The stalk consists of segments called joints. Each joint is made up of a node and an inter node. The node is the place where the leaf attaches to the stalk.

II. LITERATURE REVIEW

Kiatiwait et al. (1992) developed a selph-propelled walking type sugarcane harvester-windrower in Thailand. The machine is a one row single-axle walking-behind-type. It works on the principle of impact cutting by knife blades. As the machine moves forward along the row, the cluster of cane stalks is guided from the divider by a two sets of lugged chains and a spring loaded guide frame. At the narrowest point of guided path, the canes are cut by blades of the base cutter, revolving at peripheral speed approximately 42 m/s. A pair of solid rubber-gage tractor wheels mounted in the front part of the machine prevents the base cutter blade from striking the ground and control the height of cut. The machine type is 4GZ-9 whole stalk harvester, mounted on 11-14.7 kW hand tractor. Its productivity is 0.1-0.15 ha/h, and it is adapted to row spacing ≥ 1.0 m. shifting a lock-pin along the shaft to make adjustment for various spacing along the adjacent rows.

Viator and Wang (2321-3051) studies that the green harvesting method can also have negative effects on cane yield in certain environments because the trash layer can lower the soil temperature, which can slow down early plant growth and increase the risk of frost damage in young plants during freeze or near-freeze events summarizes the weaknesses of green cane harvesting practices. Sandhu et al. (4337-4343) showed that green cane harvesting method could reduce Lesser Cornstalk Borer damage to sugarcane because the trash blanket can inhibit the egg deposition and increase the larval mortality.

III. NEED FOR BUD CHIPPER

The need for sugar cane bud chipper is only for the farmers, where they are using an full size of sugarcanes in the field for the plantation purpose, while using this sugar cane bud chipper we can cut it down in to small pieces, compact in size it can also use for plantation from this we save the wastage of remaining portion of the sugar cane.



Fig. 3.1: Traditional Method



Fig. 3.2: Bud Chipping Method

IV. COMPONENTS USED

A. Single Phase Motor

Electric motor is an electrical machine that is used to convert electrical energy into mechanical energy, for smaller loads as in household applications. Although traditionally used in fixed-speed service, induction motors are increasingly being used with variable-frequency drives in variable-speed service.



Fig. 4.1: Single Phase Motor

Electric motor is an electrical machine that is used to convert electrical energy into mechanical energy, for smaller loads as in household applications. Although traditionally used in fixed-speed service, induction motors are increasingly being used with variable-frequency drives in variable-speed service.

B. Fly Wheel

Flywheel is used to reduce speed of shaft and to control the rotation motion. Most modern gearboxes are used to increase torque while reducing the speed of a prime mover output shaft. This means that the output shaft of a flywheel rotates at a slower rate than the input shaft, and this reduction in speed produces a mechanical advantage, increasing torque. Some of the simplest gearboxes merely change the physical rotational direction of power transmission. A flywheel designed using a worm and worm-wheel is considerably smaller than one made from plain spur gear, and has its drive axes at 90° to each other. With a single start worm, for each 360° turn of the worm, the worm-gear advances only one tooth of the gear.



Fig. 4.2: Flywheel

C. Reciprocating Chamber

It is the shaft or a chamber is connected with the flywheel through the connecting rod thus it was moving up and down to cut the sugar cane ,the blade attachment was fitted with the reciprocating chamber.Fig4.3

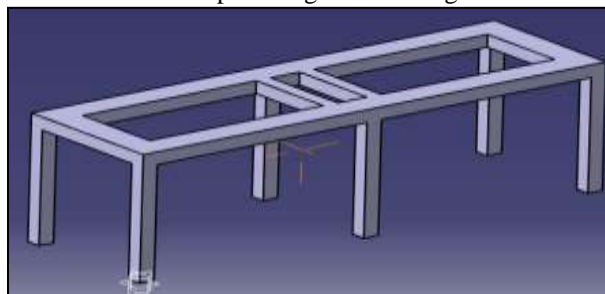


Fig. 4.3: U-Shaped Cutting Tool

This is the main section of the sugarcane bud cutting machine. The chipper is used to cut the sugarcane bud and to get the same size of sugarcane bud. Because of cutter the wastage of sugarcane reduces and safety of frame increases. It was made up of stainless steel and it was in curved shape for the compact cut. Fig4.4

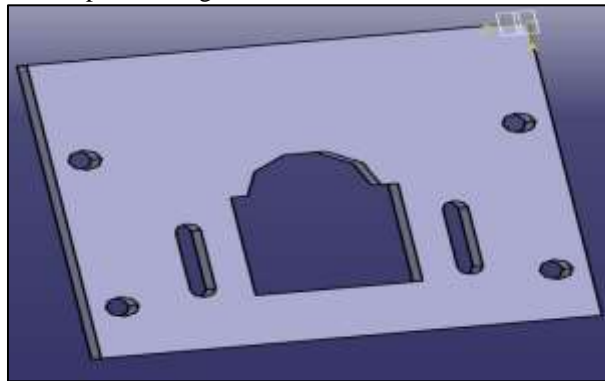


Fig. 4.4: compact cut

D. Connecting Rod

The connection rods are used to connect the fly wheel and the reciprocating arrangement, one end of the connecting rod or shaft connected to the flywheel another end was connected to the reciprocating chamber, when the flywheel rotates it act as a slider crank mechanism for the movement of upside down.

E. Supporting Frame

The whole arrangement was done on the supporting frame, it was made up of the rods by attaching them up into a table or a frame, and it is very easy to done a machining a process on that frame.

F. Supporting Plate

It is the thick plate made of steel, where it was mounted on the supporting frame as a flat surface area on that we pointed a blade setting and motor setting arrangement.

G. Wood Cutter

This is the cutter for the purpose of using this cutter for cutting the wood materials and agriculture wastages and other plant materials.

V. METHODOLOGY

A. Working Principle

When this electric motor is run by current if the power will be transmitted into the flywheel by the way of conveyor belt. The flywheels are used to reduce the motor speed. in that flywheel is connected to the crank by using actuating rod, the crank will be rotated and the connecting rod is move up & down in that way we cutting buds from the cane by using u-shaped cutting blade. Also we using the wood roller for cutting agriculture materials.



Fig. 5.1:



Fig. 5.3:



Fig. 5.4:

Figure-germinated eye buds (4-5) days after seeding transplantation and single bud cane

- 1) Change Manual Method in to Automatic –By using appropriate capacity of single phase 1) motor, gearbox which will reduce wastage and increase productivity as it will reduce strain on hands of worker and more emphasis on safety of operator.
- 2) New cutting technology- The research work in this domain was studied and new methods were developed to achieve desired goal.
- 3) Single phase operation-The power supplied to machine is single phase so to make it easy to operate at any location.
- 4) Safety-Highest priority is given to safety of the operator.

VI. DESIGN SKETCH

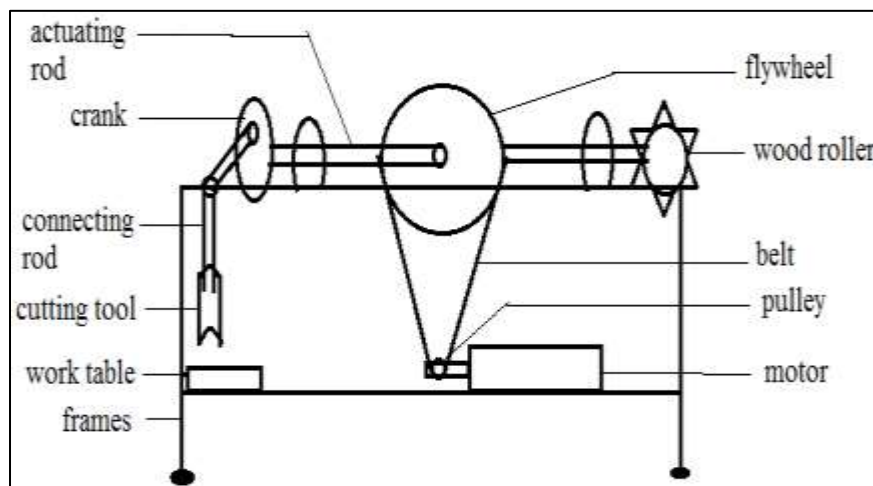


Fig. 5.5: Block diagram of bud chipping machine

VII. ADVANTAGES & LIMITATION

- Simple in construction.
- Initial cost is low.
- Less man power.
- Easy to maintain.
- Save large amount of sugarcane bud from waste by plant in form.
- We get more sugarcane compare than normal sugarcane plant method.
- Easy to operate.
- Saved sugarcane are used to white sugar production and juice.

VIII. CONCLUSION

The sugarcane machine is very useful to small scale farmer to planting sugarcane bud .and also time is saved by this process as compared to the traditional system of sugarcane bud plant. Extra sugarcane waste in small form that can be saved by using sugar cane bud cutting machine that can be used as a white sugar production and juice. Also the wood cutter is very useful for the farmers and it reduces the human

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