

Design and Fabrication of Sugarcane Harvester

¹Prof. Jagdale Shahaji R., ²Mr. Phad Sourabh D., ³Mr. Pawar Lokesh S., ⁴Mr. Salgude Mahesh S.

¹Assistant Professor, ^{2,3,4}Student, Dr. D.Y Patil Institute of Technology, Pimpri Pune & India,

¹shahaji1807@gmail.com, ²sourabhphad5@gmail.com, ³lokeshpawar02@gmail.com,

⁴maheshsalgude36@gmail.com

Abstract In today's dynamic environment, agricultural goods must be produced at a higher pace. Agriculture is India's bedrock. Almost all farmers in India are experiencing labor shortages. Day by day, labor wages rise, and demand for agricultural goods rises in tandem, necessitating a higher pace of agriculture commodity production in today's world. The aim of this project is to develop and build a small-scale sugarcane harvesting machine to minimize farmer effort and increase agricultural production processes. This machine is powered by a petrol engine and employs a variety of structures. When compared to manual cutting, this system has the ability to cut canes at a higher pace and is more cost effective. The unit is beneficial to both small and large farms.

Keywords —Sugarcane, Harvester, Agriculture, Farming, Farmer, Cutting.

I. INTRODUCTION

Agriculture in India is facing significant problems, such as a lack of agricultural labor, not just during peak working seasons but also during the year. This is mostly due to expanded nonfarm work openings with better pay, labor force relocation to cities, and the poor social status of agricultural laborers. Sugarcane is the world's most important crop. According to the Food and Agriculture Organization (FAO), it was grown on over 23.8 million hectares in over 90 countries in 2010, with a global crop of 1.69 billion tonnes. India is the world's largest sugarcane producer, with Brazil coming in second. Harvesting is the method of removing mature crops from the field and chopping and gathering them. A harvester is a computer that harvests crops. There are many varieties of harvesting machines on the market, including paddy harvesters, tea harvesters, potato harvesters, wheat harvesters, and sugarcane harvesters. All of these machines, with the exception of the sugarcane harvester, are available on a small scale. Sugarcane cultivation is the harvesting and processing of sugarcane using farm equipment. Sugar cane is a hardy crop grown in tropical and sub-tropical areas for its sucrose content as well as by-products like molasses and bagasse. The plant grows in clumps of cylindrical stalks ranging in diameter from 1.25 to 7.25 cm and reaching a height of 6 to 7 metres. The cane stalks rise straight up until they are too strong to support themselves. It then lies down on its side and grows upward. As a consequence, a mature cane field forms a mesh pattern on top of itself.

Sugar cane stalks produce a sap that is used to make sugar. Sugar cane is cultivated in the Caribbean, Central and South America, India, the Pacific Islands, Australia, Central and South Africa, Mauritius, and the southern United States,

among other places. Cane develops quickly under the right conditions and with the right pesticides and fertilizers. The cane should be harvested as soon as it completes its final growth cycle to ensure a maximum sugar content of 1 to 17 percent of total weight. Agriculture machinery is being more widely used around the world. India only contributes 10% to the use of agricultural machinery.

Manual harvesting is done with hand scissors, cutting blades, or hand axes. It necessitates skilled labor because improper cane harvesting results in loss of cane and sugar production, low juice content, and milling issues due to foreign matter. The aim of this project is to cut sugarcane at ground level. Since labor is unable to efficiently cut sugarcane at ground level. They cut sugarcane 6" above the ground floor to prevent the knife colliding with the dirt. As a result, after sugarcane harvesting/cutting, it was necessary to cut any residual sugarcane stem. It necessitates additional effort. Since it affects the next crop generation, it is important to cut the remaining sugarcane stem.

A. Problem on hand

Many of the casualties are caused by machetes in places where hand harvesting is common. These injuries can range from small wounds to body part amputation. In addition, the machete is the most often used weapon on the farm for the less experienced workers. Maintaining the sharpness of the machete helps to reduce injury so the worker does not have to swing too vigorously and has more control of the machete. Working with a cane will also result in cuts and bruises to the eyes. Since cane is grown in tropical and subtropical climates, workers must be vigilant with heat-related illnesses, so we created a scheme to assist growers.

B. Motivation

According to a poll, the majority of sugarcane spending is spent on planting rather than harvesting. We discovered that there is no such equipment that can boost the cultivation process by visiting some of the villages in our district. The most popular issues found were skilled labor for sugar cane production, a lack of advanced technology, and high labor costs. We were inspired to create an agricultural machinery that could provide complete atomization of the sugarcane cultivation method as a result of the farmers' suggestion.

II. LITERATURE REVIEW

Sugar cane production costs are far higher than other crops due to the strong demands for labor, irrigation, fertilisers, and pesticides, as well as the inevitability of time found. The costs associated with each stage of the crop's growth, from ploughing to harvest, are set. Harvesting and transportation costs are complex in nature. Although the variable cost is proportional to the yield, the fixed cost is constant regardless of yield. This means that farmers must pay a mandatory minimum of Rs. 15,000 to 20,000 per acre, regardless of yields. This is a unique challenge faced by sugarcane farmers as opposed to other crops, which have a lower fixed cost than sugarcane. The majority of sugarcane's fixed costs are for soil loosening, seeding, and levelling. Grover, D.K., and Grover, D.K. [1]

During the years 1960-61 to 1989-90, the author investigated the problems of the sugar industry in India, with a focus on four sugar mills and 72 sugarcane growers. The study's key goals were to look at cane producers, demand and market shifts, and the different price and non-price variables that caused price fluctuations. The study's results revealed that the main sugar-growing states had identical growth patterns; compound growth rates displayed an upward trend; and the coefficient of variation revealed that all variables were subject to large variations.[2]

According to the case report, sugarcane is one of Uttar Pradesh's most valuable crops, but cereals account for the majority of the state's land. Farmers here follow a conventional farming scheme that does not produce enough money for them to live comfortably. There is a need to increase sugarcane field, yield, and productivity, as well as improve low-cost technologies to reduce cultivation costs.[3]

Sugarcane yield is influenced by sett spacing, according to the findings of the analysis. As a result, instead of the traditional ear-to-ear 5 cm overlapping intra-row sett spacing that is commonly used, it is proposed that all three varieties use a 10 cm intra-row spacing between setts. This is because the 10-cm distance between sets guarantees cost-effective planting. As a result of this perspective, we can see that spacing is one of the affected aspects of yielding.[4]

The author describes a series of field trials conducted

between 1997 and 2001 in order to determine the efficiency of later model machines and create optimal modes of performance. The overall loss was calculated using material balance, and the extractor loss was calculated using the 'grey tarp' process. BSES (2001) presented data on 11 trials in this series. Each therapy had three or four replicates. Just two experiments had substantial material balance variations between treatment means at the 5% stage. The 'blue tarp' approach revealed substantial variations in extractor failure in six cases (at the 5% level).[5]

III. PROPOSED SYSTEM

The unit is used to cut sugarcane stems and multi-crop stems. The engine, which is essentially a diesel engine, is used to power the unit. Iesel is mixed with petrol. To start the motor, we must first turn on the gasoline valve, then pull the cord to start the engine. When the motor is starting, the shaft rotates, which causes the driver pulley to rotate. The driver pulley is attached to the driven pulley, which causes the driven pulley to rotate. The transmission shaft has a pulley fixed to it. Since the driven pulley rotates, the driver pulley rotates as well That engine propels the vehicle forward. One pulley is fixed to the transmitting shaft, which transmits power to the cutter. The ratio of the pulley is 2:1, resulting in speed difference on the cutter. The drive is converted at a 90-degree angle by the bevel gear. With the aid of the compressor on the handle, the cutter's speed can be changed. After removing the canes, the worker takes them and separates the leaves with a cutter.

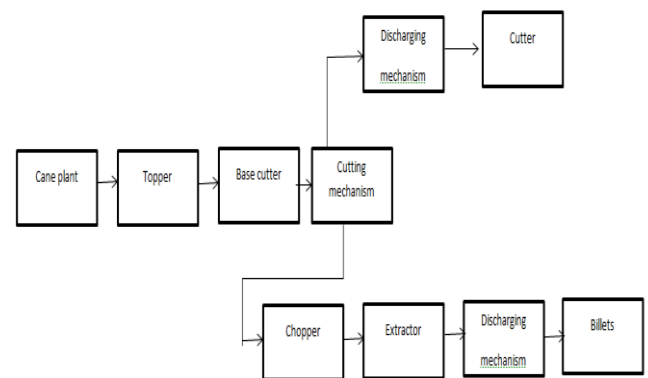


Figure no.1 Design of proposed system.

IV. ADVANTAGES

1. Increased yield due to successful processing, when it roots down to the crop's bottom level, 2" below the ground level.
2. Reduces the amount of money spending on stubble shaving.
3. Promotes ratoon rejuvenation when harvesting takes place far below ground level.
4. Increases the number of ratoons. (This is known as multiple ratooning.)

5. Harvesting operations are completed in one stretch, resulting in improved ratoon results.
6. Sugarcane garbage that is left in tiny fragments in the field decomposes quickly. It also serves as a field mulch, reducing the chance of early shoot borer while also saving crops during droughts.

V. APPLICATION

1. A sugarcane harvester is a big piece of farm equipment that is used to harvest sugarcane. The below are some of the harvester's advantages.
2. It removes the foundation of the stalks.
3. The leaves were sliced into strips by the harvester. The cane can then be split into pieces.
4. It cleans the mud and soil particles from the surface.
5. Water from the sugarcane harvester was expelled into the ground, where it serves as fertilizer.

VI. EXPECTED CONCLUSION

The dilemma of labor crises can be alleviated by using this machine. In comparison to manual harvesting, only three laborers are required. It speeds up the operation, reducing the amount of time spent harvesting and lowering the amount of labor needed to run the machine. Fabrication of the small-scale sugarcane harvesting machine. After testing a small scale sugarcane harvester in the field, it was discovered that the front wheels were stuck in mud, preventing the vehicle from moving. To ensure that the machine moves properly and smoothly, a 360 degree spinning wheel was installed at the front. The dilemma of labor crises can be alleviated by using this machine. In comparison to manual harvesting, only 18% of labor is needed. It speeds up the operation, reducing the amount of time spent harvesting and lowering the amount of labor needed to run the machine. As a result, labor costs are reduced. If the unit is used by a large number of farmers, the issue of labor shortages can be solved. As a result, labor costs are reduced, and the operation becomes quicker and easier. Productivity has also improved.

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