REVIEW PAPER ON DIFFERENT ASPECTS OF SUGARCANE HARVESTING METHODS FOR OPTIMUM PERFORMANCE

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Abstract

In today's competitive world there is a need for faster rate of production of agricultural products. Agriculture is the backbone of India. In India almost all farmers facing problems of labour shortage. Day by day labour wages are increasing and in the same way demand of agriculture products. In many countries, sugar cane harvesting is a very labour-intensive activity in which workers usually become fatigued after manually cutting the cane for a few hours. They need frequent pauses for rest, and they experience sustained injuries from excessive stress on the joints and muscles of the body. And also today's world need faster rate of production of agriculture products. This review paper is a small work towards analyzing sugarcane harvester machine aspects for economical harvesting which will help to minimize the working fatigue and to reduce labour cost.

Keywords: Harvesting, harvesting aspects, harvesting methods and machines.

1. Introduction

India is a country which is dependent on Farming as a main source of income for many families. Farmers are thus primly important for us. In India agriculture has facing serious challenges like scarcity of agricultural labour, not only 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. Sugarcane is the world's largest crop 2010 Food Agricultural Organization (FAO) estimates it was cultivated on about 23.8 million hectares in more than 90 countries, with a worldwide harvest of 1.69 billion tons. Brazil was the largest producer of sugarcane in the world and India in second position. In our state i.e. Maharashtra, crops like Rice, Wheat, Sugarcane grow in majority. Sugarcanes are important part of it. Nearly 35 to 45 % of field is under Sugarcane only. Thus it is mostly needed to be focused on it.

2. Challenges in Harvesting Practices

Harvesting is a process of cutting and gathering of mature crop from the field. Harvester is a machine used for harvesting. Different types of harvesting machines are available in the market namely paddy harvester, Tea harvester, Potato harvester, Wheat harvester and sugarcane harvester as mentioned above all are available in small scale except sugarcane harvesting machine. Hand knives, cutting blade or hand axes are used for manual harvesting. It requires skilled labours as improper harvest of cane leads to loss of cane and sugar yield, poor juice quality and problems in milling due to extraneous matter. Labours can't cut sugarcane properly at ground level. They cut sugarcane above the ground level with distance 6” to avoid the strike of the knife with soil but maximum sugar content is at bottom of cane. Labours need frequent pauses for rest, and they experience sustained injuries from excessive stress on the joints and muscles of the body. The cutting tool and motion involved directly influence the stresses created. A cutting tool that has not been designed by taking into consideration occupational biomechanics can lead to unnecessary strains in the body's muscle system, resulting in injuries.

3. Discussions

During the 1950s the sugar industries boomed and dramatic changes were taking place within Queensland. In 1954, bulk handling of raw sugar was introduced into Australia replacing bagged sugar and mechanical cane harvester gradually began to replace manual labour in fields. By late 1960s more than 80% of Australia sugar crops were mechanically harvested. In 1979, Australia achieved 100% conversion to mechanical cane harvesting (Queensland sugar Ltd) Mechanical cane harvesters were developed in a number of countries over the year of austoft in Australia was one of the 1st markets. Austoft is no longer an Australian company and its harvesters are now made in Brazil by case IH. While whole stick system still exist, a more typical harvester tops the crane stalk. Chops the stalks into 25-30 cm billets, separates the billets from the remaining leaves and other trash, and delivers them into a bin or in field transporter for delivery to a nearby rail line or mill.

Yadav et al. (2002) studied the performance evaluation of sugarcane chopper harvester mechanical harvesting. Most of the previous studies applied large-scale imported harvesters and the current price is very expensive. In addition, the large-scale imported harvesters are designed for large-scale farming areas, which require 1.50 m of the distance of each sugarcane row. Some of the small-scale Thai farming areas employed the sugarcane row distance of 1.2 m. Therefore, it is not possible for the large-scale harvester to drive through the row. Thus, the current review is aimed for solving these problems by designing and constructing a sugarcane harvester using small engine. This would be benefit for small-scale farmers in our country. From discussions with farmers and extension workers it became obvious that harvesting practices should improved not only for effective cutting of cane but should also affordable and easy to use.

4. Sugarcane Harvesting Methods

1. Manual method
2. Mechanized harvesting

(1) In manual harvesting method harvesting of sugarcane is done manually with the help of human labours. Hand harvesting accounts for more than half of production, and is dominant in the developing world. In hand harvesting, the field is first set on fire. The fire burns dry leaves, and kills any lurking venomous snakes, without harming the stalks and roots. Labours then cut the cane just above ground-level using cane knives or machetes. A skilled harvester can cut 500 kilograms (1,100 lb) of sugarcane per hour. But manually sugarcane harvesting is more labour intensive and as compare to machine harvesting the cutting speed is very slow. In Manual Harvesting to cut one acre of sugarcane 15-16 labours are required they take 3 days to cut one acre and involves harvesting of 60-70 tons per acre with labours being paid 500-550 Rupees per ton of harvest hence total cost of harvesting per acre comes up to 30,000-35,000 Rupees.

Steps to be taken in Cut and Withdrawn methods
(a) It will be detracted
(b) The base will be cut
(c) Topped
(d) Sticks will be placed in a row.

(2) Now days in many countries mechanical sugarcane harvester is used for sugarcane harvesting. It is fully automated. It requires very less time for cutting sugarcane around large area. Many foreign company involved sugarcane manufacturing like john deer, new Holland. In mechanization now by using large scale harvesting machine takes about 6-7 hours for harvesting one acre averaging about 60-70 tons with labour costing around 3,500-4,000 Rupees per hour hence the total cost of harvesting per acre comes up to 20,000-25,000 Rupees. Mechanical harvesting of sugar cane can be done in two ways:

(1) Using Whole stalk Harvester

The whole stalk harvester, also known as soldier harvester, method was one of the most popular means of sugar harvesting in Louisiana until 1992, when the the “chopper harvester” surpassed it in popularity. The method essentially involves cutting the entire cane right to its base, removing the top, and placing the canes into heap rows. The rows of canes are then burned to remove trash and leaves and a bell grab loader loads them into a trailer to be transported to the sugar mill. This method was not fully embraced as it included a number of disadvantages, including not being able to handle lodged canes and cane over 120 tons. This method did not work on slopes that inverted 10 percent or more. Cutters embraced the system because it was cheaper to put to work than the chopper system, it was easy to do, and less frequent losses were associated with it.

(2) Using Chopper Harvester

This method is similar to whole stalk harvesting in that the entire cane is cut, topped, and deposited into the machine, bottom-ended. The canes are cut into billets measuring 656 feet (200 m) in length by mesh rollers or rotor knives and then burnt. Dirt is removed from by an extraction mechanism. The billets travel up a conveyor, which sends them through a secondary extractor.

Present Harvesting Practices are given below:

Manual harvesting method is
- Time consuming
- Less profit
- Shortage of labour
- Labour fatigue

Mechanized harvesting is
- High initial cost
- High operating cost
- Area require for operation is more
- Skilled worker is require
- Applicable for only large areas

6. Present Scenario

![Fig. 1 Manual harvesting](image)
Fig 1 and 3 shows the sugarcane harvesting methods. Fig 2 shows the cutting tool used by labours in manual harvesting. Fig 4. shows the Manual harvesting is often exploitative and dangerous. In Brazil’s sugarcane and ethanol industries, from 2002-2005, 312 workers died on the job. Fig 5: These machetes are characterized by a blade long 30-50 cm and often by a hook on its back to pick up the cane for stacking or chopping it into short lengths. Sugar cane is harvested by chopping down the stems but leaving the roots so that it re-grows in time for the next crop. It is the primary tool used in countries that do not employ mechanical means for harvesting cane.

7. Conclusion

The main aim of this review paper is to have a proper understanding of different aspects of present harvesters as well as different harvesting practices to reduce the efforts which were put in by farmers in terms of money, labour, time, physical efforts for optimum performance. Above discussed parameters will definitely provide the basic ideas associated with sugarcane harvesting. Sincere efforts must be made to design a suitable harvester in order to provide more profit, stability in terms of economical considerations and machine to be design will help both whom having small or big farms and definitely farmer can overcome the labour crises problem.

References

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