

DESIGN AND FABRICATION OF SMALL SCALE SUGARCANE HARVESTING AND MULTI CROP CUTTING MACHINE

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Abstract- In today's world consisting of huge population due to this there is a need for large scale of production of agricultural products. Agriculture is the backbone of India. In India there is scarcity of labourers in agriculture, Day by day labor wages are increasing and in the same way demand of agriculture products are also increasing and today's world need large scale of production of agriculture products due to huge population. In today's world we required faster productivity in less time.

This project aims to design and fabricate small scale sugarcane harvesting machine for sugarcane Harvesting and also for cutting different types of crops like Wheat, Paddy, Millet etc. to reduce farmer's Effort and to increase production of agricultural products.

Machine consists of petrol engine and different mechanisms are used in this machine.

When compared to manual harvesting, this machine can cut the lower and upper portion of the sugar cane containing leaves, simultaneously by setting the optimum movement of the rotary blades. The advanced technology machines are very costlier and cannot be purchased by middle class farmers. The maintenance cost of these machines is very high and requires skilled labour to operate. Hence this project work overcomes these problems and aims to develop a small scale sugar cane harvesting machine. And this machine is easy to operate, low cost with more efficiency and having less maintenance. The machine is helpful for farmers and beneficial.

I INTRODUCTION

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. 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.

India is the largest producer of sugarcane in the world and Brazil in second position. Harvesting is a process of cutting and gathering of mature crop from the field. Harvester is a machine is 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. Sugarcane harvesting is an agricultural machinery use to harvest and process sugarcane.

Sugar cane is a hardy crop that is cultivated in tropical and sub-tropical regions for its sucrose content and by-products such as molasses and bagasse (the waste fibrous residue). The plant grows in clumps of cylindrical stalks measuring from 1.25 to 7.25 cm in diameter and reaching 6 to 7 m in height. The cane stalks grow straight upward until the stalk becomes too heavy to hold itself up. It then lies on its side and continues to grow upward. This results in a mature

cane field lying on top of itself in a mesh pattern. The sugar cane stalks contain a sap from which sugar is processed. Sugar cane is grown throughout the Caribbean, Central and South America, India, the Pacific Islands, Australia, Central and South Africa, Mauritius and the southern United States.

II LITERATURE REVIEW

1. Mr. Rohit J.Masute “DESIGN AND FABRICATION OF SMALL SCALE SUGARCANE HARVESTER”

This project aims to design and fabricate small scale sugarcane harvesting machine for sugarcane harvesting to reduce farmer’s effort and to increase production of agricultural products. Machine consists of petrol engine and different mechanisms are used in this machine. Researchers compare it with manual harvesting and finds it has better capacity and economical. The machine is helpful for both whom having small or big farms the small scale sugarcane harvesting machine is designed and fabricated. After testing small scale sugarcane harvester in the field it is found that stems can be cut at ground level.

2. Siddaling S & B.S.Ravaikiran “Design and Fabrication of Small Scale Sugarcane” International Journal of Engineering Research and General Science Volume 3, Issue 4, July-August, 2015 ISSN 2091-2730

Investigate that, the old harvesting machine has lot many problems, to overcome these problems researchers developed a machine which is more efficient. They design and fabricate small scale 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 labours can also operate without difficulty.

3 Adarsh J Jain¹, Shashank Karne¹, Srinivas Ratod L^{1*}, Vinay N1 Thotad and Kiran P1 Corresponding Author: Srinivas Ratod L, “DESIGN AND FABRICATION OF SMALL SCALE SUGARCANE HARVESTING MACHINE” Int. J. Mech. Eng. & Rob. Res. 2013

This project aims to design and fabricate small scale sugarcane harvesting machine for sugarcane harvesting to reduce 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 or big farms. The small scale sugarcane harvesting machine is designed and fabricated.

Problem Identified

- Major problem of sugarcane harvester is soil compaction
- High initial cost i.e. Rent of this machine is also not affordable in small farmer
- High operating cost

- Area required is more for application i.e. it requires more space at starting of cutting and also it doesn’t work in small area of farm
- Size of the machine is very big
- Time consuming and Less profit
- more labour problem and framer fatigue

Aims and Objectives

- The main and basic objective is to cut the sugarcane stem at ground level.
- The cane and crops must be cut quickly and very sharply.
- The eye should not be damaged.
- The machine should not damage the crops near to the stem to be cut.
- The cost of a machine is less so it is affordable for a middle class Farmer.
- Space occupied by the machine should not be so large. It should be kept within the land.
- The machine should not have excessive weight. It should be such that a single man can operate it very easily.

III DESIGN PARAMETER

Design for power

Power develop by engine

$$P = 2\pi NT/60 = (2\pi * 4500 * 7.5)/60$$

$$P = 3534.291 \text{ Watt}$$

For cutter torque

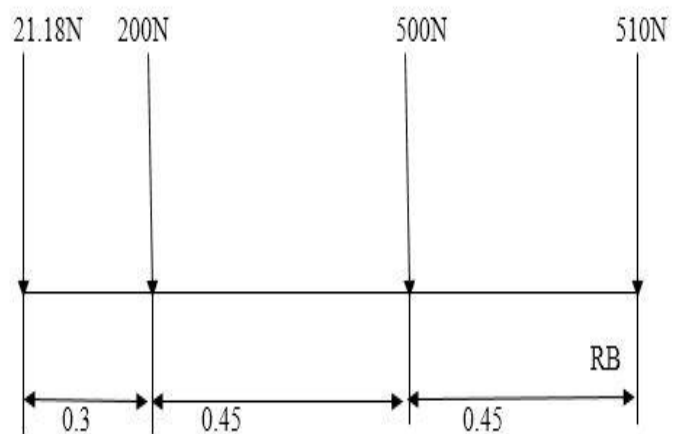
$$F = T/R$$

$$= 7500/100$$

$$= 75N$$

$$F = 75N \text{ (F= Max. Force available at cutter to cut crop)}$$

Design of Chassis



$$R_A + R_B = 21.18 + 200 + 500 + 510$$

$$R_A + R_B = 1231.18$$

$$\sum M_A = 0 \quad (21.18 \times 0) + (200 \times 0.3) + (500 \times 0.75) + (510 \times 1.2) - R_B(1.2)$$

$$= 0 + (60) + 375 + 612$$

$$1047 = R_B(1.2)$$

$$R_B = 872.5 \text{ N}$$

$$R_A + R_B = 1231.18$$

$$R_A + 872.5 = 1231.18$$

$$R_A = 358.68 \text{ N}$$

$$R_A = 358.68 \text{ N}$$

$$R_B = 872.5 \text{ N}$$

IV CONSTRUCTION AND WORKING

Construction



Working

The machine is used for cutting stems of the sugarcane and multi crops. The machine is operated with help of the engine which is basically gasoline engine. Petrol is added with oil. To start the engine first we have to on the petrol switch, after that we have to pull the cable to start the engine. When engine gets started shaft of engine is rotated and from that driver pulley is rotate pulley is connected on driven pulley from that driven pulley rotate. The pulley is attached on transmission shaft. Driven pulley rotate so driver pulley also rotate. From that engine goes to forward motion. In transmission shaft one pulley is attached which transmit power to cutter where ratio of pulley is 2:1 so speed variation on cutter which is occurs. The bevel gear is converting the drive at 90 degree angle. The speed of cutter is varying with the help of accelerator which is provided on the handle. After cutting of canes they are taken by worker and leaf are separated with the help of knife.

Advantages:-

- Using this machine problem of labour crises can be reduce
- It makes the process faster
- Area required for operation is less
- More better than manual harvesting
- Skill workers are not required

Disadvantages:

- Sleeping of belt or chain occur at high load
- Top cutting cutter is not mounted
- Cutter is manually adjustable

Future Scope:-

- Existing system can be replace by Renewable energy (solar system)
- Existing steering system can be replace by worm and worm wheel type
- Existing cutter movement can be replace by hydraulic system
- Existing transmission mechanism can be replace by chain and sprocket

V CONCLUSION

The main aim of this project of to have a proper understanding of different aspect of present harvesters as well as different harvesting practices to reduce the effort which are put in by farmers in term of money, labor, time physical effort for optimum performance. This study covers the research and development of system for a sugarcane harvester. Above discussed will definitely provide the basic ideas associate with sugarcane harvesting. Sincere effort must be made to design a suitable harvester in order to provide more profit, stability in items of economical consideration and machine to be design will help both whom having small or big farmers and definitely farmer can overcome the labor crises problem. The cost of machine is about rupees 15000 – 20000 and if the farmer buys this machine, farmer can recover the invested money back by harvesting two and half acre field. Comparing with manual harvesting. It makes the process the faster hence reduce most of the harvesting time and labor required to operate the machine is also less. So, it reduces the labor cost.

REFERENCES

- [1] Mr. Rohit J.Masute “DESIGN AND FABRICATION OF SMALL SCALE SUGARCANE HARVESTER”
- [2] Siddaling S & B.S.Ravaikiran “Design and Fabrication of Small Scale Sugarcane ” International Journal of Engineering Research and General Science Volume 3, Issue 4, July-August, 2015 ISSN 2091-2730
- [3] Adarsh J Jain¹, Shashank Karne¹, Srinivas Ratod L^{1*}, Vinay N1 Thotad and Kiran P1 *Corresponding Author: Srinivas Ratod L*, “DESIGN AND FABRICATION OF SMALL SCALE SUGARCANE HARVESTING MACHINE” *Int. J. Mech. Eng. & Rob. Res.* 2013
- [4] G. D. Shelke S. S. Borikar, M. P. Awathale A. P. Khante “Design of Sugarcane Harvesting Machine” IJIRST – International Journal for Innovative Research in Science & Technology| Volume 1 | Issue 11 | April 2015 ISSN (online): 2349-6010.