

Crop Cutter (Reaper) & Separator Machine

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Abstract— India is an agriculture based country which takes various types of crops. Now a day various agricultural machines are available in the market which are very heavy and costly. Due to this it is not suitable for poor farmers. And all farmers remove crops by hands which has very effort is fully and time consuming process. Some times while cutting or removing crops by hand results into damage due to blisters on hands. Because of this the labours are not available for work, in order to overcome this situation and reducing human efforts and working time also we introduce a new simple but more efficient machine for a farmers. Whose application is more helpful in agricultural sector. The name of this device is crop cutter (reaper) and separator. This device cuts the crop and throws it on one side in the direction on rotation of separator. This machine targets the small scale farmers who have land area of less than 2 or 5 acres. This machine is compact and can cut up to two rows of wheat, millet, jowar crops. It runs on petrol or diesel engine, this power from engine, is provided through shaft, pulley and belt drive arrangement to the cutting blades. This compact crop cutter is manufactured using locally available spare parts and thus, it is easily maintainable. This crop cutter might be the solution to the problems faced by a small scale farmer regarding cost and labour implementation.

Keywords: Crop Cutter, Maize, Jowar, Millet, Blister, Harvesting, Reaper

I. INTRODUCTION

The history of agriculture in India dates back to Indus valley civilization era and even before that in some parts of southern India. Today India ranks second worldwide in farm output, so there is always a need for more and more developments and innovations in the field of agricultural technology. Agriculture is the main source of income of India. Many people have agricultural lands and they use equipments which use fossil fuel for their operation and this causes harm to ozone layer and also results in the depletion of fossil fuel for the future generation. It is important to concentrate in some aspects like how to increase productivity and profit, how to reduce waste and how to solve and ease the problems of workers. To overcome this new manually operated crop cutter is in need of the hour. It possesses four major criterions that is ease in manufacturing, ease in handling, low cost and light weight. There are some procedures involved in fabrication of this device such as designing using Solid Edge, material and component selection and the like. The agricultural practices which are currently employed are neither economically nor environmentally sustainable and India's yields for many agricultural material are comparatively low. In the recent years we have seen a shortage of skilled labour available for agriculture; hence due to this shortage the farmers have transitioned to using harvesters. These harvesters are available for purchase but they are not affordable because of their high costs. However agricultural groups make these

available for rent on an hourly basis. Considering the Indian market, it has been noted that small holding farm owners having land less than two acres generally do not require the full-featured combine harvesters. Due to financial or transportation reasons these combine harvesters are not available in all parts of rural areas. Thus there is a need for a smaller and efficient combine harvester which would be considerably cheaper and more accessible. The mission is to create a portable, low cost mini harvester and user friendly [1].

The history of agriculture in India dates back to the Rig-Veda, written about 1100 BC. Today India ranks second worldwide in farm output. Agriculture and allied structures like forestry and fisheries accounted for 13.7% of the GDP (Gross Domestic Product) in 2013, about 50% of the total workforce. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Still, agriculture is demographically the broadest economic sector and plays a significant role in overall socio-economic fabric of India. As Per the 2010 FAO world agriculture statistics [2], India is the world's largest producer of many fresh fruits and vegetables, milk, major spices, select fresh meats, select fibrous crops such as jute, several staples such as millets and castor oil seed. India is the second largest producer of wheat and rice, the world's major food staples. India ranked within the world's five largest producers of over 80% of agricultural produce items, including many cash crops such as coffee and cotton, in 2010. India is also one of the world's five largest producers of livestock and poultry meat, with one of the fastest growth rates, as of 2011. and these process of harvesting is conventional that consumes more efforts and cost of crop cutting [3].

II. AIM & OBJECTIVE

The aim of this project is to design and fabricate a low cost multiple crop cutting machines based on the need of farmers.

- To reduce overall cost
- Save crop cutting time.
- To reduce human efforts

III. LITERATURE SURVEY

Various approaches have been proposed for improving mechanized type of crop cutter in agriculture field. Designing a reaper machine to harvest grains more efficiently. The research work focusing on harvesting operation to the small land holder to cutting varieties of crop in less time and at low cost by considering the factor as power requirement, ease of operation, field condition, time of operation and climatologically condition. By the study Mr. P. B. Chavan, Mr. D. K. Patil, Mr. D. S. Dhondge [4] to increase the productivity and profit. How to cutting reduce the cost and how to solve the problem comes from workers. It is

fabricated for cutting various crop varieties during the time cutting to the “Fabrication and Performance Test of an Ultraportable Crop Cutter by G Maruthi Prasad Yadav , GMD Javeed Basha [5] This fabrication model small scale sugarcane harvesting machine consists petrol engine and mechanisms are used in this machine to compare to manual harvesting by using this machine has capacity to cut sugarcane in faster rate and economical. This study done by the Adarsh J Jain, Srinivas Rarod, Vinay N Thotad and Kiran [6] In this research work was made to investigate the cutting energy and force required for the pigeon pea crops. The commercially available blade it has been attached to the lower end of the arm of pendulum type dynamic tester which cut the stalk at 90° to the stalk axis with knife velocity ranging between 2.28m/s to 7.23 m/s the diameter of stem at 42.6 % (wb) moisture content. The cutting force is directly proportional to cross sectional area “stem cutter was designed and developed by Atul R. Dange, S. K. Thakare, Bhaskarao and Umarfarooq Momin [7].

IV. PROBLEM DEFINITION

Problem: In the India all farmers remove crops by hands which has very effort is fully and time consuming process. Some times while cutting or removing crops by hand results into damage due to blisters on hands. Because of this the labours are not available for work, in order to overcome this situation and reducing human efforts and working time also we introduce a new simple but more efficient machine for a farmers. Whose application is more helpful in agricultural sector. This device cuts the crop and throws it on one side in the direction of rotation of separator. This machine targets the small scale farmers who have land area of less than 2 or 3 acres. This machine is compact and can cut up to two rows of wheat, millet, jowar crops. It runs on petrol engine or DC Motor, this power from engine or Motor, is provided through shaft, pulley and belt drive arrangement to the cutting blades. This compact crop cutter is manufactured using locally available spare parts and thus, it is easily maintainable. This crop cutter might be the solution to the problems faced by a small scale farmer regarding cost and labour implementation.

V. IDENTIFICATION & SELECTION OF SUITABLE MACHINE COMPONENT

Motor operated crop cutter and separator: The motor is connected to the shaft with the help of belt drive power is transmitted to the shaft. And the components are mounted or fitted on the same shaft.

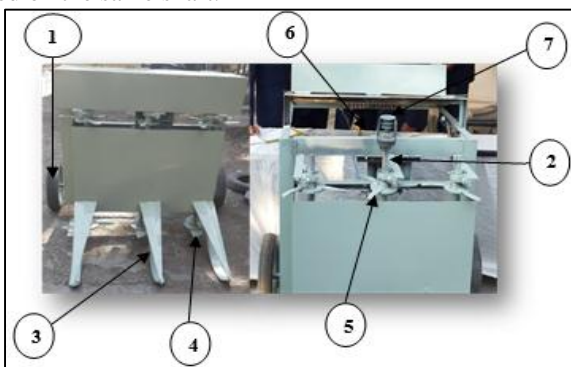


Fig. 5.1: Component of machine

A. Components of Machines are as follows:

- 1) Wheel
- 2) Shaft
- 3) Crop collector
- 4) Cutter / Blades
- 5) Separator
- 6) Motor
- 7) Pulley

VI. DESIGN OF MACHINE

Working principle:-In our concept device crop cutter and separator consist a shaft, cutter /Blades, separator, DC motor, belt drive, chain drive, and wheel. DC motor used in this device use to transmit power to the shaft, there are three shaft is used in this device on the each shaft separator and cutter is attached cutter is attached at the bottom of this shaft to cut the crop from the ground level and separator is attached at the top of the shaft to separate the crop on one side. Crop is cut by the rotary movement of the cutter which helps cutter to cut the crops easily and this rotary movement is achieved by the DC motor used in this device to take continuous rotary movement of this three shaft together this shaft are connected with the help of belt drive and chain drive used in this device



Fig. 6.1: Design of the device

As we start dc motor used in this device motor start rotating due to the arrangement of belt drive provide in this device motor causes rotation of the middle shaft and with the help of chain drive provide in this device rotation of the middle shaft causes the rotation of another two shaft. As three shafts rotates together it helps cut crops easily with relative speed. Hence the operation of cutting crop and separation of crop done easily and effectively.

A. Wheel

Wheel is one of the important component of the machine on the basis of wheel machine is travel around the farm and it help to cut the crop in a particular manner. The wheel helps to push the machine easily as it is connected in the machine in a proper way. Scooter wheel is used in this device as they are more comfortable to work with this in farm.



Fig. 6.2: Wheel

B. Shaft

Shaft is a main component in this device on which the working component are mounted to perform their work effectively. One shaft is connected to motor with the help of belt drive which transmit power from motor to this shaft.



Fig. 6.3: Shaft

C. Crop Collector

Crop collector is also the important component of the machine which is connected to the device. The function of this component is to collect the crop and make bunch of it to cut it in a proper way its shape looks like 'v' shape which is help to collect the crop and make a bunch of it.



Fig. 6.4: Crop Collector

D. Cutter/Blades

Cutter is a main component in this device whose work is cutting crops from ground level curve shape blade with two blades is used in this device to cut the crop. Some inclination angle is provided in this device to cut the crop easily and fastly.



Fig. 6.5: Cutter

E. Separator

Separator is also main component of this device, which is also mounted on the same shaft on which the cutter is mounted. Separator is mounted on the top of the shaft to separate the crop after cutting. With the help of rotary motion of this shaft separator separate the cut crops on one side.



Fig. 6.6: Separator

F. Motor

Motor is also main component of this device; motor is mounted on the frame of the device. The main function of the motor is to transmit power to the shaft to perform the relative operation. 1 hp single phase DC motor is used in this device with 1420 rpm which is sufficient to cut the crop easily and effectively.



Fig. 6.7: Motor

G. Pulley

Pulley is also the one of the important component of the machine used in this device which helps to transmit the power. There are two pulley is used in this device, one is connected to the motor and second is connected to the middle shaft of the device on which separator and cutter is connected. With the help of 'v' belt two pulleys is connected to each other and power get transmitted.



Fig. 6.8: Pulley

VII. FABRICATION & ASSEMBLY

Firstly the frame of crop cutter manufactured as per the designed load by C shape angle. Wheels are attached to that frame by means of shaft and pedestal bearings. Engine or motor base is formed on frame by welding square tubes. And engine or motor mounted on it. Smaller and Large pulleys are mounted on the engine or motor shaft and transmission shaft respectively. And both pulleys connected by v-belt. The transmission shaft is supported by using bearings with frame.

The gear is mounted on the shaft on which separator and rotary blades arrangement are provided to transmit power to moving blades. The blades are manufactured by using High carbon steel plate. And cutter sharp edges are produced by grinder. Additional attachment is that the done of metallic sheet that divide the cut crop into besides of crop cutter. Finally all the components are assembled together from base frame, wheels, motor/engine, pulleys, belt, shaft, eccentric disc, separator and rotary blade.



Fig. 7.1: Fabrication and Assembly

VIII. ADVANTAGES

- This machine is manual handling
- Machine is light in weight
- Its cost is 25000-30000/-- with best fabrication the cost of other reaping device ranges above from 10000
- Low maintenance and repairing cost due to simple mechanism set is used
- Suitable for almost all kind of crops
- There is no requirement of skilled labour
- This machine save some labour cost because it is handle by only one person
- This machine cut the crop in 1 acre area in 2 hrs
- It take less time as compare to labour while cutting crop in farm.

IX. DISADVANTAGES

- As we used dc motor instead of petrol engine there is problem for extension of wire in the farm while cutting crops
- Efficiency is less by using DC motor than compare to petrol or diesel engine.

X. APPLICATION

- Crop cutter and separator machine is used in agriculture sector where the no. of worker are used.
- It is used to cut the crop.
- It is also used to cut the grass.

XI. RESULT AND DISCUSSION

The crop cutting machine to develop is just concept. It innovative three stage crop cutting machine. In the present study, the crop cutter and separator model is developed by using chain drive or belt drive with the help of motor/engine for optimization vibration level and to increase work durability of worker, reduce cost and human effort also. The best is suitable dimensions for the model are found out by assuming to draw method and accordingly stress analysis results are also assume to design and fabricate this machine, so there is calculation part is skip in it.

XII. CONCLUSION

The purpose of crop cutter is to reduce the cost of labours for harvesting and also to eliminate the situations that faced because of the lack of labours. Due to back pain and blisters on hand labours are not work in harvesting field. In order to overcome this situation, it gives out following benefits

- 1) This system reduces the cost of harvesting upto 60-70 % as that of conventional method.
- 2) It is suitable for small scale farmers having 2-5 acres of land area.
- 3) It is also reduces the 50-60 % timing of harvesting as that of conventional method
- 4) Ease of maintenance, ease of operation.
- 5) Particularly economical operation as it eliminates extra man power.
- 6) High degree of operational safety.

XIII. FUTURE SCOPE

“The crop cutter machine” provides wide range for future advancements.

Some of these are as follows:

- 1) By just changing the blade size we can use the crop cutter as lawn mover and it use to cut crop like sugarcane. We can make the crop cutter to work under the different crops as per the loads (Just we have to change the power and blade size).
- 2) By providing the curved collectors at sides of crop cutter to collect the cutting crops and also the bunch of crops is get tying together by using automation. And throw at backside of cutter.
- 3) In case to use the machine in case of sugarcane application we can provide more power at prime mover one spring in parallel, let us say 4 parallel springs can be used to increase the capacity.
- 4) This crop cutter and separator machine we can also operate with the help of petrol or diesel engine.

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