

# Design and Fabrication of PASMA Multi-crop Cutter

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**Abstract-** India ranks 2nd in agriculture output worldwide. Along it had exported agriculture equipment of USD 573.5 million in the year 2019-2020. Also, these machines are costly, and not every farmer could afford it maybe by having it for themselves or on rent. The main purpose of this project is to design and develop a multi-crop cutter that can be used as an alternative for harvester which would thus be beneficial for small and medium land holding farmers and would help in saving their economy. The design and development include fabricating a vehicle that is small and compact. This project is all about machine development which makes harvesting and cutting of crops, weeds, etc. much easier and simpler. As it only needs the pushing efforts and can be operated by a single person along this machine is portable, available at low cost, easy to maintain, and highly efficient.

**Key Words:** Multi-crop cutter, Harvester, Chassis, Scotch yoke mechanism, Operation, Agriculture, Flywheel.

## 1. INTRODUCTION:

As in past, many farmers have adopted direct harvesting to salvage the bean crop when field conditions are too wet for pulling and extracting. Often the plants had suffered low yields and high harvest loss. However when timely direct combining is intended as a part of a narrow row management system with modern harvest equipment a high yielding, the high-quality crop can be harvested.

These combine should be equipped with flexible floating cutter bar adjusted to clip bean plants as close in the ground as possible. It minimizes the cutting of low hanging pods associated with harvest loss. However new and modified equipment has been developed to minimize harvest losses. As specialized air reels are available to assist in moving the crop quickly of the knife and back into the cylinder. This minimizes the build-up of cut bean plants on blades and thus reduces shatter losses as offers better cutter visibility without showing tones into the header.

As these modern equipment are highly efficient but they are costly too. Thus leads to limitations as all may not be able to afford it and also they are not mostly available in some parts of rural areas. However, in some areas in India such as south India rice harvest has been done using engine power. It is misinterpreted that the benefits of mechanization could be reaped only by farmers having large land. But even farmers with small holdings utilize selected improved farming equipment through custom hiring to increase productivity and cost of production. The small land size may have impeded use of large tractors but not for the use of small

tractors and improved machinery. Thus improved hand tools, animal or human-operated equipment are more adopted in most places to increase productivity per unit has increased

Thus the objective of the project to develop and fabricate the low cost multi-crop cutter is

1. To minimize time of Harvesting
2. To minimize human efforts
3. To minimize labor cost

## 2. Literature Review:

We have studied various literature review as per the project criteria. So we have come up with the following and helpful literature reviews.

1. **As per G. Maruthi Prasad Yadav**, Agriculture especially in India we need to focus on some aspects such as how to increase productivity and profit, how to reduce the cost, and how to solve the problems which arises. It is basically composed of three touchstones such as "easy to fabricate, low cost and lightweight". With this Crop Cutter where the ultimate aim is that it should be easy to fabricate and test the performance of the prototype of a crop cutter for harvesting the crop.

2. **Laukik P. Raut**, in his paper stated that this machine focuses on small-scale farmers who have a land area less than 2 acres. They conclude that the harvesting cost using crop cutting machine is considerably less than compared to manual harvesting. The harvesters which are available in the market are suitable for large farms, so this can be the best alternative machine for farmers with a small land.

3. **Indian Government Analysis** was the survey done by the Indian Government in the fiscal year of 2012-3. This survey was intended to analyze and collect the data related to the problems and difficulties faced by the Indian farmers from where the need was properly explained.

4. **N. S. L. Srivastava** researched on the interest and needs of farmers and the difficulties which they face while harvesting and keeping the agricultural field. This paper was thus a depth study of farming conditions, of farmers and their basic problem.

## 3. Problem Identification:

As most of the crop cutters are designed for large farm area and single-crop system. Most of the Indian farmers possess very meagre land for crop cultivation in the Indian agricultural system the intercrop cultivation is mostly observed (e.g. soybean, cotton, etc.) according to their crop

management. By concentrating on Indian farmer's problems identified are listed below.

1. The cost of crop cutters are very high
2. Skilled as well as unskilled labours are not easily available
3. Labour charges are also too high.
4. A mixed crop system is followed.
5. The economic condition of Farmers is not so good.

#### 4. Aims and Objectives

After going through a problem faced by average farmers and by considering their need we aim to design and fabricate such soybean cutter which consists of

1. Should be easily available at low cost
2. Should have Low operating cost
3. Should be manually operated
4. Easy in handling
5. Can be used in single as well as multi-crop cutter.
4. It can also be used as a weed cutter.

#### 5. Methodology

This PASMA multi-crop cutter can perform crop cutting operations very efficiently. In this, it is developed for effective cutting of soybean crops without the use of fuel or electricity. In this new model of low weight and size, two rows of soybean can be cut simultaneously as in India mostly multi-cropping is preferred. This model is based on the principle of motion transmission by using a prime mover. As the operator start engine with the rope. Power from the engine is transmitted to gear arrangement or gear box by using a centrifugal clutch and belt drive the gear drive and thus reduce the speed from 3000RPM to 150 RPM approximately and has a ratio of 1:20.

Power from gear drive is given to scotch yoke mechanism in which reciprocating arm is directly attached to cutter blade assembly which performs cutting operation where the operator only need to push the machine by using the handle where the speed can be adjusted by throttling and the machine will perform a cutting operation and after cutting the crop is collected for harvesting.

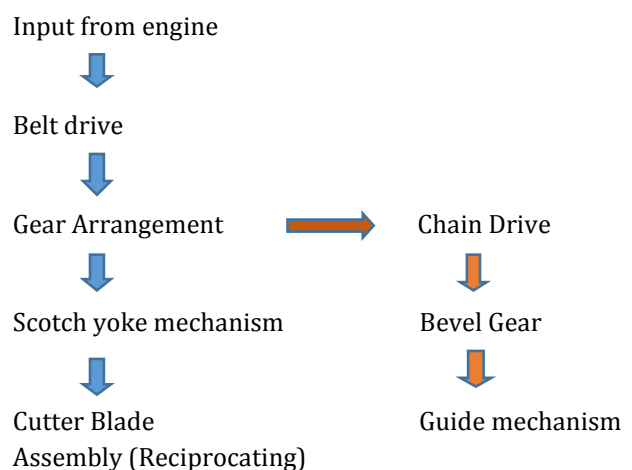
#### 6. Advantages of PASMA Multi-crop cutter:

1. It is relatively cheaper as compared to others.
2. It is affordable even by farmers having small landholding
3. It is manually operated and thus reduces the cost.
4. It is a smaller size and compact in nature.
5. It is portable and can be transported easily.
6. It is easy to handle and thus can be operated by skilled as well as unskilled labor
7. It can also be used as a crop or weed cutter.
8. Easy to assemble and disassemble in nature.

#### 7. Selection of component with material specification

Sr. No	Name of component	Dimension	Material	Material Specification
1.	Frame	25*22	M.S	Cheap, Durable, Good Strength
2.	Chain	1900mm	M.S	Cheap, Durable, Good Strength
3.	Wheel	350mm	M.S	Cheap, Durable, Good Strength
4.	Bevel gear big	15teeth	M.S	High velocity ratio
5.	Bevel gear small	8teeth	M.S	High velocity ratio
6.	Cutter	500mm	M.S	Cheap, Durable, Good Strength
7.	Sprocket		M.S	Cheap and Durable

#### 8. Working of PASMA Multi-crop cutter



**9. Materials used and Total Costing;**

Sr.no	Components	Quantity	Cost
1.	Chassis frame	1	1000
2.	Shaft	25mm 3ft 12mm 3ft	500
3.	Pedestal Bearing	8	2400
4.	Wheels	2	3600
5.	Bevel Gears	2	350
6.	Chain and Sprocket	1	320
7.	Cutters	14	350
8.	Handle	1	350
9.	Engine	1	2500
10.	Machining Expense's	-	1000
11.	Labour cost	-	1000
12.	Total Cost		13370rs

**10. Pictures:**



Fig 1. PASMA Multi-crop cutter (front view)



Fig 2. PASMA Multi-crop cutter (top view)

**11. Conclusion:**

The combined reaper and collecting machine is built to be compact and efficient to cut the crops. The machine was thus tested on the field to check its cutting capability and efficiency. The test results found were successful as the machine performed flawlessly. Thus it can be concluded that the machine is comparatively compact and easy to handle. This machine can run off field effortlessly and thus efforts farmers are reduced. The cost of harvesting using this machine is considerably less as compared to manual harvesting. The harvester available in the market is suitable for large farms, so this can be the best machine for farmers with small land. The success of this machine depends on how farmers use this machine. Some changes need to be done and a final product is to be taken out for sale.

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