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Modeling And Fabrication Of Pedal Operated Multi Crop Cutter

¹P. Narasimhulu and ²N. Jaya Krishna

¹Student, Mechanical Engineering, AITS, Rajampet, AP, India.

²Assistant Professor, Mechanical Engineering, AITS, Rajampet, AP, India.

Address For Correspondence:

P. Narasimhulu, Student, Mechanical Engineering, AITS, Rajampet, AP, India.
E-mail: pparasimhulu15@gmail.com

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ABSTRACT

In Agriculture how to reduce the cost and labour efforts . To overcome these, a new manually operated cutter is fabricated specially for cutting various crop varieties and named as an “MODELING AND FABRICATION OF PEDAL OPERATED MULTI CROP CUTTER”. It is easy to fabricate, low cost and light weight. There are steps involved in fabricating this machine such as fabricating the small model using suitable material and test the functioning of this machine. So the aim is to fabricate and test the performance of the small model of a manually pedal operated crop cutter for cutting the crop. The use of machines can help for cutting at proper stage of crop maturity and reduce operation time. Considering these improved cutting tools equipment, combine being accepted by the farmer . This multi crop cutter mainly used for small scale farmers, that means below two acres farmers.

INTRODUCTION

In world the use of agriculture equipment is increasing. India uses only 10% agricultural equipment’s as Conducted survey in year2012. Nowadays India has second rank worldwide in farm output. Agriculture like forestry and fisheries accounted for 13.7% of the GDP (Gross Domestic Product) in 2013, about 50% of the total manpower. The economic contribution of agriculture in India’s GDP is continuously decreasing with the country’s broad-based economic growth.

Still. As per the 2010 FAO world agriculture record, of wheat and rice, this is the world major food. India has ranked between five largest producers over 80% of agricultural produce items. All countries used wide range of technology for production of crops including soil cultivation, and cutting of crops, and the activities of proper processing and marketing. Many different factors influence the kind of agriculture practiced in a particular area. It differs from climate, soil fertility, availability for near market place. The first agricultural products consist of crop plants for human food and animal feed and waste products from crops. Crop cutting machine is an essential tool. They are different in size, way of operation, and power. The power source for such machine is usually gasoline engine and can ride by skilled operator. Modern gas powered and electric powered lawn grass cutters cut grass with a single blade revolving at a high speed parallel to the ground. This blade is slightly raised from its rear edge to create draft that lifts the cutting blades before its cutting operation. Reduce the cost on the harvesting method. In this paper we develop the instrument called multi crop cutter is to help small-scale farmers to fulfil demand and supply for market, it cut the crop more easily. Our aim is on focus easy of cutting operation to the small land holders for cutting varieties of crop in less time and at low cost by considering different factors as power requirement, cost of equipment , ease of operation , field condition , time of operation and climatologically conditions. This is very cheap in cost but used the electricity is not profit getting factor. So therefore we design and fabricate the multi crop cutter. For multi crop cutter no need for electricity, because it is manually operated it is operated on the basis of gear mechanism.

Harvesting:

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It is the operation of cutting, picking, plucking digging or a combination of these operations for removing the crop from under the ground or above the ground and removing the useful part of fruits from plants.

Harvesting action can be done by four ways

1. Slicing action with a sharp tool.
2. Tearing action with a rough serrated edge.
3. High velocity single element impact with sharp or dull edge.
4. Two elements scissors type action.

Classification of Crop Cutting Machines:

Cover crop cutting:

Cover crops are, by definition, left on and in the soil rather than moved to the compost heap. With some (like rye), you do have to wait a couple of weeks before planting into them, but with others (like buckwheat) there's no need to wait. Sitting on the soil surface, only those with a very high C:N will steal nitrogen from the soil (as opposed to if you tilled them in, in which case all would steal nitrogen for at least a short time.) That's the problem you could see, not that they'd cause seeds to rot.

The basic idea of cover crops is that you grow humus during gaps in the garden year when the beds would otherwise be fallow, and in the meantime you keep weeds from taking over that garden bed. If done right, it's a win-win. Of course, you'll still want to add other compost to the bed, but the cover crops help.



Row crop cutter and conveyor:

Accordingly, it is an object of the present invention to provide a row crop harvesting apparatus which automatically cuts and conveys a single row of crops. It is another object of the present invention to provide a row crop harvesting apparatus for cutting and conveying row crops without damaging the produce attached thereto. Still another object of the present invention is to provide a row crop harvesting apparatus which increases row crop harvesting efficiency. These and other objects of the invention will become apparent upon reference to the following specification, drawings, and claims.

By the present invention, it is proposed to overcome the difficulties encountered heretofore. To this end, a harvesting apparatus for row crops having stalks and produce is provided. The apparatus is capable of cutting the stalks and conveying the row crops to a processing point without substantial damage to the produce. The apparatus comprises a frame having a front and a back, as well as a cutter connected near the front of the frame, the cutter which is capable of cutting the stalks of the row crops.

At least one guide is connected near the front of the frame and in front of the cutter, the guide which is capable of directing the row crops into the cutter. Means are connected to the frame for receiving and conveying the produce to the processing point. Means are also connected to the frame for engaging the stalks separately from the produce and conveying the stalks to the processing point. The stalk engaging and conveying means are capable of conveying the stalks in a manner which substantially prevents contact of the stalk engaging and conveying means with the produce.



Root crop haulm cutter:

It is appropriate to make the root crop haulm cutter such that the blades of one auger overlap with those of the other by a value greater than the clearance between the nearest surfaces of the blades of the coupled augers.

Due to this the recess between the augers of the pair is not deep and passage of the root towards the augers terminates before the root head contacts the surface of the rotating augers. This prevents the root heads from being damaged by the screw blades of the augers.

Additionally, it is appropriate to provide sharp edges for the screw blades of the augers adjoining the cutting edge of the immovable knife whereas the blade edges throughout the remaining length of the augers should smoothly blend into a rounded or oval shape. v

The oval shape of the edges of the auger screw blades at the zone of haulm entry and dragging of root crops makes it possible to decrease the distance between the root head and the plane of cutting the haulm and ensures better levelling of the root crops as to the height of their heads prior to the haulm cutting. Sharp edges of the auger blades at the zone where they slide along the cutting edge of the immovable knife during the augers rotation facilitates the process of haulm cutting between the two adjoining and mutually sliding edges of which belongs to the immovable knife and the other to the rotating screw blades of the augers.

The cutting edge of the immovable knife can be made biconcave in the direction of the auger axes.

The cutting edge of the immovable knife having a biconcave shape curved in the direction of the auger axes makes it possible to increase the length of those sectors of the auger blades which, during the rotation of the augers, slide along the cutting edge of the immovable knife, and, therefore, participate in the process of haulm cutting. Thanks to this, the load on each point of the sharp edges of the auger blades is decreased and substantially prolongs the service life of the cutter prior to repair.

Such a design of the root crop haulm cutter makes it possible to employ the same in root crop harvesters to harvest table root crops, as to well as harvest commercial quality products without resorting to manual labor.



Sickle bar cutter:

A sickle bar cutter assembly for use on crop harvesting machines includes a mechanism for automatically adjusting the relationship of the cutter hold downs to the cutter knives to ensure that proper scissors action of the cutter knives produces a clean cut of the crop being harvested. The mechanism includes a member for biasing the cutter hold downs against the cutter knives and a member to which the cutter hold down is mounted and about which it pivots. At least those portions of the cutter hold downs contacting the cutter knives are hardened.

Typically, in previously known sickle bar cutters, the reciprocating cutter blades were held in place against the cutter knife guards by a hold down clamp which was firmly fastened to a mounting bar. The hold down was fitted with an adjusting mechanism to enable the proper spacing to be achieved between the hold down and the reciprocating cutter blades such that proper shearing of the crops occurs. However, it will be appreciated that frequent adjustments between the hold downs and the reciprocating cutters were necessary as the wearing action caused by the continual back-and-forth movement of the cutter blades against the stationary hold downs tended to wear, and thereby alter, the present spacing between the two. It was then necessary for the operator of the equipment to manually readjust the spacing to the prescribed acceptable tolerances. This was, and still is, a time consuming and tedious procedure resulting in an unacceptable period of down time for the harvester. Of course, if the adjusting procedure became necessary while crops were being harvested, it could result in the farmer's inability to complete the harvest due to, for example, a change in weather conditions. Additionally, while the equipment is being serviced, the farmer, who in many instances is the person responsible for maintenance, would not be available to perform required other tasks.



Problem Statement:

In India especially southern part of the country where agriculture becomes the new focus which can give many advantages and benefits especially to our economy, politics and social. Paddy and Wheat is one of the new targets in agriculture where still not much researchers and manufactures participate in this field. From that there are some problems arise such as how to maximizing the profit, how to increase productivity and how to reduce the cost. One of the important activities in Paddy and Wheat is harvesting.

The fabrication of any machine demands sufficient and proper planning while selection of systematic process. Normally, the fabrication is carried out after the design process. Once the required dimension obtained

then the only work remains and that is to convert the calculated dimensions into actual fabricated model. It is the common that any new concept which is being evolved it needs to be verified to check its performed physical dimensions.

1. Studying the present mechanisms.
2. To identifying the potential problem.
3. Problem definition.
4. Literature review.
5. Design of crop cutter.
7. Calculation.
8. Fabrication.

Introduction to pro/e:

PRO/E is the industry's de facto standard 3D mechanical design suit. It is the world's leading CAD/CAM /CAE software, gives a broad range of integrated solutions to cover all aspects of product design and manufacturing. Much of its success can be attributed to its technology which spurs its customer's to more quickly and consistently innovate a new robust, parametric, feature based model. Because that *PRO/E* is unmatched in this field, in all processes, in all countries, in all kind of companies along the supply chains. *PRO/E* is also the perfect solution for the manufacturing enterprise, with associative applications, robust responsiveness and web connectivity that make it the ideal flexible engineering solution to accelerate innovations. *PRO/E* provides easy to use solution tailored to the needs of small medium sized enterprises as well as large industrial corporations in all industries, consumer goods, fabrications and assembly. Electrical and electronics goods, automotive, aerospace, shipbuilding and plant design. It is user friendly solid and surface modeling can be done easily.

Advantages of PRO/E:

- ✓ It is much faster and more accurate.
- ✓ Once a design is completed. 2D and 3D views are readily obtainable.
- ✓ The ability to changes in late design process is possible.
- ✓ It provides a very accurate representation of model specifying all other dimensions hidden geometry etc.
- ✓ It is user friendly both solid and surface modeling can be done.
- ✓ It provides a greater flexibility for change. For example if we like to change the dimensions of our model, all the related dimensions in design assembly, manufacturing etc. will automatically change.
- ✓ It provides clear 3D models, which are easy to visualize and understand.
- ✓ PRO/E provides easy assembly of the individual parts or models created it also decreases the time required for the assembly to a large extent.



Fig. 1: Design model

Components And Description:

The pedal operated crop cutter contains following components

- Pedal system (bicycle)
- Bevel gears

- pedestal bearing
- Yoke mechanism
- Crop cutting blades

Crop Cutting Blades:

The Crop cutting blades are two types they are given below

- Rotary blades
- Reciprocating blades

Rotary Blades:

A rotary cutter is a tool generally used by quilters to cut fabric. It consists of a handle with a circular blade that rotates, thus the tool's name. Rotary cutter blades are very sharp, can be resharpened, and are available in different sizes: usually smaller blades are used to cut small curves, while larger blades are used to cut to straight lines and broad curves. Several layers of fabric can be cut simultaneously with a sharp (fresh) blade, making it easier to cut out patchwork pieces of the same shape and size than with scissors. Quilters use rotary cutters with specially designed templates and rulers made of approximately 1/8-inch thick clear or color-tinted plastic.

The first rotary cutter was introduced by the Olfa company in 1979 for garment making, however, it was quickly adopted by quilters. Prior to the invention of the rotary cutter, quilters traced handmade templates of the necessary shapes onto the wrong side of fabric and added 1/4-inch seam allowances all around. Templates were often handmade of (cereal box type) cardboard and the pencil wore down the edges with repeated tracings, rendering them inaccurate; new templates would be made several times until all the patchwork pieces were cut. Pieces were usually cut one at a time with dressmaking scissors, which were often heavy and had long blades that were designed for cutting large pieces for garments but were cumbersome to use for cutting small pieces for patchwork. The rotary cutter gained almost immediate widespread use among quilters after its introduction and, along with the accompanying development of strip techniques, revolutionized quilting.

Today there are many companies making rotary cutters. Cutters come in a variety of handle types and some include specialty blades to cut curved or zigzagged lines. Most have retractable blades that can be locked to prevent injury.



Fig. 2: Rotary blade cutters

Reciprocating Blades:

A reciprocating saw is a type of saw in which the cutting action is achieved through a push-and-pull ("reciprocating") motion of the blade.

The term is commonly applied to a type of saw used in construction and demolition work. This type of saw, also known as a hognose has a large blade resembling that of a jigsaw and a handle oriented to allow the saw to be used comfortably on vertical surfaces. The typical design of this saw has a foot at the base of the blade, similar to that of a jigsaw. The user holds or rests this foot on the surface being cut so that the tendency of the blade to push away from or pull towards the cut as the blade travels through its movement can be countered.



Fig. 3: Reciprocating blades

Working Principle:

- When the worker will pull or pedal the machine with the pedal system, the wheels are starts to rotating.
- On shaft the sprocket is mounted having chain drive with 2nd shaft having freewheel and cycle wheel which transfer the rotation to the front wheels. On this front wheel shaft, the bevel gear is attached to both the ends then with the help of bevel gears this rotation is transmitted to vertical shaft having cutter at the end.
- Due to the teeth ratio of bevel gears, rotation is maintained and power is obtained for cutting purpose.

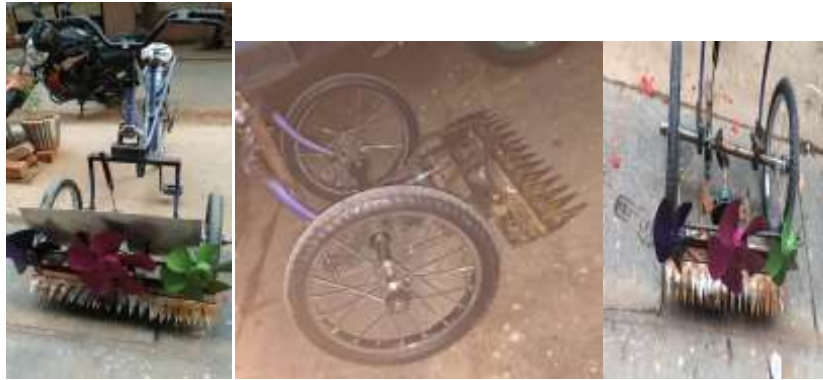
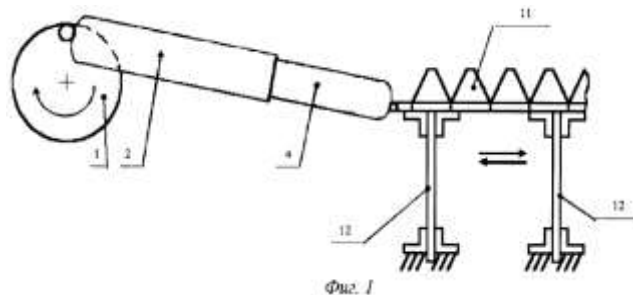


Fig. 4: Fabricated model

Mechanism:

It is a walk behind type of harvester which is powered by the pedal. Drive power is transmitted to gearbox. As the human power, a bevel gearbox and a spur gearbox is used. Direction of the drive can be changed by 90° with the help of bevel gears. Rotary motion of shaft converted into reciprocating motion of cutter blade with the help of one end of this output shaft is connected to slider crank mechanism. Scissoring action is created when reciprocating cutter blade slides over fixed blade which is responsible for cutting the crops. Collecting mechanism consist of flat belt with collecting plates are bolted on it. Collecting belt simply carry cut crops sideways.



Conclusion:

The harvester developed is just proof of concept. This has to still undergo a detailed analysis of components used. The new design of the cutter bar is to be tested and changed as per the requirements. The innovative three stage threshing mechanism will result in a yielding good Quality seeds. The machine is designed to run without external sources like diesel engines, (Power tiller or tractor). The machine can be operated by single labour. The machine will eliminate the labour problem and struggles of labour in cutting the crop. This machine will serve a great deal for small scale chickpea cultivators.

Future scope:

- Though the machine has some innovative concepts, there is still a lot if scope for development like
- The machine has to be provided with gear box for different speed ad torque generation.
 - The machine can be made lighter by doing detailed analysis of the design and removing excess material wherever it is not necessary.
 - There is lot of space wastage in the threshing unit, the design of the components should be meticulously refined.
 - With minimal modifications this machine can be used for harvesting of different crops.
 - Additionally provision can be provided of connecting to a tiller or tractor instead of the diesel. (for the farmers who already own a tiller or tractor).
 - A better and large storage unit has to be provided to collect the seeds.
 - Using the batteries for mechanism ,speed increment in this model frame .

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