FABRICATION OF PHYSICALLY OPERATED AGRICULTURAL MULTI-USE CUTTER

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Abstract. Currently in India farmers used conventional method for the paddy cutting i.e. the conventional method for paddy cutting is as manually cutting using labour but this method is lengthy and time consuming. This project aim is to fabrication of small field paddy cutter machine for small height paddy. It comprises three criterions such as "easy to fabricate, low cost and lightweight". With this ultraportable paddy Cutter, the entire problem can be solved easily. There are some procedures involved in fabricating this device such as fabricating the prototype 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 operated paddy cutter for cutting the paddy. Time requires for cutting paddy is main importance. Fast cutting of paddy gives more time for preparation of land for next paddy planting. The use of machines can help for cutting at proper stage of paddy maturity and reduce operation time. Considering these improved cutting tools equipment, combine being accepted by the farmer. The communication of this manual motion into rotary motion of cutter at the end of which the crops get cut easily without any hard effect for manual operation.

Keywords: Paddy Cutting, paddy cutter Machine, ultraportable paddy Cutter, Fast Cutting, communication.

1. INTRODUCTION

In dry season the green grass is hardly available for cattle, the crop residues like maize stovers, sorghum stovers, pearl millet stovers etc. are being used to feed the cattle. The crop residue can be feed to the cattle but they can't able to consume whole stovers and thereby 20-30% wastage. In India most of farmers have 2-3 cattle to meet their milk requirement as well as to earn some money for daily expenses. These farmers used to collect crop residues to feed directly or cut manually by crude methods using machetes into 3-4 pieces for easy intake by the cattle. This is perhaps the cost and output of electric operated cutter is high which is not appropriate for small farmers. In addition to this, in rural and remote area power supply is frequently not available. The handoperated cutters are also available. The cutting process of this type of cutter is characterized by slow operation, fatigue and low production rate. Also, it is facts that hand muscles are weaker than leg muscles. It is necessary to apply human power in such a way that drudgery is minimized by applying concept of human powered flywheel motor (HPFM). Ordinarily, pedaling a stationary bicycle is a form of exercise performed for pleasure or to

keep fit. It is gratifying if during such exercise the much-needed power is also being supplied for cutting.

The Human powered Flywheel motor comprises of three sub systems namely (i) Energy supply unit (peddling mechanism to supply power or to store energy in flywheel) (ii) Appropriate clutch and transmission and

(iii) a process unit. The complete unit consists of a bicycle mechanism, appropriate clutch and transmission system and a process unit which could be any process device needing power up to 7 hp. Referring Figure3.the rider sits on the seat and paddles the bicycle mechanism while the clutch is in disengaged position. Thus, the load on the legs of the rider is only the inertia load of the flywheel. The flywheel is accelerated to the speed of 600 RPM in minutes time by a young rider of the age group of 20 to 35 physically fit of height about 165 cm. The flywheel size is one meter rim diameter, 10cm rim width and 2cm rim thickness. Such a Flywheel when energized to the speed of 600 rpm, it stores energy to the extent of 3200 kgf-m. At the end of one minute, flywheel speed is reached about 600 rpm. Then the peddling is stopped, clutch is engaged and a stored energy in the flywheel is communicated to the process unit through the clutch. Obviously, the clutch is subjected to sever shock on account of instantaneous momentum transfer. This is so because as the clutches engaged, the flywheel is subjected to the process load and the process unit consumes energy of the flywheel. The energy stored in a flywheel gets exhausted in 15 to 50 seconds for application tried so far [1] to [6]. The capacity of such a system is in the range of 0.5 to 8.5 Hp. The functional feasibility and economic viability of this system has also been confirmed ([1] to [6]).

2.OPERATION & CONSTRUCTION

In this multi cutter the rotary motion is converted into linear Sliding motion. Scissors ring action is obtained due to reciprocating movement of cutter blade over stationery blade is used to cut the crops it is a walk behind type of harvester which is powered by the 1.2Kwatt, 7000 rpm petrol engine. With the help of shaft mechanism drive power is transmitted from gear box. As the required rpm at cutter is as less as 6000rpm; here gear is used to change the direction of drive in the gear system by 90˚ and reduce the speed to require. One of the output shafts of gear box is connected to gear mechanism which converts rotary motion of shaft into reciprocating motion of cutter blade. Reciprocating cutter blade slides over fixed blade and creates scissoring action responsible for cutting the crops. While, other shaft coupled to run a collecting mechanism consist of shaft with collecting plates bolted on it. Collecting belt simply carry cut crops sideway.

2.1 Major Parts of Machine

- Power head
- Grip
- Throttle trigger lockouts
- Front handle
- Drive shaft assembly
- Nylon cutter
- Cut-off knife
- Plastic debris shield assembly

2.2 Specifications of Engine

Engine : 2 stroke petrol

Speed : 7000 to 7500 rpm Saw Blade Diameter : 255mm

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Blade thickness : 2mm
Fuel tank capacity : 0.9 to 1.2 liters
Handle type : cycle both hands Power transmission method : Automatic centrifugal clutch

Blade rotation direction : Counter clock-wise

Weight: 7.4 kg

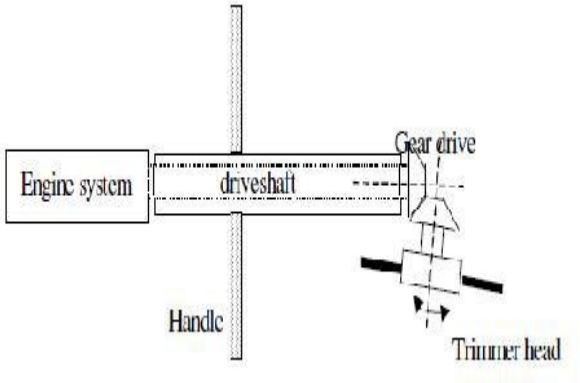
2.3Geometric layout

The best approach is to learn from similar problems that have been solved and combining the best to solve your own problem. A general layout to accommodate shaft elements e.g. gears, bearings, and pulleys, must be specified early in the design process. Shoulders are used for axially locating shaft elements and to carry any thrust loads, Common torque transfer elements: Keys, setscrews, pins press or shrinks fits, tapered fits. Small pinions are often machined onto shafts. Sequence of assembly should be thought. Use chamfers to ease assembly and avoid interferences.

Consider stress risers due to grooves and sharp steps in shafts.

1. Stress and strength : Static and fatigue
2. Deflection and rigidity: Bending deflection, tensional twisting, slope at bearings and shear deflection due to transverse loading on shaft.

Fig 2.1: Paddy cutting machine



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3. Vibration: critical speed.

Figure 2.2: Geometric layout

3. TESTING AND RESULTS

3.1 Test results for the Rice Harvesting

The performance test for the rice harvester machine was conducted at an average speed of 9.07-10.95 m/minute. With a theoretical work width of 75-100 cm 3-4 lines, a theoretical work capacity of 18.54-26.3 hours/ha was obtained. The fuel consumption of the machine was in the range of 0.60-0.86 l/ha. Under a dry rice field, a high cutting efficiency 99% was obtained, whereas under a wet rice field condition, its cutting efficiency was only 82- 85%. The field test results for a lawn mower that has been modified into a maize harvesting machine showed that the working capacity of the harvest was not significantly different from the land preparation machinery or from three row capacities of a reaper 18-19hours/ha, with working of efficiency >95% and fuel

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consumption of 0.8-0.9 l/hour. In this modification, a larger belt with a more ergonomic construction was added, so operators did not feel weary (tired) despite working more than

0.5 hours continuously.

This was in contrast to the original machine design, which used a smaller belt; hence it was less comfortable to wear.

Various values obtained while testing the machine in farm

S. No	Trimming Area (m^2)	Rate of fuel consumption (lit/hr.)	
		Nylon thread	Metallic cutter
1	10*1	0.6295	0.605
2	15*1	0.6498	0.595
3	20*1	0.6078	0.613
4	18*1	0.6295	0.605

S.No.	Trimming Area (m^2)	Rate of fuel consumption (lit/hr.)	
		Nylon thread	Metallic cutter
1	3*3	0.50376	0.6498
2	1.5*3	0.50364	0.6792
3	2.7*3	0.4929	0.5838
4	1.8*3	0.47652	0.6222

3.2 Test results on Grass Cutting

4. CONCLUSION

The Multi crop cutter is designed, fabricated and tested. This machine does not employees any use of power equipment's such as DC motors and it is fullyhuman operated. The use of this machine makes the harvesting process faster hence reduce most of the cutting time and labor required to operate the machine is also less. This machine is helpful for small as well as big firms. This human powered machine will help to improve an economical condition. This is new type of machine which is different to the other cutting machine which is used for harvesting purpose till now.

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