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Fabrication and Performance Test of an Ultraportable Crop Cutter

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ABSTRACT

Today, Agriculture especially in India need to concentrate in some aspects such as how to increase the productivity and profit, how to reduce the cost and how to solve the problem comes from workers. To overcome these, a new motorized cutter is fabricated specially for cutting various crop varieties during the time of harvesting and named as an ULTRAPORTABLE CROP CUTTER. It comprises three criterions such as “easy to fabricate, low cost and lightweight”. With this Ultraportable Crop 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 objectives are to fabricate and test the performance of the prototype of a motorized crop cutter for harvesting the crop.

Keywords

Productivity, Crop Cutter, Fabricate, Harvesting, Clutch

1. I NTRODUCTION

Agriculture is the art and science of crop and livestock production. In its broadest sense, agriculture comprises the entire range of technologies associated with the production of useful products from plants and animals, including soil cultivation, crop and livestock management, and the activities of processing and marketing. Many different factors influence the kind of agriculture practiced in a particular area. Among these are climate, soil, and water availability, topography, nearness to markets, transportation facilities, land costs, and general economic level. The primary agricultural products consist of crop plants for human food and animal feed and livestock products.

1.1 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. This harvesting operation requires 50% of the investment on the particular crop goes to harvesting the crop and its transportation due to increased in wages of the labor and reduce

in availability of labor leading to the high demand of the labor. So the ideas to reduce the dependent on workers in this harvesting, this project comes to solve all this problems where the new invention for machinery in harvesting which able to reduce the workers.

By using the tools like machinery, the dependent on the worker can be reduce, productivity can be increase, the cost can be reduce and the profit can be increase. From that, the main objective for this project is to design and fabricate the prototype of a motorized cutter to harvest crop for commercial used can achieve.

1.2 Objectives

I. Make the review about other research and study relevance to the title.

ii. Design the prototype of motorized cutter for a harvesting crop using some criteria such as low cost.

Material Selection

iii. Select suitable material, components and parts for this new invention.

iv. Fabricate the prototype of motorized cutter for a harvesting palm fruit using suitable process and concept. v. Preparing a report for the project.

1.3 Significance of study

This study is to design and fabricate machinery which can reduce dependent to workers which give much effect to our country in maximizing the profits to the farmers. To design and fabricate this machine, there are several criterion are selected such as easy to fabricate, low cost in long term, and can harvest high and with easy to use.

2. LITERATURE REVIEW

Crop cutting machine is an essential tool for the maintenance of yards. They vary in size, mode of operation, and power. The power source riding mowers for example are usually powered by a gasoline engine and are ridden and steered by the operator. Walk behind mowers are designed to be pushed by the operator and typically run on gasoline or electricity. Modern gas powered and electric powered lawn mowers cut grass with a single blade revolving at a high speed parallel to the ground. The blade is slightly raised along its rear edge to create draft that lifts the cutting blades before its cutting operation. Mulching mowers suspends clippings and other debris near the blade shredding them before blowing them straight down in the lawn where they serve as manure for future lawn growth.

Koori, (2010) designed a locally operated engine powered lawn mower. The mower is fitted with horizontal cutting blade attached to a vertical shaft. The mower was tested and the average effective field capacity and efficiency were 0.127 ha/hr and 88.4%respectively. Jeremy, (2005) designed and fabricated solar charged lawn mower. The machine was dependent on weather since the battery would be charged using photovoltaic panel (i.e. solar panel). The common disadvantage was that the engine runs down easily and the cost of production was high for an average individual to purchase.

Rotary movers were not developed until engines were small enough and powerful enough to run the blades at a high speed. Many people experimented with rotary blades in the late 1920s and early 1930s, and Power Specialties Ltd. introduced a gasoline-powered rotary mover. The story of one experiment in the design of rotary moving equipment is that of C Stacy, a farmer in the Midwest region of the United States. His concept was the use of a toothed circular saw blade mounted horizontally on a vertical shaft, which would be suspended at a height of approximately 2 inches (50 mm) and moved across a lawn to cut grass and other lawn vegetation at a uniform height. The power for his experimental mower was an electric motor.

The success of Stacy's design was limited by two factors: the relatively small diameter of the saw blades he used for his

experiments, which were about 8 inches (200 mm); and the fact that toothed circular saw blades are not an ideal tool for cutting free-standing grass and other plants. Stacy did not come up with any idea for a cutter similar to modern rotary mower straight blades, and soon dropped his experiments with rotary mowing.

The string trimmer was invented in the early 1970s by George Ballads of Houston, Texas, who conceived the idea while watching the revolving action of the cleaning brushes in an automatic car wash. His first trimmer was made by attaching pieces of heavy-duty fishing line to a popcorn can bolted to an edger. Ballads developed this into what he called the "Weed Eater", since it chewed up the grass and weeds around trees.

Victor and Vern's, (2003) designed and developed a power operated rotary weedier for wet land paddy. The complex nature of the machine makes its maintenance and operation difficult for the peasant farmers. Generally, in areas like ours, the conventional methods of grass cutting involved the use of cutlasses whichever met the maximum satisfaction. More so, it is strenuous, time and labor intensive.

In world the usage of agriculture equipment is increasing. In the usage of agriculture
Equipment's, India contributes only 10% as Conducted survey in year2012.two types of harvesting methods generally available in India are 1.Manual method2. Mechanized type of harvesting In Manual Harvesting to cut one acre of crop 15-16 labors are required they take 3 days to cut one acre and involves harvesting of 60-70 tons per acre with labors being paid 500-550 Rupees per ton of harvest hence total cost of harvesting per acre comes up to 30,000-35,000 Rupees. In mechanization now by using large scale harvesting machine takes about 6-7 hours for harvesting one acre averaging about 60-70tons with labor costing around 3,500-4,000Rupees per hour hence the total cost of harvesting per acre comes up to 20,000-25,000 Rupees.

With reference to literature available there are many types of lawn mowers, bush cutters and lawn tractors are exist in the market, which may not fulfill the capital and operational cost criteria. The main concentration of our design is the cost and operational ease

In case small form units it is very expansive, so we decide to develop the new harvesting machine to reduce the cost of harvesting. We start research on the harvesting methods and machines. In the development of ultraportable crop cutter we utilize the past data and techniques.
Therefore, there is the need to develop a locally, fabricated **Ultra Portable Crop Cutter** which can take care of this operation easily.

3. OVERVIEW OF MACHINE

3.1. Parts of a machine and its specifications

- **Power head**

Includes the Engine, Clutch, Fuel System, Ignition System and Recoil Starter.

Engine Parameters
Engine Type: Two stroke air cooled engine.
Power: 1.2 kW
Displacement: 43cc
Max crank speed: 7000-7500 rpm
Clutch Type: Centrifugal.
Ignition system: CDI, coil starter.
Fuel system: Carburetor feed fuel (petrol) system.

- **Grip**

Rear (right hand) handle made up of rubber.

- **Throttle trigger lockouts**

This lever must be held during starting. Operation of the throttle trigger is prevented unless throttle trigger lockout lever is engaged.

- **Stop switch**

"SLIDE SWITCH" mounted on top of the Throttle Trigger Housing. Move

switch FORWARD to RUN, BACK to STOP.

❖ **Front handle**

The Front (loop) handle is loosely assembled to the Drive Shaft assembly and must be positioned for proper cutting attitude and operator comfort.

❖ **Drive shaft assembly**

Includes the Rear (right hand) Handle assembly, Gear Housing assembly, Front (loop, left hand) Handle assembly, steel drive shaft and Safety Decal.

❖ **Nylon cutter head**

Contains replaceable nylon trimming line that advances when the trimmer head is tapped against the ground while the head is turning at normal operating speed.

❖ **Cut-off knife**

Automatically trims line to the correct length: 5" after head is tapped on the ground. If trimmer is operated without a cut-off knife, the line will become too long, the engine will overheat, and engine damage may occur.

❖ **Plastic debris shield assembly**

Included in plastic bag (co-pack). MUST be installed on unit before use, see Assembly Instructions. Shield assembly includes the Cut-Off Knife. Mounts on the Gear Housing Assembly just above the cutting attachment. Helps protect the operator by deflecting debris produced during the trimming operation. This shield must be replaced with the steel shield for blade use.

❖ **Throttle trigger**

Spring loaded to return to idle when released. During acceleration, press trigger gradually for best operating technique.

❖ **Spark plug**

Provides spark to ignite fuel mixture.

❖ **Arm rest**

Provides armrest during operation and protects arm from the hot engine.

❖ **Recoil starter handle**

Pull handle slowly until starter engages, then quickly and firmly. When engine starts, return handle slowly. DO NOT let handle snap back or damage to unit will occur.

❖ **Spark arrestor muffler or Spark arrestor muffler with catalyst**

The muffler or catalytic muffler controls exhaust noise and emission. The spark arrestor screen prevents hot, glowing particles of carbon from leaving the muffler. Keep exhaust area clear of flammable debris.

❖ **Fuel tank**

Contains fuel and fuel filter.

❖ **Fuel tank cap**

Covers and seals fuel tank opening.

❖ **Choke**

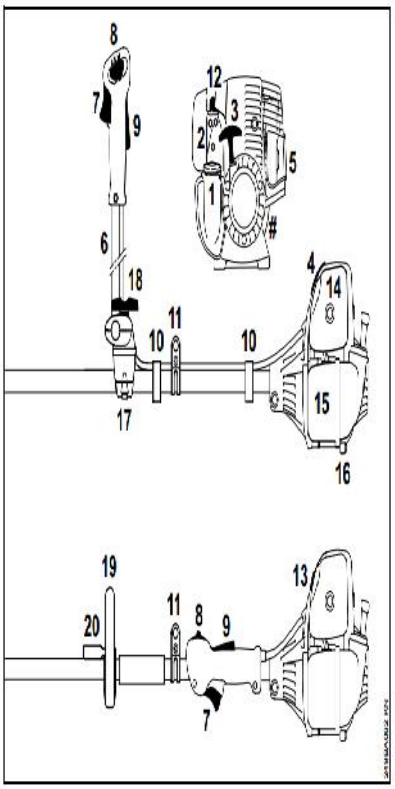
The choke control is located on the top of the air filter case. Move choke lever to "Cold Start" to close choke for cold start. Move choke lever to "Run" position to open choke.

❖ **Air cleaner**

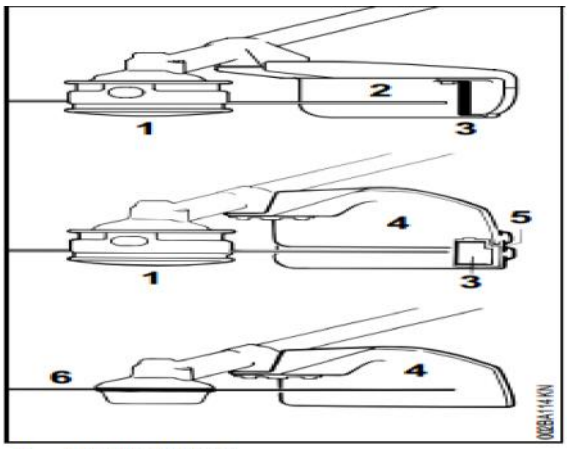
Contains replaceable filter element.

❖ **Purge bulb**

Pumping purge bulb before starting engine draws fresh fuel from the fuel tank, purging air from the carburetor. Pump purge bulb until fuel is visible and flows freely in the clear fuel tank return line. Pump purge bulb an additional 4 or 5 times. The objective of the study is to design and develop a locally fabricated engine powered **Ultra Portable Crop Cutter.**



1 Fuel Filler Cap
2 Carburetor Adjusting Screws
3 Starter Grip
4 Spark Plug Boot
5 Muffler (with Spark Arresting Screen, not Fitted on all Markets)
6 Bike Handle
7 Throttle Trigger
8 Slide Control
9 Throttle Trigger Lockout
10 Throttle Cable Retainer
11 Carrying Ring
12 Fuel Pump
13 Choke Knob
14 Air Filter Cover
15 Fuel Tank
16 Machine Support
17 Handle Support
18 Wing Screw
19 Loop Handle
20 Barrier Bar (not Fitted on all Markets)
Serial Number



1 Mowing Head
2 Deflector for Mowing Heads
3 Line Limiting Blade
4 Deflector with Skirt for all Mowing Attachments
5 Skirt
6 Metal Mowing Tool

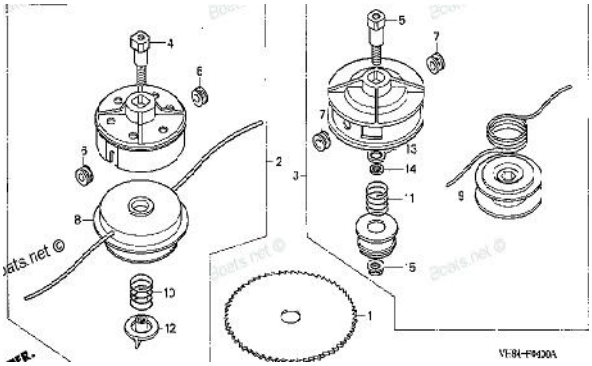


Figure: Nylon cutting thread arrangement

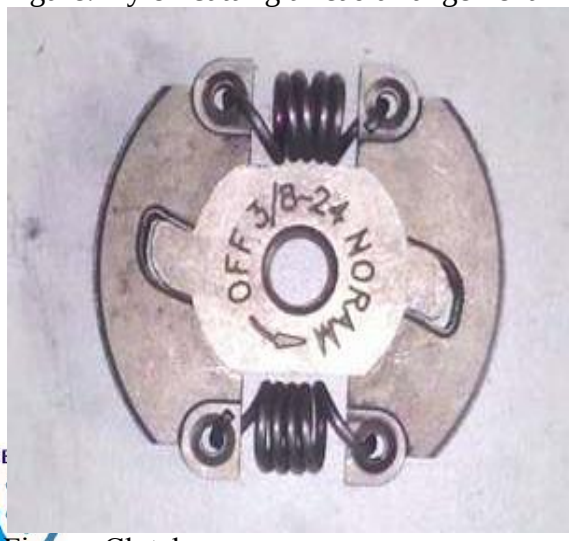


Figure: Clutch

Figure: Purge Bulb

3.2 Specifications

Cubic capacity: 43 cc
Power rating according to ISO 8893:1.2 kW
Rated speed: 7,000 rpm
Idle speed: 3,000 rpm
Engaging speed: 4,100 rpm
Carburetor (diaphragm carburetor): WALBRO WYL
Ignition system: CDI, Coil starter
Spark plug: NGK-CMR 6A
Electrode gap: 0.7-0.8 mm
Fuel consumption according to ISO 8893: 0.458 kg/h
Specific consumption according to ISO 8893: 426 g/kWh
Capacity of the fuel tank: 1 liter
Fuel: Regular gasoline

Engine oil: SAE 10W-30
Classification API SF or higher
Transmission ratio: 1.37
Dimensions, length x width x height (Without cutting tool): 1760 x 600 x 405 mm
Weight (without cutter guard, cutting tool, fuel):
MS-352 U 7.4 kg,
MS-352 C 6.6 kg

3.2. About power unit

The power unit of the brush cutter, power unit consists of the Engine, Clutch, Fuel system, Ignition system with recoil start, Exhaust system (muffler).

3.3 Types of cutters

There are various designs of tools and equipment used for harvesting the crops and threshing it separately. Sickles, hand tools and reapers for grain crops and diggers for tuber crops and rhizomes, operated with different power sources are used. Combine harvesters, both tractor mounted and self-propelled, are being very widely used for different grain crops. Functional requirements and principles of working of tools and equipment for harvesting and threshing.

Harvesting Tools and Equipment

Crops are harvested after nominal maturity with the objective to take out grain, straw, tubers etc. without much loss. It involves cutting / digging / picking, laying, gathering, curing, transport and stacking of the crop.

In case of cereals like wheat and paddy the plants are straight and smooth and ears containing grains are at the top whereas most of oilseed and pulse crops have branches, which create problems' in harvesting by manual or mechanical means. As per Bureau of Indian Standards the cutting and conveying losses should not be more than 2 percent.

Traditional method of harvesting

The harvesting of crops is traditionally done by manual methods. Harvesting of major cereals, pulse and oilseed crops are done by using sickle whereas tuber crops are harvested by country plough or spade. All these traditional methods involve drudgery and consume long time.

Mechanical harvesting equipment

Timeliness of harvest is of prime importance. During harvesting season, often rains and stones occur causing considerable damage to standing crops. Rapid harvest facilitates extra days for land preparation and earlier planting of the next crop. The use of machines can help to harvest at proper stage of crop maturity and reduce drudgery and operation time. Considering these, improved harvesting tools, equipment, combines are being accepted by the farmers.

Different type of mechanical harvesting tools / equipment, suitability for crops and their limitations

(a) Serrated blade sickle

It has a serrated curved blade and a wooden handle. The handle of improved sickle has a bend at the rear for better grip

and to avoid hand injury during operation. Serrated blade sickles cut the crop by principle of friction cutting like in saw blade. The crop is held in one hand and the sickle is pulled along an arc for cutting. Cutting of crop close to the ground is possible with modified handle. Energy requirement is 80-110 man-h/ha. It can be used effectively for harvesting of wheat, rice and grasses.

(b) Reapers

Reapers are used for harvesting of crops mostly at ground level. It consists of crop-row divider, cutter bar assembly, feeding and conveying devices. Reapers are classified on the basis of conveying of crops as given below:

Vertical conveying reaper windrower

It consists of crop row divider, star wheel, cutter bar, and a pair of lugged canvas conveyor belts. This type of machines cut the crops and conveys vertically to one end and windrows the crops on the ground uniformly. Collection of crop for making bundles is easy and it is done manually. Self-propelled walking type, self-propelled riding type and tractor mounted type reaper-windrowers is available. These types of reapers are suitable for crops like wheat and rice. The field capacities of these machines vary from 0.20-0.40 ha/h.

Horizontal conveying reapers

This type of reapers is provided with crop dividers at the end, crop gathering reel, cutter bar and horizontal conveyor belt. They cut the crop, convey the crop horizontally to one end and drop it to the ground in head-tail fashion. Collection of crop for making bundles is difficult. This type of reapers tractor mounted and suitable for wheat, rice, soybean, and gram. Performance of reapers with narrow-pitch cutter bar is better for soybean and gram crops

Bunch conveying reapers

This type of reapers are similar to horizontal conveying reapers except that the cut crop is collected on a platform and is being released occasionally to the ground in the form of a bunch by actuating a hand lever. Here, collection of crops for making bundles is difficult. Bullock drawn and tractor-operated models are available and they are suitable for harvesting wheat, rice and soybean crop it. Reaper binders the cutting unit of this type of reapers may be disc type or cutter bar type. After cutting, the crop is conveyed vertically to the binding mechanism and released to the ground in the form of bundles. Self-propelled walking type models are available but these are not popular due to high cost of twine. Reaper binders are suitable for rice and wheat.

(c) Strippers

The design of a tractor front mounted stripper is available for collection of matured grass seeds from the seed crops. It consists of a reel having helical rubber bats which beat the grass over a sweeping surface where the ripened seeds get detached and the seeds are collected in the seed box.

(d) Diggers

The design of groundnut and potato diggers of animal drawn and tractor operated types are available. The digging units consist of V -shaped or straight blade and 1ifter rods are attached behind the share. These lifter rods are spaced to allow the clods and residual material to drop while operating the implement. The plant along with pods/tubers is collected manually.

(e) Combines

Various designs of combine harvester having 2 to 6 m long cutter bar are

commercially available. Therefore, no research effort has been initiated under the Project up till now. However, the need of a small whole crop combine harvester is felt. The function of a combine harvester is to cut, thresh, winnow and clean grain/seed. It consists of header unit, threshing unit, separation unit, cleaning unit and grain collection unit. The function of the header is to cut and gather the crop and deliver it to the threshing cylinder. The reel pushes the straw back on to the platform while the cutter bar cuts it. The crops are threshed between cylinder and concave due to impact and rubbing action. The threshed material is shaken and tossed back by the straw rack so that the grain moves and falls through the openings in the rack onto the cleaning shoe while the straw is discharged at the rear. The cleaning mechanism consists of two sieves and a fan. The grain is conveyed with a conveyor and collected in a grain tank.

Figure 13: Cutters, Cutting heads

4. DESIGN AND CALCULATION

1. DIAMETER OF CLUTCH

Die of clutch=75 mm

2. DIAMETER OF DRUM

Die of drum= 85 mm

3. WHOLE DIAMETER OF SHAFT

Die of hole= d = 25 mm

4. NO OF ARM IN A CLUTCH

n=3

5. ANGLE OF HOLE FROM CENTER OF SHAFT

ɵ=37°

6. WIDTH OF SLOT IN A CLUTCH

W (cut) =2.15 mm

Centrifugal force on clutch

Of = M×Rdrum×ω²

=0.076×0.0425× (293.21) ² = 277.7 N

Normal force on clutch

F=$K\Delta\theta k+ (Rcm - Rbc) \times Fo/ (Rcont \times \mu - Rcont)$

K= γ kǿ

EI

l= 0.85 ×2.62(2× 105×4.32×10−94.5 ×103)

E= Modulus of elasticity

= 0.4325

I= Polar Moment of Inertia

kǿ= Stiffness coefficient

$I=bh3/12$

=0.0448× (105× 0.001)3/12
b= length of arm
= 4.32 × 10−9
h= width of arm
=0.4325 0.157 +(0.01685 −0.028)(277.7)(−0.0448) 1.28
= 53.77 N
Torque transmitted by a clutch
T=F×μ×Rdrum×n
=53.77×0.28×0.0425×3

= 2 N.m

Transmitted torque =1.011 Nm

Mass of shoe = 0.00498 Kg

Centrifugal force =118.54Nm

Spring force = 66.78Nm

4.1. Shaft

1. Material Selection

Many shafts are made from low carbon, cold drawn or hot-rolled steel Alloy steel: Nickel, chromium and vanadium are some of the common alloying materials. However ,alloysteel is expensive. Shafts usually don't need to be surface hardened unless they serve as the actual journal of a bearing surface. Hardening of surface(wear resistant):case hardening and carburizing, cyaniding and nitrating.

2. Geometric 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.

3. Vibration: critical speed.

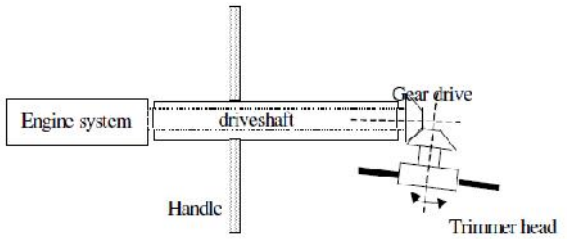


Figure: Power Train

5. FABRICATION

Fabrication is the process of making the machine or structure by using the various machining methods and fabrication techniques. The machining methods we used for the fabrication of the brush cutter are.

5.1 Mechanical operations

Turning

Turning is the removal of metal from the outer diameter of a rotating cylindrical work piece. Turning is used to reduce the diameter of the work piece, usually to a specified dimension, and to produce a smooth finish on the metal. Often the work piece will be turned so that adjacent sections have different diameters

Milling

It is one of the most commonly used processes in industry and machine shops today for machining parts to precise sizes and shapes. Milling can be done with a wide

range of machine tools. The original class of machine tools for milling was the milling machine (often called a mill).

Grinding

A grinding machine, often shortened to grinder, is any of various power tools or machine tools used for grinding, which is a type of machining using an abrasive wheel as the cutting tool. Each grain of abrasive on the wheel's surface cuts a small chip from the work piece via shear deformation. Grinding is used to finish work pieces that must show high surface quality (e.g., low surface roughness) and high accuracy of shape and dimension. As the accuracy in dimensions in grinding is on the order of 0.000025 mm, in most applications it tends to be a finishing operation and removes comparatively little metal, about 0.25 to 0.50 mm depth. However, there are some roughing applications in which grinding removes high volumes of metal quite rapidly.

Slotting

A machine tool with a vertically reciprocating planing tool used for making a mortise or shaping the sides of an aperture. Drilling is machining method is used to produce the circular holes in the machining component , to produce the holes in jobs various drill bits are used.

5.2. Fabrication techniques

Welding

Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, bycausing coalescence. This is often done (the weld pool) that cools to become a strong joint, with pressure sometimes used in conjunction with heat, or by itself, to produce the weld. This is in contrast with soldering and brazing, which involve melting a lower-melting-point material between the work pieces to form a bond between them, without melting the work pieces.

Nut & bolt joint

Fasteners can also be used to close a container such as a bag, a box, or an envelope; or they may involve keeping together the sides of an opening of flexible material, attaching a lid to a container, etc. There are also special-purpose closing devices, e.g. a bread clip. Fasteners used in these manners are often temporary, in that they may be fastened and unfastened repeatedly.

5.3. Shaft machining

For the drive shaft we choose the EN8 (medium carbon steel) material, it is economical and having the required strength for the equipment. EN8 is usually supplied untreated but can be supplied to order in the normalized or finally heat treated (quenched and tempered to "Q" or "R" properties for limiting ruling sections up to 63mm), which is adequate for a wide range of applications. Please refer to our selection guide for comparisons. EN8 is a very popular grade of through-hardening medium carbon steel, which is readily machinable in any condition. (Refer to our machinability guide). EN8 is suitable for the manufacture of parts such as general-purpose axles and shafts, gears, bolts and studs. It can be further surface-hardened typically to 50-55 HRC by induction processes, producing components with enhanced wear resistance. For such applications the use of EN8D (080A42) is advisable. It is also available in a free-machining version, EN8M (212A42) .EN8 in its heat treated forms possesses good homogenous metallurgical structures, giving consistent machining properties. Good heat treatment

results on sections larger than 63mm may still be achievable, but it should be noted that a fall-off in mechanical properties would be apparent approaching the centre of the bar.

6. TESTING AND RESULTS

After fabrication of machine we did experimental analysis, we conduct the four major tests they are

1. Grass cutting test

2. Testing of cane cutting

3. Testing of rice cutting

6.1 Test results on Grass Cutting

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

6.2 Test results on Cane Cutting

This design was tested against standard manual cutting on a farm. Tests were performed cutting a 10 m long sugarcane row. With each test,

(1) The time taken to cut the row,

(2) The amount of cane left behind (butt height) and

(3) The stalk damage at the impact zone were recorded.

Stalk damage was subjectively assessed using a damage classification developed. This classification scores a zero for a very clean cut and an eight for an extensively damaged stalk. Each test was repeated at least eight times, allowing for the calculation of means and standard deviations. It should also be noted that manual cane cutting was performed by inexperienced persons, and improved performances may be expected among experienced labourers. The brush-cutter was found to be easy to use, even with no previous experience in cane cutting, and although not tested, it is believed that it could be used on steep slopes. Various safety measures, such as protective clothing, glasses, ear covers and a blade cover were required to safeguard the brush-cutter operator. The brush-cutter weighs 15 kg compared with 0.8 kg for a standard cane knife. The brush-cutter, however, is supported by a waist harness, which eases movement and reduces ergonomic stresses.

6.3. 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 capacity of a reaper (18-19 hours/ha), with working of efficiency >95% and fuel 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

CONCLUSION

From this work the following conclusions were drawn For the work to be accomplished in 1acer area without a machine (crop cutter) or manually, it costs Rs:4200/- by a minimum of Rs:350/- per each labour in a day. Whereas , by using an ultraportable crop cutter wee can accomplish the same work in the same area (1acer) with only one labour (skilled labour), it takes 5-6 hours at a cost of only Rs:650/- (i.e., fuel cost Rs:300/- & labour cost 350/-). So by using an ultraportable crop cutter we can reduce the cost up to 80% . The performance through manual cutting cannot be. The same through out the day, as man get strained, whereas a machine cannot

Therefore , 80% of the time can also be saved by using the Ultraportable crop cutter. It is concluded that the device is most ecconomical.

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