Design & Fabrication of Agriculture Cutter

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Abstract— The problem faced by farmers who work on small fields while harvesting crops as it takes a lot of time, labour and effort to cut the crops manually. Although Harvesting machines are already available in the market but these are quite large and costly. Since farmers with small lands have no such large usage and also harvesting is done only twice or thrice in a year, it becomes difficult for small farmers to afford such kind of a machine. So, it becomes essential to make a portable and cost efficient semi or fully automatic crop cutting machine. To achieve this aim, a lot of ground research has been done in this project wherein various farmers of our village were met and their problems were understood. Based on all the findings, a design for a crop cutting machine has been developed which is expected to help small scale farmers. A prototype has been developed which is easy to operate and can be used for efficient and effortless harvesting of crops. The model so constructed, can be used by small scale farmers for increasing their profits by decreasing labor and machinery cost. This model will offer a superior and cheap technique to decrease labor and endeavors required in collecting crops.

Key words: Harvesting Crops, Labour, Farmers

I. INTRODUCTION

A. *Aims of Project*

- To prepare our self and to work individually.
- To develop an attitude of inquiry.
- To develop problem solving skill.
- To develop skill of process planning & decision – making.
- To develop ability of report writing.
- To develop the skill of analyzing & evaluating of available data.
- Apply knowledge about practical situation.
- Participate effectively-group work/ team work.
- To understand & accept information and information of running technology
- To increase the self-studies.
- To calculate the cost, cost estimation, & costing.
- To provide & develop the decision making.

B. *Selection of Project*

- Before selection of the project, survey of factors like,
- Feasibility
- Market requirement
- Availability of raw material
- Facilities of machines, equipments and tooling
- Time limit
- Economical etc. have been considered.

First we thought over many like,

- Combine harvester
- Lawn mover
- Machine operated sickle
- Reaper binder machine

C. *Why we Selected Agriculture Cutter?*

- Market requirement.
- Time limit.
- Economical.
- Design
- Ability of making project

D. *Construction*

- The main frame was brought in shape by welding. All the components were brought together and then bolted on the frame. The rear wheels were welded through an aluminium axle and front wheels were bolted on the main frame. 1hp motor was mounted on the frame using nut and bolts. The cutters were welded onto the front bottom of the main frame and the slider crank mechanism was bolted and welded. The engine runs the motor which starts the motion of the cutter blades via slider crank mechanism.

II. LITERATURE SURVEY

A. *Design*

The design of multipurpose agriculture cutter can be extended for cutting paddy, wheat, and lawn grass etc., by using solar powered motor. In present days the concept and technology employing this Non-conventional energy becomes very popular for all types of development activities. Finding solutions, to meet the "demand of energy" is the great challenge for Social Scientist, Entrepreneurs, Engineers and Industrialist of our country. According to them, use of Non-conventional energy is the only alternate solution for conventional energy demand. There are many applications in Agriculture Sectors. Multipurpose agriculture cutter which can be used for finishing work as well as for cutting long, thick grass, brush. It has been carefully designed for user comfort by considering ergonomics aesthetics. Particular attention has been given to avoid the pollution and worker tiredness.

A. Research Paper on [1] Bending and Shearing Properties of wheat stem of Variety gives the information on shearing and bending properties of wheat stem under various conditions of moistures and cutting height of crops.

B. *Components of Agriculture Cutter*

1) Scotch yoke mechanism
2) AC motor
3) Gear box
4) Cutter blade
5) Frame
6) Frame structure
7) Bearings
8) Wheels

a) 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

b) 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

c) 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

d) 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 900 to the stalk axis with knife velocity ranging between 2.28m/s to7.23 m/s the diameter of stem at42.6 % (wb) moisture content. The cutting force I directly proportional to cross sectional area "stem cutter was deign and developed by Atul R. Dange, S. K. Thakare, I Bhaskarao and Umarfarooq momin.

e) Literature review is done to solve the problems which are identified in studying the present Machine and to fulfill the input taken by field survey. For that we referred some papers namely "Conceptual design of a chickpea harvesting header", "Fundamental Limits in Combine Harvester Header Height Control", "Integrated Robust Optimal Design (IROD) of Header Height Control System for Combine Harvester", "Nonlinear System Identification on a Combine Harvester". We also referred some literatures on diesel engine and some literatures regarding how actually harvesting of chickpea done.

C. Methodology

Methodology followed

1) Studying the present design
2) Identifying the potential problems
3) Field survey Problem definition
4) Literature survey
5) Methodology Establishing functions
6) Generate multiple solution
7) Selecting best solution
8) Analysis and fabrication Testing
9) Documentation

This methodology was obtained from the research paper on [8] Design methodology of acrop cutting machine.

III. COMPONENT DETAILS

The components used for making the agriculture cutter are listed below:

1) AC motors
2) Scotch yoke mechanism
3) Star coupling
4) Gear box
5) Cutter blades
6) Frame
7) Wheels
8) Bearing with pedestal

A. AC Motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this is the conversion of mechanical energy into electrical energy and is done by an electric generator, which has much in common with a motor.

Most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force. In certain applications, such as in regenerative braking with traction motors in the transportation industry, electric motors can also be used in reverse as generators to convert mechanical energy into electric power. Motor is having 1 hp (0.746 kW) and 1440 rpm.

Fig. 1: AC Motor

B. Scotch Yoke Mechanism

The Scotch yoke mechanism is a reciprocating motion mechanism, converting the linear motion of a slider into rotational motion, or vice versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating part. In many internal combustion engines, linear motion is converted into rotational motion by means of a crankshaft, a piston and a rod that connects them. The Scotch yoke is considered to be a more efficient means of producing the rotational motion as it spends more time at the high point of its rotation than a piston and it has fewer parts.

C. Gear Box

Gear box is used to reduce the speed and increase the torque by using different types of gear combinations. We have used the warm type gear box where gear ratio is 10:1. The rpm of the output shaft of the gear box becomes 144 rpm. The torque is increased by 10 times.

Fig. 2: Gear Box

D. Cutter Blades

It is mounted at the front side of frame which reciprocates with SHM. The one part is connected to the scotch yoke mechanism which provides reciprocating motion to the cutters. The pair of two cutters are used for cutting. One blade is stationary and the other is reciprocating. The thickness of blade is 6 mm and made up of MS plate.

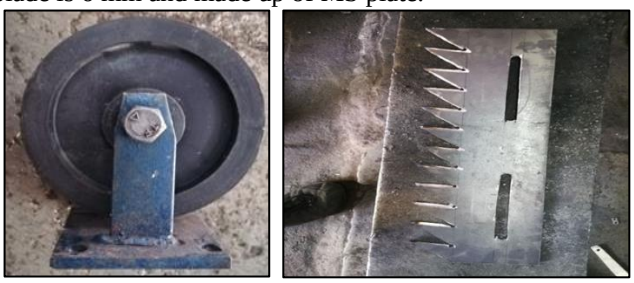

Fig. 3: Cutter Blades

E. Star Coupling

Star coupling is used to connect the motor shaft to the gear box shaft.

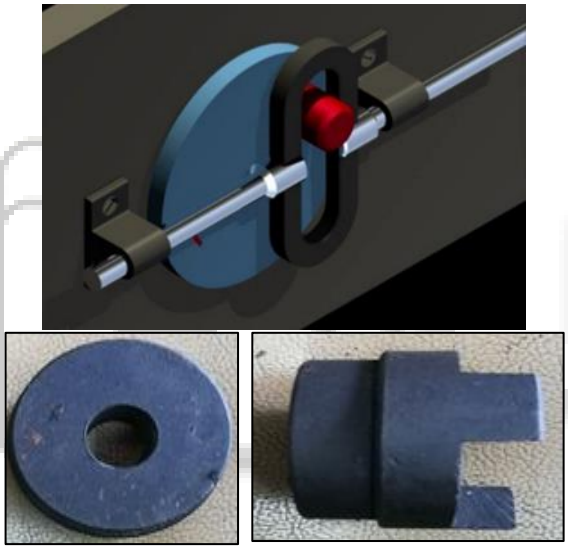

Fig. 4:

F. Wheels

Wheels are used for easy transportation of the system during harvesting. Plastic material wheels are used in this system for better grip slotted wheels are used in front side. The rubber wheels are used at rear side of machine.

Fig. 5: Wheels

G. Bearing with Pedestal

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

Fig. 6:

IV. SYSTEM DESIGN

Fig. 7:

V. CONCLUSION

The main focus of this project was to design and fabricate a crop cutting machine under certain constraints such as compact size, easy to operate, low cost etc. A model has been created within prescribed boundaries to meet the demands of the farmer and to make harvesting more flexible operation.

Based on the models and analysis presented in the previous sections, various conclusions can be drawn. A model which is easy to operate and manipulate has been developed which can be used for efficient and effortless harvesting of fodder crops. The model so constructed, can be used by small scale farmers for increasing their profits by decreasing labor and machinery cost. This model will offer a better and inexpensive method to reduce man power and efforts involved in harvesting crops.

Thus, the aim of this project is to construct a realistic and practical crop cutting machine which can be used by farmers for performing harvesting operation with easy and good efficiency has been achieved.

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