DESIGN OF SELF-PROPELLED ELECTRIC CROP CUTTER

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Abstract— **Now-a-days every field is heading towards automation, whereas agricultural field is still an exception. Current scenario says many countries do not have enough farmers to cultivate lands and even in India there are lots of families that are lacking an able member to toil during harvesting period. To overcome this problem, a robot farmer is the optimum solution. The objective of this research is to design a robot farmer which can work in the crop-fields for automatically cutting and placing crops aside. It will reduce the necessity of man-operated machineries. The total design of this robot farmer consists of 4 motors, a sensor, and an Micro_controller board. This research work will be helpful for the researchers who are interested to introduce automation in the agricultural sector and who want to perform any smooth cutting operation which requires holding of an object before cutting.**

Keywords— Robot farmer,sensor, scotch yoke mechanism,solar

I. INTRODUCTION

Recently India has seen a shortage of skilled labour available for agriculture. Because of this shortage, the farmers have transitioned to using harvesters. These harvesters are available for purchase but they are not affordable, because of their high costs. However, agriculture groups make these available for rent on an hourly basis. But the small holding farm owners generally do not require the full-featured combine harvesters. Also, these combine harvesters are not available in all parts of rural Maharashtra due to financial or transportation reasons.
Thus, there is requirement of a compact and efficient combine harvester which would be more accessible and also considerably cheaper. The mission is to create a portable, user-friendly and low cost mini harvester. The idea was to create a machine which is cheap and will reduce the labour required to harvest crops. Thus the idea is of using a non-conventional energy source such as solar power is being used in this project. This machine has the capability and the economic value for fulfilling the needs of farmers having small land holdings.

A. Conventional harvesting process:-

In conventional harvesting process, the crop is cut manually by labour and then this crop is get threshed by Thresher. It takes time and it is not effective as they can work only 5-6 hours in a day. Even though the small scale farmers who having land less than 5 acres, it takes two to three days to cut and harvest the crops. After plantation of crops, if proper care is not taken then non-required plants also grows with crop. So, to separate this unwanted plant while harvesting is tedious work. Aim of our project is to target small scale farmers who's having land less than 10 acres.

Fig1:-Manual crop cutting

From past few years, government and private sector working together to overcome the problem occurring in conventional process.

B. Land Statistics: -

There are certain regions in Maharashtra where new harvesting methods are adopted, but these are not implemented at the ground level. The reason behind this is high cost of machines and its maintenance cannot be afforded by small scale farmers, even though these machines available

on rental basis. Down the years, the agricultural land is decreasing and average land per farmers is also degrading.

II. LITERATURE REVIEW

[1]Chieh (2012) converted internal combustion engine operated brush cutter into the electric brush cutter. To obtained some very attracting advantages such as low vibration and acoustic noise, free of air pollution and low using cost, a DC motor was used as the mechanical power source of new electric type brush cutter. In addition, a Li-ion battery and electronic control board designed for DC motor speed control and circuit protection purposes were included as well.

[2]Okafor (2013) designed and developed self-powered lawn mower. The heart of the machine was a battery-powered dc electric motor. It comprised of a system of speed multiplication pulleys which drive the cutting blades and the charging unit comprising of a 12V alternator and a lift mechanism meant to alter the height of cut.

[3]Amrutesh *et al*. (2014) fabricated solar powered grass cutter using scotch yoke mechanism. The results obtained was satisfactory. Suitable for a common man as it was having much more advantages i.e., no fuel cost, no pollution and no fuel residue, less wear and tear because of less number of moving components. This system was having facility of charging the batteries while the solar powered grass cutter was in motion.

[4]Nkakini and Yabefa (2014) developed a manually operated apparatus for cutting grass with an internal spur gear system which transfers the torque to the mower spiral mechanism. The cutting mechanism was made of a flat blade rigidly fixed to the frame behind the spiral arrangement which was configured to contact at least one-reel bar of the spiral blades during the rotation of the spiral mechanism.

III. AIM AND OBJECTIVE

Aim of this project is to design and develop small scale low cost compact harvester which reduce the overall cost of grain harvesting in the form of labour cost and harvesting cost.

- To provide proper utilization of wastage which is useful for cattle.
- To reduce overall harvesting time as that of traditional harvesting time.

IV. METHODOLOGY

As the requirement for grains is increasing day by day, therefore the target was to create the machine which is affordable to each and every farmer, which is cheaper, efficient and will reduce the total harvesting cost.

To achieve this aim, it is decided to follow the following steps:

- To understand farmer's problem which they are facing about harvesting, for this it is decided to interview the farmers. So as decided we surveyed the farmers who are having land less than 5 acres.
- Design of small scale harvester.

4.1. Survey of problems which are farmers facing:

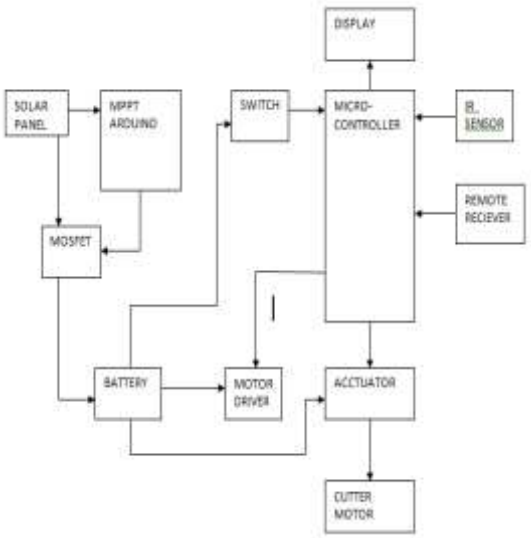
The design is based on the requirement and demand for compact efficient and affordable harvester. This demand could be seen only with interaction with farmers of having land less than 10 acres. The main moto of this survey was to see and collect information about harvesting methods which are being used by them, the problems are being faced while using these harvesting methods and also to see through a farmers life while this harvesting process gets carried out.

The following questions were asked to the farmers:

- machines available for harvesting?
- machines cost?
- Are these machines feasible for small scale farmers?
- traditional techniques used for harvesting?
- Can a small scale harvester be able to satisfy the increasing prices of labour?
- What is the labour cost for harvesting, as it is the most labour intensive work?

From these questions, we got the basic idea about the current situation of small scale farmers. We also found that there is essential to have small scale harvester with each farmers for reducing there harvesting cost.

V. GENERAL BLOCK DIAGRAM



A. Components:-

1.DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

The PMMC RS-775 motors are used to drive the wheels which are also used in hand driven drill machines. These motors have high torque and is easy to control its speed.

These are very economical and easily available motors.12v DC supply is sufficient to drive this motor and its motion can be electronically controlled such as forward,reverse,left,right.

Fig3:-DC Motor

2.Cutter

Cutter blade assembly consist of a sliding cutter blade and a stationery cutter blade. The cutters used are of triangular shape. In sliding cutter blade, cutter blade is made of 3 mm SS plate and in stationery cutter plate; cutter blade is also made of 3 mm SS plate. The stationary cutter plate can be directly bolted and fixed on frame. Sliding cutter blade has stroke length of 76mm and the length is 350mm; it allows sliding motion of moving blade to be in straight line.

Fig 3:-cutter Blade

3.Conveyer System

When the dry crop cut by cutter blade then these crops get transfers with the help of guider to the side trench of crops .The conveyor belts collects the crops and transfers it on to side desired side of the machine.

4.Solar Panel

Fig 4:-Solar Panel

A PV module is an assembly of photo-voltaic cells mounted in a frame work for installation. Photo-voltaic cells use sunlight as a source of energy and generate direct current electricity. A collection of PV modules is called a PV Panel, and a system of Panels is an Array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

5.Design

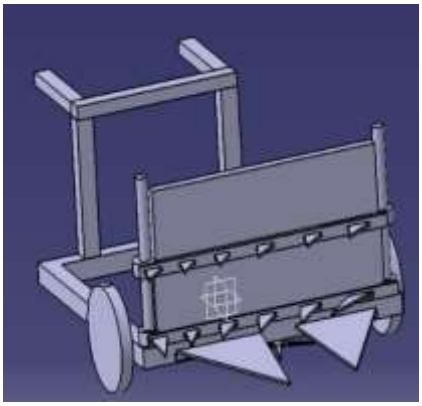


Fig 5:-Design of Crop Cutter

VI. WORKING

This project is operating on a microcontroller. In this, microcontroller there are 4 ports present as input and output port we will use two ports one as input port and second is an output port.

In input port we will connect an input buttons Forward,Reverse, Left, Right. When forward button will pressed then High bit will pass from input port and get output to output port of microcontroller. When reverse button will pressed then High bit will pass from input port and get output to output port of microcontroller.

When left button will pressed then High bit will pass from input port and get output to output port of microcontroller.

When right button will pressed then High bit will pass from input port and get output to output port of microcontroller.

Similarly, in input port when start/stop button is pressed, accordingly the operation of cutter will be carried out by microcontroller.

VII. CONCLUSION

This multipurpose agriculture cutter is the replacement of the petrol/diesel engine cutter present in the market. The solar-powered agriculture cutter is the implement in a petrol engine. This cutter is totally Eco-friendly and is so useful to the people for multipurpose also. The cost of the system is reduced because of the use of solar energy in the replacement of conventional fuel energy. This cutter is more suitable to the people for the cutting purpose because of is easier handling. The common man can also offer this because of its advantage like less cost, pollution free, easy to operate, time-saving and no waste. But compared to all parts of cutter assembly solar panel is costlier and at present in order to curtail global warming and ozone depletion, the government of India offering a subsidy for solar equipment to avoid such effect on the environment, so in present days it is expected to operate by using solar energy.The panel use for this is not much costly, it can save more fuel and the money which is for the fuel purchase. The maintenance and operating cost also reduce in this way the solar-powered multipurpose agriculture cutter is completed successfully within the working days of the project.

VIII. REFRANCES

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