

A JOURNAL ON DEVELOPMENT OF SOLAR POWERED MULTI CROP CUTTER

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ABSTRACT

This paper represents the project work carried on development of solar power crop cutter. We mechanism for cutter of crop cutter work on solar power so that we can easily cut grass in minimum period of time. This set up is used to cut the multi-crops at a time, which help the small scale farmers. This cutter is been invented because of low cost, high compatibility, and use for rough use. This set up uses the solar power, which is provided with different blades, solar plate, rubber wheel, DC motor and battery arrangement which results in transmission of this solar power into reciprocating motion of cutter at the end of which the crops get cut easily and perform various task as per requirement. We have made changes in the existing machine to make its application easier at reduced cost. Our main aim in Cost and pollution control is attained through this Project work.

Keyword: - Crop Cutter, Solar Panel, reciprocating motion etc.

1. INTRODUCTION:

The basic objective of this project work is to develop compact multi- crop cutter operated on electric motor running through a solar energy. By implementing this project we can eliminate a lot of difficulties in agriculture sector. Power plays a great role wherever man lives and works. The living standard and prosperity of any nation vary directly with the increase in the use of power. The electricity requirement of the world is increasing at an alarming rate due to industrial growth, increased and extensive use of electrical gadgets.

In this context, today's, best alternative source is solar energy. A solar powered Multi Crop-cutter was developed on the principle of grass mowing. The sun provides sustainable amount of the energy used for various purposes on earth for atmospheric system. The total solar energy is estimated to be 30,000 times greater than the total annual energy of the world. The solar powered Multi crop cutter is based on the same principle that other early inventions of crop-cutter works on. It uses the Flat plate solar collector to generate the energy needed to power the mower. It is assumed that a crop-cutter using solar as the energy source will address a number of issues that the standard I C Engine and crop-cutter worked on electric motors do not. A crop-cutter with solar energy will be easier to use, it eliminates down time and also it is user friendly.

Solar powered Multi-crop cutters can be described as the application of solar energy to electric energy converted and applied to motor which revolve a blade which does the cutting of crop. Solar energy is the renewable energy. We are developing such crop cutter which has easy to use. We are going to use solar energy to generate power which is stored in the battery. This supply is distributed in all section as per our requirement. Using Flat Plat Solar Collector panel generate the energy needed to power the cutter. The dangerous emissions produced by the gasoline spillage in that of the I C Engine into the atmosphere are also eliminated.

1.1 LITERATURE REVIEW:

P.Amrunesh et al.[1] Solar Grass Cutter with Linear Blades by Using Scotch Yoke Mechanism, the paper presents, solar grass cutter is a machine that uses sliding blades to cut a lawn at an even length. Even more sophisticated devices are there in every field. Power consumption becomes essential for future. Solar grass cutter is a very useful device which is very simple in construction. It is used to maintain and upkeep lawns in gardens, schools, college's etc. He has made some changes in the existing machine to make its application easier at reduced cost. His main aim in pollution control is attained through this. Unskilled operation can operate easily and maintain the lawn very fine and uniform surface look.

VarikutiVasantha Rao et al .[2]Multiple Power Supplied Fertilizer Sprayer, In this paper, the design of multiple power supplied fertilizer sprayer has been presented. The proposed system is the modified model of the two stroke petrol engine powered sprayer which minimizes the difficulties of the existing power sprayer such as operating cost, changing of fuel etc. The two stroke petrol engine has been replaced by a direct current motor and operated by the electrical energy stored in the battery attached to the unit. It could also be operated on direct current during rainy and cloudy weather conditions. This system can be used for spraying pesticides, fungicides, fertilizers and paints.

Linz, A. Ruckelshausen and E. Wunder(2014) et.al [3] The authors is working in the fields of unmanned or remote controlled autonomous field robots, navigation, image-based sensor fusion as well as agricultural applications. In particular field robots have been applied for a few years in outdoor agricultural field applications. Within an interdisciplinary research group these technologies are transferred to robot applications in vineyards and orchards. The goal is the availability of an autonomous service robot, whereas first applications are site-specific plant protection (e.g. precise spraying), mulching and picking up fruit boxes. A first version of the robot with electrical drives and precise sprayers has already been developed.

Mrs. Melba D'Souza et al [4]Presently, manually handled device is commonly used for cutting the grass over the field which creates pollution and loss of energy. The wireless grass cutter system puts forth an automated lawn mower mechanism. This will reduce the effort required for cutting grass in the lawns and solar power used will help to contribute in lowering pollution. The robotic vehicle is equipped with a grass cutter blade that allows for grass cutting at high RPM. The system has a smart functionality that allows it to cover the complete area of a lawn or garden by detecting corners using ultrasonic sensor and moving in a raster manner in order to cover the entire area. This efficient system uses an Arduino Mega microcontroller in order to achieve this functionality. The Arduino will act as the brain of the project which will send commands to the grass cutter. It also controls the movement of motors which help for the movement of the cutter.

1.2 PROBLEM IDENTIFICATION:

As we know, India is an Agriculture based country and the agriculture is the major source of income of many peoples of India, which, needs to concentrate in some aspects like how to increase productivity and profit, how to reduce cost and how to solve and ease the problems of farmers.

To overcome this new Solar powered operated cutter is fabricated for cutting of multiple types of crop during cutter and named as "Solar Powered Multi-Crop Cutter". It possesses five criterion ease in manufacturing, ease in handling, low cost, light weight and no pollution (Eco-Friendly).

Now a day's pollution is a major issue for whole world. In case Gasoline crop cutters due to the emission of gases its result gives pollution. Also, recently in rural areas, has seen a shortage of skilled labor available for agriculture. Because of this shortage the farmers have transitioned to using cutters. These cutters 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. Due to financial or transportation reasons these combine cutters are not available in all parts of rural area. Thus, there is a need for a compact and efficient cutter which would be considerably cheaper and also more accessible. Thus, the objective of the project work is to create a portable, low cost mini cutter which will be userfriendly. The price of fuel is also, rising hence it is not efficient and economical. So the Solar powered crop cutters are introduced. All these problems mentioned above, gave us the basic idea about what was required in the current situation. The idea was to create a machine which will reduce the labour required to cut crops and which is cheap and compact. This machine has the capability and the economic value for fulfilling the needs of farmers . This machine is cost effective and also easy to maintain and repair for farmers

1.3 METHODOLOGY:

The solar powered multi-crop consist of a base frame, supporting frame, DC motor, solar panel, switch, electric wiring, battery, wheels and sharp blades. All this components are mounted on a frame, along with wheels are fitted to this frame. The movement of this cutter is done by pushing i.e. by using human powered. This crop cutter is highly efficient as it works on solar powered and it is affordable to small farmers due to its simple working. The advantage is it does not require any maintenance, easy to handle and it can cut different crops with the help of simple height adjustment by nut and bolt mechanism.

3D MODELL:



FIG:3D MODEL AND ASSEMBLY OF MACHINE



FIG: SIDE VIEW OF ASSEMBLY

The working principle of solar grass cutter is it has a panel arrangement at an in such a way that can receive solar radiation with high intensity easily from the sun. The solar panel converts solar energy into electrical energy. This electrical energy is stored in batteries by using a solar charger. The main function of the solar charger is to increase the current from the panel while batteries are charging. The motor is connected To batteries through connecting wires. Between these mechanical circuit breaker switch is provided. It starts and stops the working of the motor. From this motor, power transmits to the mechanism and this makes the blade to reciprocate by the shaft this makes to cut the grass. Fig. shows circuit diagram of solar operated grass cutter .

2.Detail Design:

Design of cutting blade

types of cutter bar - knife edge section

length of cutter bar-400mm

knife section- standard

Blade type-Rectangle

Width-50mm

Thickness-5mm

Angle between cutting edge and axis of knife section-31°

Rake Angle-22°

Material-High carbon steel

Torque of the motor

$$P = \frac{2\pi NT}{60}$$

Where, N – speed in rpm

Following are the specification of DC Motor :

Speed:-50 RPM DC Motor

Power of motor, $P = V \times I = 12 \times 1.5 = 18W$

$$18 = \frac{2\pi(50)T}{60}$$

$$T = 3.43Nm = 3.43KNmm$$

Diameter of the shaft

Torque is also given by,

$$T = \frac{\pi\tau_s d^3}{16}$$

Where, d – diameter of the shaft

τ_s = Shear stress of the shaft (MS) =48Mpa

Therefore, **d = 7.46mm**

The nearest standard size is d = 8 mm

P – Power in Watts Shaft diameter which transmits motion from

T – torque in Nmm motor to blade .

3.CONCLUSIONS:

To conclude, we believe that the project was a successful one since we could meet most of the targeted requirements with pleasant teammanagement. The terms stated at the beginning stage was accomplished with a rather simple design which maintain throughout the project. We hope that the experience learned from the project, including the planning in the designs and the skills in utilizing different tools could help develop our career path in the future. The Development of Solar powered grass cutter was an important aspect of this study because a strong interaction between the different parts was needed. So we are satisfied with our project work. The basic objective of this project work is to cut the grass in optimum manner without failure . Beside these, following objectives of project work are getting fulfilled .We successfully manufacturing a solar powered grass cutter for the ease of cutting crop a faster rate .We simplified the complex driving mechanisms used in earlier project and giving it simple and high working capacity .We carried out the complex crop cutter easily. We achieved crop cutter process at cheaper side and eco-friendly.

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