

## **DESIGN AND FABRICATION OF SOLAR POWERED MULTI-CROP WEEDER**

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***Abstract: Agriculture plays a vital role in Indian economy. The reason behind reduction in the productivity of agricultural is weeds. Weed removal is serious problem faced by the farmers that will reduce the farmer interest to continue cultivation. The main objective of this paper is to construct and develop a solar powered weeder to provide the best opportunities for cultivation. The working of this project is depends on the solar panel .This is motorized equipment driven by the solar energy which moves blades to cut the weeds by chain sprocket mechanism. The design is simple and easy to operate. This equipment is designed to minimise the human effort, to reduce the cost and provide the efficient work output. This weeder will fulfil the requirements of the marginal farmers.***

***Keywords: Agriculture productivity, weed control, solar energy, efficient work output.***

### **1. INTRODUCTION**

Weeder is a mechanical implement used to take away the unwanted plants in the field. Indian agriculture is reliant on human power and also animal power. It is a time consuming process. Most of the Indian farmers are having small agricultural land. Farmers still follow the conventional methods in the cultivation for weeding purpose. These methods require high labour force to perform the operations. The main disadvantage of the modern equipment is its cost effectiveness because most of them are mechanized and driven by fuel. So they can hardly afford such costly equipments. [1] Single row weeder was developed for weeding purpose but are not used widely in the agricultural operations. This is because lack of awareness on the newly invented single operated weeders. Weeding operation was done mostly by the hands. The weeding performance of the hand tools are good but mostly time consuming [3]. These tools may have the chances of injuring the performer. [4] The different postures of the workers have been studied on the basis of their working conditions on the field. Agriculture is not an easy task which includes different stages. Different working postures have been studied to develop an ergonomically suitable weeder for workers. [3] Different types of weeders have been studied to understand the weeders in a better manner. The comparisons of the weeders helped to understand the present weeding tools which perform better operation. But mostly fuel operated weeders are available in for the wet land cultivation. The performances of the equipments are efficient but the fuel rates are going up in the present situations. Soli tillers and weeders are non-traditional tools used for weeding. The mechanical implemented tools plays major role in the weeding process helps to achieve the high productivity of the crops yields but they are labour intensive. In order to overwhelm this, a new type solar powered rotary weeder is designed based on mostly available nonconventional energy. This motorized agricultural equipment works with the support of rotating blades that breaks the soil to cut the weeds. This machine helps to minimize the expenses caused by labour and fuel.

### **2. WORKING**

This equipment is a type of agricultural weeder operated with the utilization of solar power. The drive mechanism of this machine includes one solar panel, two electrical dc motors, two batteries, rotary blades and chain sprocket mechanism. One electrical dc motor is connected to the wheels of the machine with the help of chain sprocket mechanism. These mechanisms transmit the power from the motor to the shafts of the wheels and weeder blades. In this machine J-type rotary blades are used. This shape of blades mainly used for tilling hard soils such as dry lands. These rotary blades are attached to the rear end at the roots of weeds and are driven by another electric dc motor. The two motors are connected to the two batteries individually in series. Batteries are connected to the solar panel. The solar radiation immersed on solar panel. By this process the generated solar energy is converted into electrical energy. This energy is stored in batteries. This stored energy is supplied to the dc motors when they needed through which the wheels and weeder blades are rotated. The motor speed is varied by altering the operated voltage output through the speed controller.

### 3. COMPONENTS

The main parts that are used in the fabrication of solar powered weeder are:

- 3.1 Frame
- 3.2 Solar panel
- 3.3 Geared Dc motor and batteries
- 3.4 Chain sprocket mechanism
- 3.4 Weeder blades
- 3.6 Speed controller and charge controller



Fig1. Fabricated model

#### 3.1 FRAME:

The frame is the most important part of this machine shown in Fig. 2. The top part of the frame holds handle and at the bottom end the chassis is arranged to fix the Dc motors and batteries on the fame. Arrangements are made on the handle to fix the solar panel and to hold the speed controller. The chain sprocket mechanism is fixed below the chassis of the fame with the support of two pedestal bearings at both the ends of the chassis. Two wheels are connected to the frame with the help of locking pins.

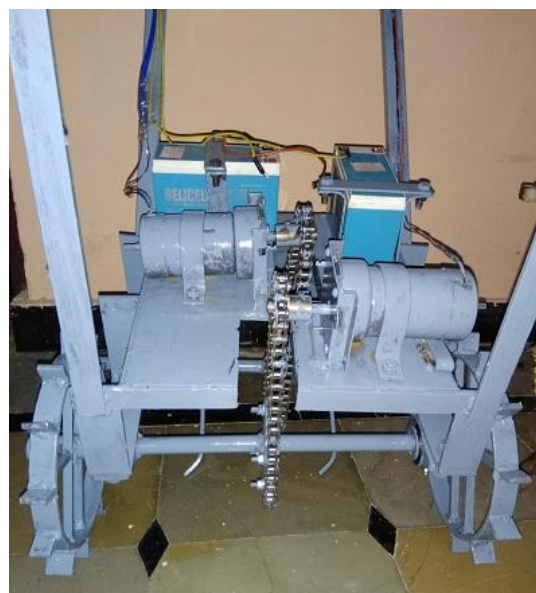


Fig2. Frame

### **3.2 SOLAR PANEL:**

The renewable energy in the form of sunlight was absorbed by the solar panel which converts that light into electricity to provide power for electrical loads. This panel is mounted on the frame with help of supporting structures shown in Fig1. A solar module or PV module is packaged; series connected many individual solar cells. A single solar cell cannot produce required power output so multiple solar cells are installed in a module to get required output. Under the standard test conditions each module rated DC output power is ranges from 100 to 360W. PV system generates and supplies electricity for the trading and building applications.

### **3.3 GEARED DC MOTOR AND BATTERY:**

This type of DC motor contains a gear head assembly which is connected to the electrical motor. The gear head helps in reducing the speed by increasing the torque. This type of motors is used in different applications such as electrical propulsion, commercial jacks, cranes, paper machines and rolling mills. By altering the operational voltage, motor speed is varied. Two 12V DC motors are used individually for power supply. These DC motors are fitted on the frame as shown in fig1. Two 12V batteries are used in this project to supply the energy to the motors while they are in operational condition. Connections of these batteries made in series and are placed on the frame as shown in fig1.



Fig3. 12V DC motor

### **3.4 CHAIN SPROCKET MECHANISM:**

Chain drive is mainly used to deliver power from one part to another with the help of linked chain and sprockets. This mechanism used in the wheels of a vehicle for power transmission, particularly in bicycles and motorcycles. It is also having many different applications besides vehicles. The roller chain which delivers power is known as the drive chain or transmission chain. Chain drives having chain links, which are meshes with toothed sprockets. Big sprocket is locked to the shafts of the driver and small sprocket is to the driven machinery. A form of positive power can be delivered with chain drives. The sprocket tooth meshes with the links of the chain. It generates the speed ratio in a positive manner.



Fig4. Chain drive

### **3.5 WEEDER BLADES:**

Weeder blades are the parts which are directly having an interaction with the soil and are having high impact on the weeding operation. The weeder blades are made up of mild steel. Generally weeder blades are connected to a shaft by means of permanent welding. But in this rotary type solar powered weeder, blades are attached to a flange mounted on a rotating shaft usually with bolts and nuts. The blades are of three types and are used as weeder blades and tillers namely C- shaped blades, L- shaped blades and J – shaped blades. Two units of rotary cutting blades are used for weeding operation. Each unit consists of four J- shaped blades connected in orthogonally opposite direction on a rotary flange which is attached to shaft.



Fig5. Shape of the weeder blade

### 3.6 SPEED CONTROLLER AND CHARGE CONTROLLER:

Speed control is an electric circuit used to control the speed of the motor. This control is done by the knobs which are linked to the potentiometer provided in the circuit. Through this the operator can change the motor speed according to the requirements. This gives the required operational speed. The speed can be controlled by altering the voltage with the help of knobs.



Fig6. Speed controller

A charge controller manages the power going into the battery bank from the solar panel. It ensures that the deep cycle batteries are not over charged during the day, and the power doesn't run the backwards to the solar panels overnight and drain the batteries. This charge controller can charge two 12V batteries that are connected in series at a time without any power losses.



Fig7. charge controller

## 4. RESULTS AND DISCUSSION

- The fabricated equipment is easy to operate and suitable for dry land crops.
- The depth of cut is maintained at 3 to 5cm. The operator can vary the depth of cut by adjusting the blades.
- This equipment minimizes the man power.
- It gives the efficient work output.

## **5. CONCLUSION**

An effort is made to Design and fabrication of solar powered multi crop weeder is done. Provisions are made to utilize solar energy was successfully completed. This work is executed with an idea to achieve an effective solution to the weed control. The designed equipment is safe to use and eco friendly. Single operator can operate this machine to weed out the plants. Labour requirement and fuel charges are greatly reduced by this weeder.

## **6. REFERENCES**

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