SOLAR PADDY WEEDER

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ABSTRACT

The main objective of this proposal is to design a paddy weeder which utilizes solar power for its operation. There are six weeding drums which are connected in the front side and two large wheels at the back side for turning the device. To provide a high torque in the farm fields a 100V DC cumulative compound motor is connected as a drive, source is supplied by using a 26AH lead acid battery connected with the solar panel. Hence it is operated at a speed of 2.5m/s Buck Boost converters are used to regulate it.

1. INTRODUCTION

Weeds are a major problem in paddy cultivation. Herbicides are usually used for weed controlling despite the fact that herbicides have many negative effects due to environmental contamination. It has been understood that mechanized weeding significantly improves weeding efficiency as well as the quality of weeding. However, it may consume solar energy for operations. Cono-weeder, which is mechanized weeding (manual) method, capable of weeding about 0.18 ha/day. However, operational difficulties and slow weeding rate have been identified as major drawbacks of this weeder, particularly in large-scale cultivation.

The specifications of a paddy field, which is cultivated by using a mechanized seeder, are as Follows. (Ground requirement for power weeder)

- The space between each row of paddy is about 8 inches.
- The spaces between two paddy plants are 2-3 inches.

The machine is to be designed to remove weeds while travelling along the weeding area of the field as Shown in Figure 1.

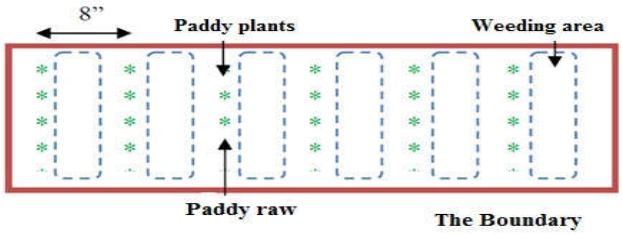


FIGURE-1

Simultaneous removal of weeds in several weeding areas is a key requirement forefficient operation. Further, a mechanism is needed to move the machine between weeding areaswithout damaging paddy plants. The major mechanical engineering considerations in the design are:Driving mechanism, Weeding mechanism, turning and row changing mechanism, PowerTransmission, Floating mechanism.

2. OBJECTIVES AND METHADOLOGY

The main objective is to design and fabrication of a power weeder, while minimum damages done to Paddy plants, cost effectiveness, easy manual ling, low weight, and fabrication by using freely available Components and easy maintenance are main features of this design. The following methodology was used:

- Development of the concept
- No or minimum damage to the paddy
- Easy maneuvering on wet fields

- Dynamic analysis and mechanical design
- Kinematic analysis
- Power transmission and drive systems design
- Design of mechanical components
- Assembly of components
- Fabrication of components
- Field testing and improvements
- the cost analysis

DEVELOPMENT OF THE CONCEPT *CHAIN DRIVEN SYSTEM*

The weeding drums are driven by a chain drive arrangement as shown in Figure 2. Accordinglyspecially designed double-acting weeding drums are proposed in the design to remove weeds while providing the necessary traction to move the machine forward.

DEFERENTIAL SPEED OF WEEDING DRUMS

Two weeding drums which rotate at a deferential speed are suggested for each row. As shown in Figure 2,

Wheel Dimensions	Dimensions (H*W)inches
Front Weeding drums	10.8*7.5
Back Wheel	30*2.5

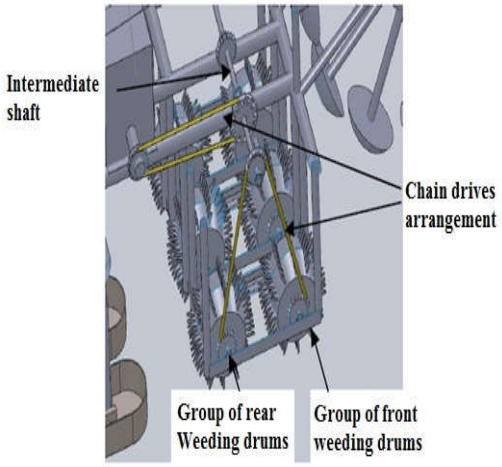
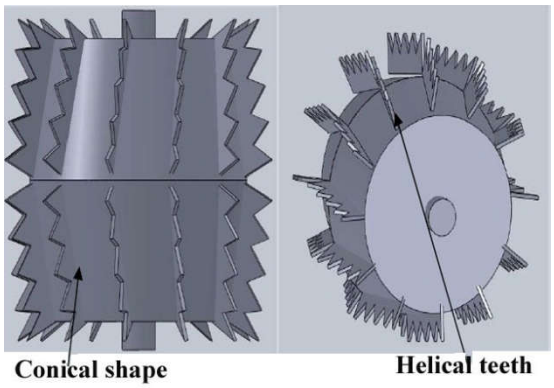


FIGURE-2

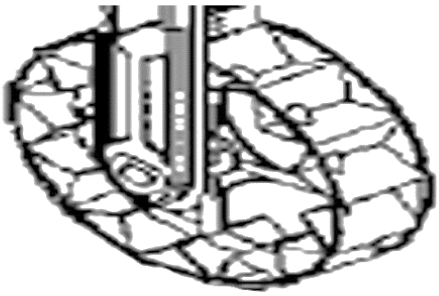
Thedrum at the rear is set to rotate faster than the drums at the front by using differentSprockets. This design would enhance the shearing process due to the miss-match of linear speed of the two drums at the ground level. Further, it helps to push the weeds already removed under the mud to avoid any possible re-growth.

3.3. SHAPE OF THE WEEDING DRUMS

The weeding drums are expected to perform two activities simultaneously: driving the machine forward and weeding. The back wheel is used for row changing of the machine and reduce power requirement of the drive without sinking in muddy places. As shown in Figure,



Front Weeding drum

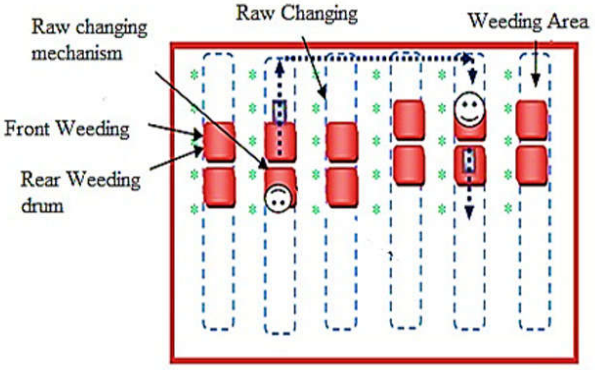


Back wheel

Helical shaped teeth made on conical shaped drums are proposed for the weeding wheel. The conical shape helps to push mud to the roots of the paddy plants as it rotates which enhances the growth of the paddy plants. On the other hand, helical shaped teeth help to provide the shearing effect required for weeding and traction force required for the forward Motion.

3.4. NUMBER OF ROWS TO BE WEEDED SIMULTANEOUSLY

It has been observed that if an odd number of rows are to be weeded simultaneously the maneuveringis easy as the operator can easily walk in the middle raw. Therefore, it is decided to design the Machine to weed three paddy rows simultaneously at a single operation. This is schematically shown in Figure 4.

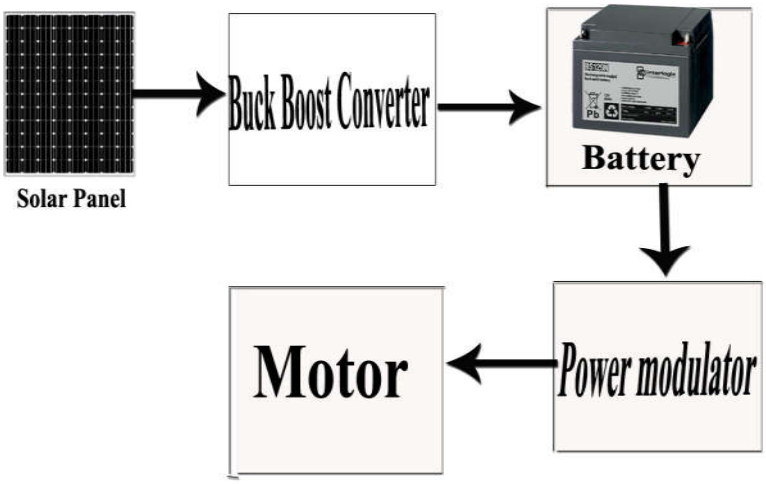


3.5. TURNING AND ROW CHANGING MECHANISM OF THE MACHINE

The turning of the machine can be performed by pushing the handle towards the ground. Hence front side panel can be lifted upwards, so that the operator can turn the machine in between the rows.

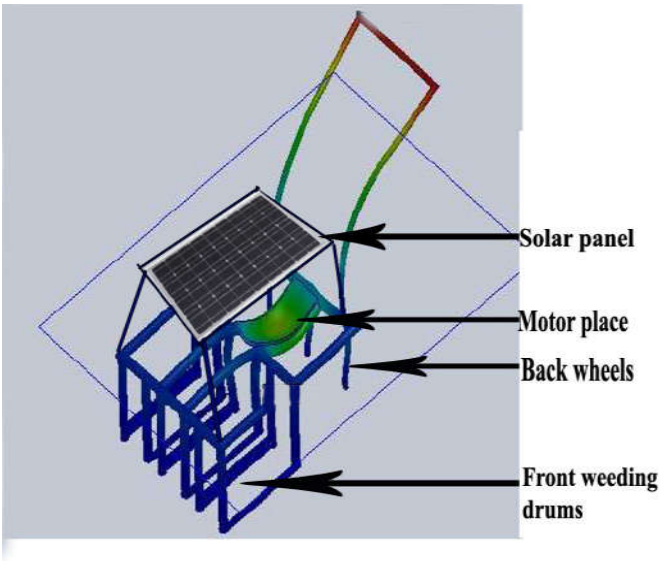
The width of back wheel is 2.5 inches it moves in between the plant and change the rows.

WORK PLAN



Block of drive operation

During the day time solar panel converts the light and heat energy of the sun into electrical energy. In order to get a better performance 140W polycrystalline photovoltaic cell is used, the battery can be charged with different irradiation values. Before connecting to battery a Buck Boost converter is used, it maintains the value of voltage to be supplied. A Zener diode is connected at the positive terminal in between battery and converter to ensure prevention of return flow of current. Then the battery is connected to the power controller. It controls the flow power to be given for the drive, based on the land operator adjust the value of power for the drive. The structure of solar paddy weeder is shown in below figure.



Structure of solar paddy weeder

CONCLUSION

The machine operates on solar power so the cost of fuel required is negotiated. It is eco-friendly and free from pollutants. The turning mechanism provides easy way row changing in between the crops. The weeding drum is formed into conical shape to push the mud towards the paddy plants to ensure the proper growth.

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