

Design and Fabrication of Portable Electric Tiller and Cutter Machine

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Abstract - In Indian Agriculture, Generally tractors or cultivator machines are commonly used for ploughing. Before this method farmers uses the traditional method this is time consuming and hardworking and costly. So we are introducing a new machine. This Machine useful for agriculture in India is of a much larger level. All machine high price and useful for agriculture but not affordable to farmers. So we have created a new machine with this problem in mind to increase the maximum weed removal capacity of the tiller blade in the new design. We have added some extra parts to this machine to help improve the maximum weed removal efficiency. First removing parts are three long tiller blades for tilling operation for Creates favorable environment for crop growth and the second part is cutter attachment for crop and grass cutting. This machine performs both tilling and crop cutting operations.

Key Words: Battery, Blade, Cutter, Tiller, Cutter

1. INTRODUCTION

In India currently farmers are unhappy to spend money for ploughing operation because of raise in petrol price day by day. To solve this problem, we made an electric power tiller and cutter machine which is power by battery to electric motor. The battery is ecofriendly and easily recharge. The power tiller is mainly used in farming operation for preparing a seedbed on upper level of land. The portable power tiller is not only the large soil mixing capacity compared to the other machine but also good weed cutting capability.

In a market various power tiller machine is available and it is operated on internal- combustion engine. It running on engine the petrol or diesel is needed it is big problem, because this tiller machine creates a pollution in environment and it is dangerous for human health. To solve this problem we make this portable electric power tiller and cutter machine.

This is cost-effective and pollution free. in this portable electric power tiller we added some more useful accessories, which are wheel attachment and cutter attachment is used to cut the growed crop in soil and grass in gardening.

1.1 The Need of the Project

In For making farmers life comfortable during tilling work, Earlier farmers were using Traditional farming method which is time consuming, hardworking and costly, hence we introduce new technology. Normally, the machines are used for the agricultural use in India which is of higher stage. All machines were used in farm are high price and not reasonable to farmers, hence to overcome this trouble we were make this model. This working model of power tiller is Reducing man power & Rescuing the risk. This machine reduce the cost, improve the soil properties. This battery operated power tiller reducing the use of fossil fuel and improving the productivity of agriculture.

1.2 Portable Electric Tiller & Cutter Machine

In Farming has been an important part of the human being ecosystem. However, conventional agricultural methods need a lot of human effort and are very time-consuming. Agriculture tilling is one of the most labor demanding operations in agriculture. Physical tiling of fields is very tough task while tractors incur high investment along with heavy fuel use costs. This low-cost portable battery charged electric power tiller and cutter machine is a one-stop new solution to develop the conventional agriculture methods of farming, as it reduces the human effort, at a very small price using motorized tilling mechanism.

2. MOTIVATION AND OBJECTIVE

- 1) To replace the use of non renewable energy source and to make use of other renewable energy source.
- 2) This may decrease the investment on fuel, and its price.
- 3) These make farming more effective and easier.

3. METHODOLOGY

Following is the methodology used to design and fabricate our portable electric tiller and cutter machine.

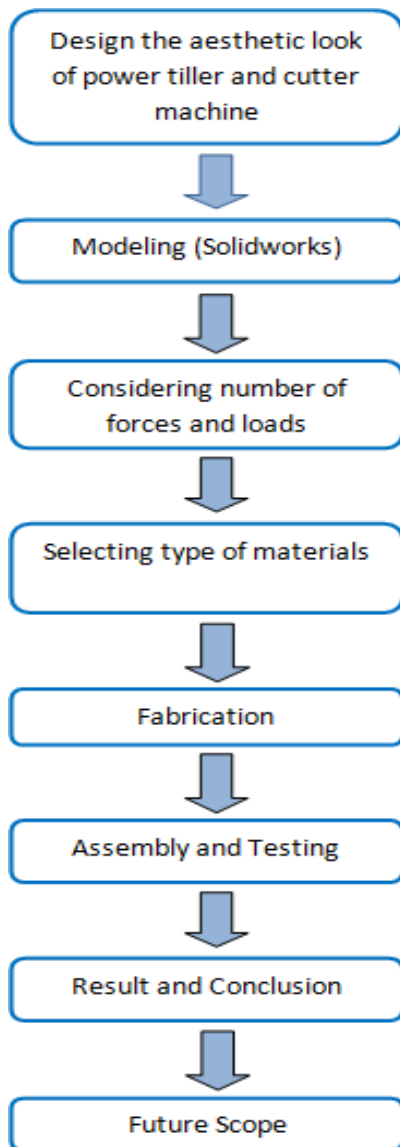


Fig -3: Flow Chart

3.1 Material Selection

After doing research on the several material properties, the most feasible material is select-ed for the portable electric tiller and cutter machine. We investigated for the characteristics which are taken into account, which including machinability, durability, strength, weight, availability, and material cost. A mate-rial with sufficient strength is chosen to ensure that the frame of the portable electric tiller and cutter machine does not fail under the strain exerted. Rectangular iron pipe has been used for this project.

4. COMPONENTS

4.1 Electric Hub Motor



Fig -4.1: Electric hub motor

Rated Voltage: 24V DC, Output Power: 250W
 Rated Speed: 3300rpm, Reduction Ration: 9.78
 Teeth On Sprocket: 9

4.2 Two Wheeler Wheel Rim



Fig -4.2: Two wheeler wheel rim

Spoke: 36, Rim Diameter: 49 Cm
 Spoke Length: 18.5 Cm, Rim Width: 6.8 Cm

4.3 Controller



Fig -4.3: Controller

Type: Brush Controller
 Rated Volt: 24V, Rated Power: 250 Watt

4.4 Wheel Angles



Fig -4.4: Wheel angle

Angle Type: Right Angle
Length: 3.5 Cm, Breadth: 9 Cm

4.5 Lithium-ion Battery



Fig -4.5: Lithium-ion battery

Voltage: 24V, Current: 7.5Ah

4.6 Nut, Bolt & Screw



Fig -4.6: Nut, bolt and screw

Nut Type: Plain, Bolt Type: Grade 0,
Screw Type: Truss Head

4.7 DC Motor



Fig -4.7: DC motor

Voltage: 12V, Rated Speed: 6500 rpm

4.8 Shaft



Fig -4.8: Shaft

Material: Mile Steel, Length: 27 Cm

4.9 Cutter



Fig -4.9: Cutter

Shape of Blade: Circular Shape,
Material: Stainless Steel
Number of Blade: 28

4.10 Chain, Sprocket & Bearing



Fig -4.10: Chain, sprocket & bearing

Chain Length: 134 Cm, Chain Pin: 53
Sprocket Diameter: 18.5 Cm, Sprocket Teeth: 43

5. MODELLING

5.1 Solidworks

The virtual model is created by using solidworks modeling software to analyze the model. The dimension are considered as per the physical model and a rough diagram of the portable electric tiller and cutter machine is drawn. Then create a 3D model.

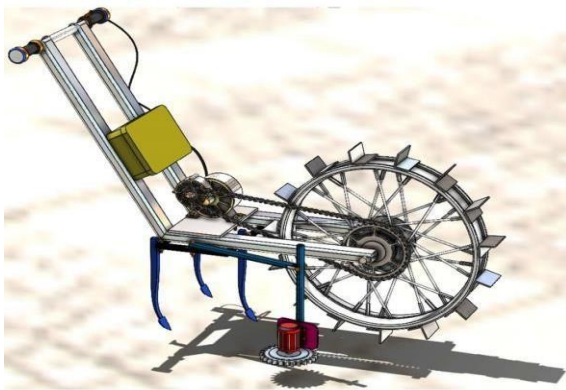


Fig -5.1: 3D view

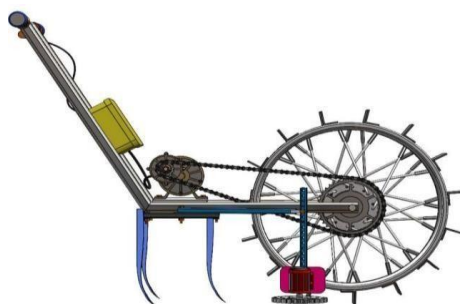


Fig -5.2: Right side view

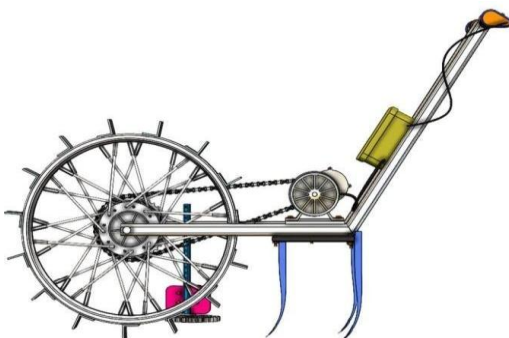


Fig -5.3: Left side view

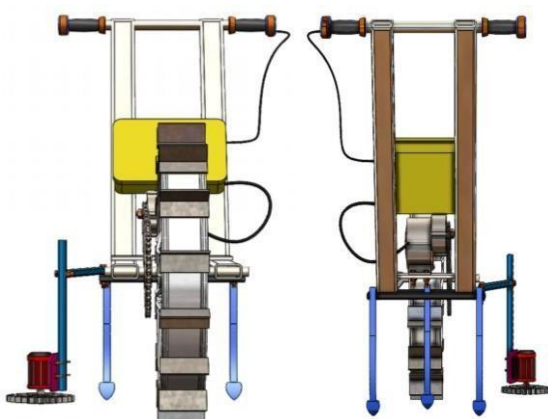


Fig -5.4: Front and back side view

6. WORKING AND MODIFICATION

This portable electric power tiller and cutter machine is operated on battery power. The tiller machine is running on electric motor which uses a chain and sprocket mechanism arrangement to drive the bike wheel rim. A lithium-ion battery is used to power hub motor with tiller blade through soil. The tiller blade allow for easy and narrow tilling accurately as needed for farming and on left side of the machine is cutter attachment is attached for crop or grass cutting. While cutting operation we remove tiller blade and attach wheel attachment for easy work. The machine is portable due to simple in construction of machine the maintenance is very less. The price of machine is very low as compared to other IC engine operated tiller machine so as the farmers can purchase the machine easily.

The machine makes use of a bike wheel rim with welded angles to provide efficient gripping on agriculture soil. The wheel rim design is developed to provide a firm gripping on agriculture land strong sufficient to drag the tiller machine blade while tilling process. A switch is provided on the right side of handle is used to switch on or off the machine. The machine is run by an electric hub motor which uses a chain and sprocket mechanism arrangement to run the pulling bike wheel rim.

A lithium-ion battery is used to power the hub motor with a force capable of pulling the tiller blade through agriculture soil. The three J Shaped tiller blade allow for simple, easy and narrow tilling exactly as needed for farming. The light weight and portable design of tiller machine makes it easy to handle and control the direction of machine around in any vehicles or by hand for transporting the machine. This tiller machine provides a smart new fuel free system for farming and gardening. This tiller machine provides a smart new fuel free system for farming and gardening. This Machine Works 2 to 3 hours.



Fig -6.1: Tiller Blade & Cutter Attachment



Fig -6.2: Wheel attachment

7. FABRICATION

Following the selection of materials that are light in weight, durable, and readily available, such as rectangular iron pipe. Several machining processes are performed on the material. Clamps, Handle, supports, rectangular iron frames, and other elements are tiller blade and cutter blade manufactured. In the fabrication, we do cutting, drilling, welding and shaping operations. Other operations are bending of tiller blade. Bench-wise clamping is used to prepare the clamps. This all operation done in fabrication of project overall making cost of this machine is Rs 9506 only.



Fig -7: Assembled project model

8. ADVANTAGES

- 1) Automatic Operation.
- 2) Battery Powered no fuel needed.
- 3) Portable and easy to operate.
- 4) Cost- effective as compared to a tractor.
- 5) Replacement for animal power and human effort.
- 6) Simple in design.
- 7) Easy to maintain.
- 8) Cheap in cost.
- 9) Pollution free.
- 10) Eco-friendly
- 11) User friendly
- 12) It has low running cost.

9. DISADVANTAGES

- 1) It needs charging when battery runs out.
- 2) Clean after every use.

10. APPLICATION

- 1) In agriculture field for preparation for seed sowing.
- 2) For Plugging.
- 3) Weed removal.
- 4) For softening land.
- 5) For harvesting small crops.
- 6) For cultivation of soil.
- 7) Soil preparation for seed sowing.
- 8) Crop cutting.
- 9) Unwanted grass cutting.
- 10) A number of common weeding tools are designed to ease the task of removing weeds from gardens and lawns.

11. FUTURE SCOPE

- 1) Various processes along with ploughing could be done such as seeding and spraying by adding more attachments.
- 2) More operations can be included to the machine like pesticide sprayer, tiller and many other machines for various operations.
- 3) By making modification same machine with able to changing the different rotary tool for different purpose example rotary tool for cutting purpose, digging purpose.
- 4) By making further modification using large power generated solar panel.
- 5) By making modification in increasing the speed of the motor.

12. CONCLUSIONS

Today in the world fuel prices and environmental pollution increases day by day. So control environmental pollution, to save fuel and bio product this project is design. For this model requires low investment at the starting stage but its gives more energy output with low maintenance. Our new project developed battery powered is minimizing the harmful effort of manual tiller. Here in our project we conclude that by using this machine we reduce the farming cost, animal use, and air pollution and manpower. Our main objective is to help the farmers.

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BIOGRAPHIES



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