

## Mini Electric Power Tiller

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**Abstract** - Tractors or cultivator machines are typically used for plowing in Indian agriculture. Farmers formerly employed the conventional method, which involved utilizing animals. Tractors or cultivator machines are typically used for plowing in Indian agriculture. Farmers formerly employed the conventional method, which involved utilizing animals. Which is a time-consuming and hardworking method. All machines are out of reach for farmers despite being costly and beneficial for agriculture. The primary step in farming is tilling, and current methods are unaffordable and environmentally hazardous, whereas traditional ones required a lot of time and labor. Mini electric power tiller machine uses battery-powered mechanism to serve the tilling purpose at minimum cost, time in tilling, and thereby increasing productivity and efficiency to enhance healthy environmental purposes too. The Mini Electric Power Tiller is constructed with modern technology. In which the controller gets control of all the functions. The controller gets power from the battery and sends a signal to the motor as per the gear setting. The gear box gets to work, and the rotary of the power tiller gets to start plugging. The hole machines are powered by a battery, and there is no CO2 gas exhaustion from the tiller, making the process environmentally friendly. Because of its light weight, the power tiller is perfect for use in both dry and rainy conditions. Two-wheeled agricultural machinery with a rotary tiller, power tiller machinery effortlessly handles all farm chores. An improved type of little electric power tiller was created as an alternative.

**Key Words:** Motor, Motor controller, Battery, Gearbox, Tractor, Cultivator.

### 1. INTRODUCTION

The human ecosystem has always included agriculture. Traditional farming techniques, however, demand a lot of labor and take a long time. One of the most labor-intensive agricultural practises is farm tilling. Field tiling by hand is an extremely taxing task, and using tractors requires a significant upfront investment and hefty fuel expenses. It is an agricultural machine that is mostly used for land development. As it can turn around and cut soil while doing so, it functions adequately. In terms of maintenance, it is more cost-effective, wise to use, and also requires less room. Power Tiller can play out the activities of various agricultural implements like a rotavator, harrow, and

harvester A two-wheeled horticulture cart with rotating turners that provides smooth protection from all farm activities is called a power tiller. In actuality, it offers a variety of uses and advantages. Power tillers aid in preparing the soil, sowing seeds, and planting crops.

This low-cost battery-operated mini electric power tiller machine is a one-stop modern solution to enhance the conventional agriculture methods of farming as it reduces human effort at a very negligible price using motorized tilling mechanisms. The electric power tiller helps reduce the time and cost involved in tilling using a smart, portable design, thereby increasing productivity and efficiency in agriculture. The power tiller is exceptionally simple to utilize. It merely needs to be tweaked, and it drives accordingly. It made the collection of every type of yield possible. With a clever, adaptable design, the electric power tiller reduces the time and expense involved in tilling, increasing its usefulness and efficiency in farming. All things considered the Mini Electric Power Tiller is a conspicuous venture. Due to the decreased appropriation, it benefits the farmers by generating cash.

### 1.1 Electric Power Tiller Benefits:

1. Programmed Operation
2. Battery Powered No Fuel Needed
3. Versatile and simple to work
4. Decreases Tilling time

### 2. OBJECTIVES

1. to employ other renewable energy sources in place of using non-renewable energy source.
2. To may decrease the investment on fuel, and its price.
3. To make farming more effective and easier.
4. To facilitate the growth of agribusiness in the state for farmer, social, corporate & environmental good.
5. To Facilitate Transformation of traditional farming system in to a commercial and technology.

### 3. METHODOLOGY

Design the Electric Power Tiller With the help of our group members, we decide to make a Mini Electric Power Tiller, for which we create a block diagram and circuit diagram first on the computer, followed by its construction design. After it, we can decide the capacity of the load carried by the mini electric power tiller and the required force for the motor to rotor for losing the soil and the required power to start the motor. In this process, we can select the types of materials for structure or fabrication work. We designed the 3D model of the mini electric power tiller on AutoCAD.

Also, we design its skeleton first and define its size. First of all, the selection of components as per the rating is difficult. At the initial stage, we identify the torque required for the cultivation of land. We select a high-torque motor and a suitable controller for that motor for the connection of the wire with the battery with the motor. At the time of motor selection, we compare the hub motor with a BLDC motor. In which we know that the hub motor has high losses as we require torque continuously, but the hub motor has a tendency to decrease torque as speed increases, so we can avoid it. The main issue with that hub is that the motor's foundation does not fit properly in our structure. As for high torque and higher efficiency, we select the BLDC motor, as well as its suitable size and weight. For proper connection, we crimp it properly, and for proper handling and maintaining acceleration, the throttle and lever are fitted to the handle. In the fabrication work. We weld the main skeleton of the power tiller with the help of iron bars, angles, pipes, and square tubes. In which we assemble the components like the controller, motor, battery, gearbox (transmission), throttle, etc. The skeleton or on the cheese of the electric power tiller and do the connection of it. After the completion of the assembly, we get to test it on the field. To begin fitting the rotary shaft to the gearbox, we ground the motor shaft to the proper diameter. For the rotation of the gear box shaft, we connect that shaft and motor wheel with the help of a chain.

In this mini electric power tiller, we connect the blades to the main shaft of the cultivator with the help of a quarter-inch pin. For avoiding getting stuck in mud, we provide the metal strip ring at both ends of the rotary. On the back side of the mini electric power tiller, we provide the iron strip support for proper standing of the power tiller and a joint front wheel for smooth operation and locomotion. For the connection purpose, first of all, we measure the current value with the help of the multimeter required for starting the motor and select the wire of 4 sq. For a proper look as well as for protection of electric connections from water, we make a cover of thin metal sheet and weld it onto a skeleton.

### 4. COMPONENTS

#### 4.1. BLDC Motor:



**Fig. 4.1:** BLDC Motor

Rated Voltage: 48V DC, Output Power: 1000W  
Rated Speed: 3000rpm

#### 4.2. Controller:



**Fig. 4.2:** Controller

Type: Brush Controller  
Rated Volt: 48V, Rated Power: 1000 Watt  
Rated Current: 40 Amp

#### 4.3. Battery:



**Fig. 4.3:** Battery

Voltage: 12V, Current: 12Ah

#### 4.4. Chain, Sprocket & Bearing:



**Fig. 4.4:** Chain, Sprocket & Bearing

Chain Length: 134 Cm, Bearing Type: Ball Bearing

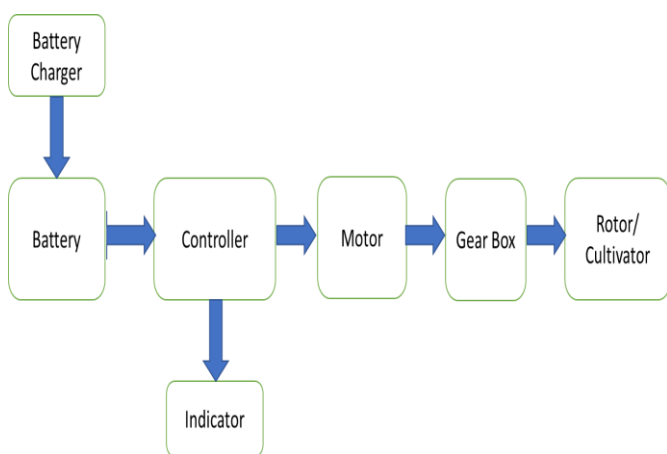
#### 4.5. Rotary Blade:



**Fig. 4.5:** Rotary Blade

No. of Tilling Blade: 16, Blade Size: 16.76 cm

### 5. DETAILS & IMPLEMENTATION



**Fig. 5.1:** Block Diagram

#### 5.1. Working:

This power tiller has a main component controller. It has different output functions like a motor, display, reverse, neutral, and forward gear, and an accelerator (throttle). This facility for speed variation is in that controller. A battery of 48 volts and 40 watts is installed in this. The output terminal of the battery is connected to the controller. So, the controller turns on. Simultaneously, all controller functions are turned on, and the controller comes into working condition.

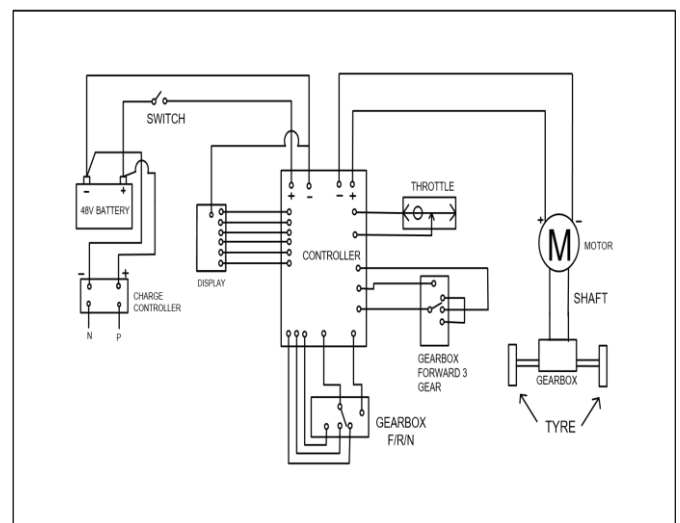
The output terminal of the controller has an accelerator, a 48-volt BLDC motor rated at 1000 watts, and three gears. In that three forward gears, one reverse gear, and one neutral gear. If the motor is kept in the forward position on first gear, the motor will run at a low speed; if it is kept in second gear, the speed of the motor becomes medium; and if we keep it in third gear, the motor will run at full speed. Also, reverse gear starts the rotation of the motor in reverse, or the opposite direction. Neutral gear can be used to stop the motor.

It has a display that is used to indicate the battery charging level, power tiller speed, and which gear the power tiller is

in. The shaft of the motor is mechanically connected to the gear wheel. And the gear wheel is connected to the rotary below by means of a chain. Also, a rotary rotates according to gear. And the land is plowed with a blade attached to the plow shaft.

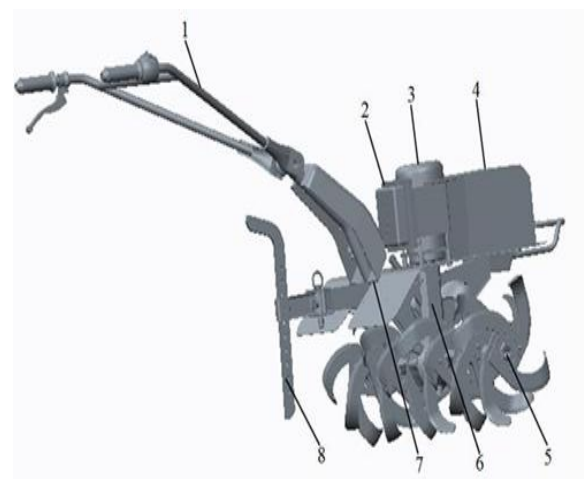
When plowing is not the purpose or when plowing is done, we can use tires instead of plowing blades and a trolley behind the tiller to carry the goods. This power tiller can easily carry up to 750 kg. Due to the high torque of the motor, more pickup is available for the power tiller.

#### 5.2. Circuit Diagram:



**Fig. 5.2:** Circuit Diagram

#### 5.3. 3D Model of Mini Electric Power Tiller:



**Fig. 5.3:** 3D Model

1. Handrail
2. Motor controller
3. Electric motor

4. Battery pack
5. Rotary blade roller
6. Transmission system (Gear Box)
7. Frame
8. Depth limiting device

#### 5.4. Advantages:

1. Battery Powered no fuel needed.
2. Portable & easy to operate.
3. Cost- effective as compared to a tractor.
4. Simple in design.
5. Easy to maintain.
6. Pollution free

## 6. CONCLUSION

Fuel costs and environmental degradation are on the rise globally today. To control environmental pollution and save fuel and bioproducts, this project is designed. This model requires low investment at the beginning, but it gives a higher energy output with low maintenance. Our latest battery-powered project reduces the damaging effort of a manual tiller. In this section of our project, we come to the conclusion that employing this equipment will lower farming expenses, animal use, air pollution, and labor requirements. Our main mission is to help the farmers.

## 7. 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 machines like pesticide sprayer, tiller and many other machines for various operations.
3. By making modifications, the same machine can be changed to use a different rotary tool for a variety of purposes, such as cutting or digging.
4. By making further modification using large power generated solar panel.
5. By making modification in increasing the speed of the motor.

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