

Review paper on Portable Electric Power Tiller Machine

Sandesh Sawant¹, Abhisheak Gawade², Yadnyesh Salgavkar³, Khemraj Naik⁴, Akshay Khumbhar⁵ Prof. A J Rane⁶
 Students, Department of Mechanical Engineering, YB Polytechnic, Sawantwadi^{1,2,3,4,5}
 Faculty and Head, Department of Mechanical Engineering, YB Polytechnic, Sawantwadi⁶
 Yashwantrao Bhonsle Polytechnic, Sawantwadi

Abstract:- Agriculture starts from human existence. It is important part in human life as it feed us and thereby it runs the ecosystem though. It is extreme important section for living beings. But modern farming techniques are heavy-coughed and very intensive. Modern tractors which runs by fuel are detrimental to environment and not affordable to farmers. Tilling in farming is main step and traditional techniques were time consuming and very intensive and modern ones are non-affordable and hazardous to environment. Portable Electric power tiller machine uses battery-powered mechanism to serve the tilling purpose at minimum cost, time in tilling and thereby increasing productivity, efficiency to enhance healthy environmental purpose too.

Keywords:- Electric Tiller machine, motor, portable, mini tractor, frame design, vibration and traction effort.

I. INTRODUCTION

To enable good soil gripping, the machine uses a wheel with welded angles. The wheel design was created to offer a tight grip on the soil that would allow the cultivator prongs to be dragged during the tilling process. The machine is turned on and off using a switch on the handle. The machine is powered by an electric motor that drives the pulling wheel using a sprocket chain configuration.



Picture 1: tractor when tilling

The motor is powered by a battery and has enough force to draw the forks through the soil. The three cultivator forks allow for precise and easy tilling, which is ideal for farming. The machine's direction can be easily controlled while in use because to its portable, lightweight construction. For carrying the machine, it can also be simply carried around in vehicles or by hand. As a result, the electric power tiller offers a smart, fuel-free mechanism for farm and garden tilling.

II. LITERATURE REVIEW

Prof Prashant Rahat et al (2021) published in International Journal of Advanced Research in Science, communication and technology (IJARSCT). Design "portable electric power tiller machine" In this paper researcher studied the portable battery charged electric power tiller machine. Farming practises used in traditional agriculture. To provide maximum soil grip, the machine uses a wheel with welded angles. The wheel design was created to offer a strong grip on the soil that would allow the cultivator prongs to drag during the tilling process. An electric motor drives the pulling wheel through a sprocket chain arrangement. By adopting a motorised tilling system, it minimises human effort at a very low cost. Using a unique portable design, the electric power tiller reduces the time and cost of tilling, enhancing agricultural output and efficiency.

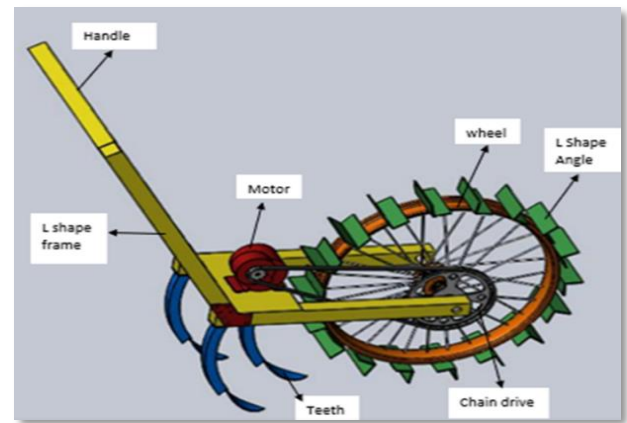
Shabbir J. Karjatwala et al (March 2018) published in open access international journal of science and engineering Design development and fabrication of mini cultivator and tiller. In this paper researcher studies Farmers used to use traditional farming methods, which are time-consuming, labour-intensive, and expensive, therefore they introduced new technologies. Machines are commonly employed for farming purposes in India, which is at a higher level. They are creating this model in order to solve this challenge. This document discusses the operating machinery that would be used to till one and a half hectares. With this new technology, the plough will be able to go ahead and the base wheel will rotate with blades that provide traction.

Zakariya et al (June 2021) published in Journal of Engineering Research and Reports perform Modification of Portable Power Tiller for Small Scale Weeding Operation. After preliminary study, it was found out that power tiller could be adopted for weeding. As a result, the study sought to improve its performance by altering some essential components, such as weeding blades and depth blades. Three sets of four, six, and eight blade gangs were fabricated from 3 mm mild steel sheet metal. The fabrication took place at Ahmadu Bello University's Department of Agricultural and Bio-Resources Engineering in Zaria. The redesigned machine was tested in the maize field at the Institute for Agricultural Research, IAR, and Ahmadu Bello University, Zaria research farm during the 2017/2018 irrigation season for weeding effectiveness, field capacity, plant damage, and fuel consumption. There were four levels of blade types 'B' and three levels of weeding depth 'D.' At two (2) weeks, the field was put out in a 43 randomised complete block design.

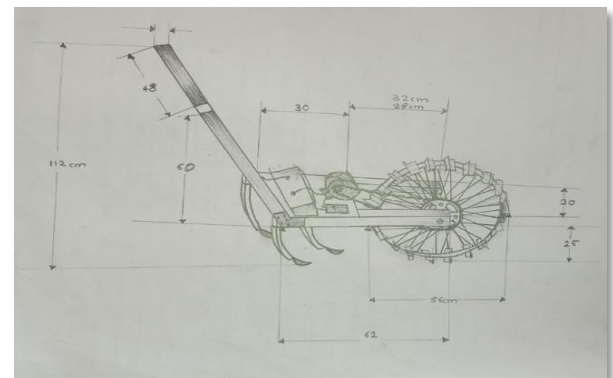
Mr Mahesh Gavali et al (April 2014) published in International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization) design In India, a comparison of portable welders and power tillers was conducted. In this study, the author investigates in this article, a comparison of portable welders and power tillers in the Indian market is examined. Various weed-removal procedures for crops are also mentioned. The examination of various equipment used for mechanical weed removal is the main focus of this project. According to this survey, the majority of Indian farmers, the majority of whom are small-scale farmers, can only afford portable welders. As a result, mechanical weed management is not used by these small-scale farmers. These small-scale farmers primarily utilise chemical and manual weeding methods. Portable welders are less expensive to operate and maintain, according to the literature review, but they are also less adaptable. Power tillers are more expensive, but they are more efficient.

III. OPERATION

A motorised tiller is operated by walking behind the machine. The machine consists of electric motor, battery, chain sprocket, wheel angles, bearing, electrical & wiring, mounts and joints, supporting frames, screw and fitting, bicycle wheel, the machine is powered by an electric motor that drives the pulling wheel using a sprocket chain configuration. The motor that drives the forks into the soil is powered by a battery. The cultivator forks enable for precise and easy tilling, as required by farming. The machine is light in weight and portable. Due to easy construction of machine the maintenance is very low.



Picture 4: 3D conceptual drawing



Picture 5: 3D Drawing of tiller machine with dimension

IV. METHODOLOGY

Fabricating the machine according to the following steps:

- Development of the new concept
- Literature review
- Dynamic analysis and mechanical design
- Comparison between working model and other active machines in present.
- Fabricate the actual machine by using the machine components.
- Cost analysis

V. WORKING

The machine works on motor which gives power to overall system to run the object. The machine is drive by electric motor which is in contact with belt drive which ultimate helps to run the working of wheels of tiller during operation. For tiller machine the neat and accurate modification of supporting frame is provide For tiller machine the neat and accurate modification of supporting frame is provided which gives output voltage of fixed proposition. It is in such way that magnitude remains constant and input voltage doesn't change for conditions of voltage. Regulator connected at main wire which is connected to switch. Regulator and wire are connected to motor to running the operation. Motor is fitted to suitable angle as per stability for a worker during operation. Wheels are provided for ease in working during agriculture. When motor generates power machine runs and thereby teeth run



Picture 2: working on model structure



Picture 3: working on model structure

side by side capable of digging in agricultural land with ease. One sensor is provided. The working of sensor is to stop or to cut off the extra or over or the extra energy which not needed battery is placed for energy supply to working of tiller machine.

VI. PROBLEM DEFINITION

- From literature review we can understand researchers work on the parameters of power tiller machine in India. But to take it to next generation as a solution was a less attentive part.
- Researchers proposed their studies and different aspects.
- We have given focus on increasing efficiency, vibration control to avoid wear and tear thereby increasing life span of machine, weight, portability etc.

Our research will be carried out on electric power tiller machine on field of agriculture to test parameters of machine. On the field the soil and other weeding factors could affect efficiency or any other parameters which reduces the efficiency. So it is necessary to use other active machines and analyse properties of the respective parameters.

VII. OBJECTIVE

Objectives of this research works are as follows:

- To study various mini tractor models
- To perform design of electrically operated tiller machine for field conditions.
- To perform standard analysis of different working parameters for same operating conditions.
- Comparison between working model and other active machines in present.

VIII. CALCULATIONS

Motor power = 250 W = 0.25 KW

Motor Speed = 300 rpm

250 W = 0.335256 Hp

$$1. \text{ Machine Torque} = \frac{9.5488 \times \text{Power}}{\text{Speed}}$$

$$= \frac{9.5488 \times 0.25}{300}$$

$$\text{Torque} = 7.96 \text{ N/m}$$

$$2. \text{ Power (KW)} = \frac{\text{Torque} \times \text{Speed}}{9.5488}$$

$$= \frac{7.96 \times 300}{9.5488}$$

$$= 0.25 \text{ KW}$$

$$3. \text{ Efficiency } (\eta) = \frac{0.745 \times \text{Hp} \times \text{load}}{\text{Pi}}$$

$$= \frac{0.745 \times 0.335256 \times 90}{0.25}$$

$$0.25$$

$$= 89.91\%$$

IX. CONCLUSION

The power tiller is most suited for usage in hilly locations, moist conditions, and on small farms because it can do both primary and secondary tillage operations. The power tiller, with the correct set of tools and attachments, can handle most of the field operations in intensive cultivation. The power tiller's small weight makes it ideal for working in both wet and dry situations. Depending on the type of work, external attachments can be added to the tiller. As a result, the tiller can be utilised for a variety of tasks.

REFERENCES

- [1.] www.prace-ri.eu
- [2.] www.vortexbladeless.com
- [3.] <https://www.tractorjunction.com/blog/the-benefits-of-power-tiller-cultivator-on-agriculture/#:~:text=In%20fact%2C%20it%20has%20multiple,the%20and%20side%20is%20small>
- [4.] <https://www.tractorjunction.com/blog/top-10-agriculture-equipments-for-farmer-benefits/>
- [5.] <https://nevonprojects.com/portable-electric-power-tiller-machine/>
- [6.] <https://www.tractorjunction.com/blog/the-benefits-of-power-tiller-cultivator-on-agriculture/>
- [7.] <https://www.kisankraft.com/how-power-tiller-helps-to-change-the-wealth-of-farmer/>
- [8.] <http://synopsis.nevemtech.com/mIndex.aspx?Id=MEC215>
- [9.] International Journal of Advanced Research in Science, communication and technology (IJARSCT).
- [10.] Open access international journal of science and engineering.
- [11.] Journal of Engineering Research and Reports.
- [12.] International Journal of Innovative Research in Science, Engineering and Technology.
- [13.] International Journal of Innovations in Engineering and Science.
- [14.] International Journal of Innovations in Engineering and Science.
- [15.] Journal of Asian Electric Vehicles.
- [16.] International journal for scientific research and development.