



Multipurpose Battery Operated Electric Mini Cultivator for Tilling Operations

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Abstract- Agriculture has always been an important aspect of the human ecology. Traditional agricultural methods, on the other hand, need a lot of human labour and take a long time. Even in 2020, the majority of Indian farmers still utilise conventional farming implements like the plough and sickle. As a result, there is a waste of energy and personnel, as well as a lower yield per capita labour force. Farm tilling is one of the most labour-intensive agricultural procedures. Field tiling by hand is a difficult work, and tractors require a large investment as well as a lot of gasoline. Despite the massive mechanisation of agriculture in some regions of the nation, the majority of agricultural activities in the country's bigger areas are carried out by hand utilising rudimentary and traditional equipment and implements such as a wooden plough, sickle, and so on. This low-cost portable battery-powered electric power tiller machine is a one-stop contemporary solution to improve traditional farming practises by reducing human labour at a very cheap cost through the use of a motorised tilling mechanism. Because design and manufacture are the keys of engineering, mechanical engineering education requires real design and production. Using a clever portable design, the electric power tiller helps minimise the time and expense required in tilling, consequently enhancing agricultural output and efficiency. Power tiller equipment is two-wheeled agricultural equipment outfitted with a rotary tiller that conducts all farm activities effortlessly. It prepares the soil, plants, and sows seeds, as well as sprays fertiliser.

Keywords: mechanisation, battery powered, motorised tilling, portable design, rotary tiller.

I. Introduction

It is a farm machine that is primarily used for land cultivation. It is effective because it can reverse and cut dirt at the same time. A power tiller that runs on batteries is a kind of wheeled farm equipment. This Power Tiller is suitable for home gardens, small and big farms, but it is especially recommended for paddy farmers with tiny plots of land. The earth is just smoothed and loosened to the desired depth. The underlying concept of soil scratching for weed control is millennia old, and it was done using hoes before cultivators were invented. Herbicides have considerably decreased the amount of cultivating that is done for weed control in modern commercial agriculture.

Herbicides, on the other hand, are not always desirable, as in organic farming. Arthur Clifford Howard devised the motorised rotary hoe after experimenting with rotational tillage on his father's farm in Gilgandra, New South Wales, Australia, in 1912. Using his father's steam tractor engine as a power source, he discovered that ground could be mechanically tilled without soil-packing, which was a problem with traditional ploughing. His first prototypes tossed the tilled soil in the wrong direction, but he refined his innovation by inventing an L-shaped blade set on widely separated flanges attached to a small-diameter rotor. He formed a firm with fellow apprentice Everard McCleary to manufacture his machine, but plans were thwarted by World War I. Howard returned to Australia in 1919 and started his design work, patenting a concept in 1920 that had five rotating hoe cultivator blades and an internal combustion engine. Howard founded Austral Auto Cultivators Pty Ltd, which eventually became known as Howard Auto Cultivators, in March 1922.

From 1927, it was situated in North mead, a Sydney suburb. Tractors in North America were transitioning away from traction engine-sized monsters toward smaller, lighter, and more economical machines throughout the 1910s. For maybe the first time in history, the Fortson tractor had made tractors affordable and practicable for small and medium family farms. Farmers and homeowners utilise mini tillers, which are miniature agricultural tillers or cultivators. These are also referred to as garden tillers or power tillers. These agricultural rotary tillers are compact, powerful, and, most significantly, low-cost alternatives to four-wheel tractors, and are more cost-effective in small farmer's fields in developing nations than four-wheel tractors. Where the land side is tiny, a power tiller is suitable. Farmers in India's mountainous regions, where only terrace farming is feasible, must find Power tillers to be extremely beneficial.

Farm mechanisation is being expedited for a variety of reasons, including a growing lack of agricultural labour and rising pay rates. Agricultural machines are also in high demand due to factors such as time savings, effective input application, transportation of farm inputs and output, and reduced drudgery. For the rise of mechanisation in India, the invention and mass manufacture of multi-utility mechanised equipment to meet the needs of farmers is critical.

For marginal farmers, purchasing large and expensive machinery such as tractors to execute numerous farming chores is tough. Furthermore, such farmers cannot afford the expense of labour, and as a result, their crops suffer losses owing to a lack of sufficient care. As a result, such farmers want a more economical and effective solution. One of the most significant tasks of the Power Tiller is that it accurately seeds the crop to be sown and warms the soil before sowing by burying its head in it. Controlling weeds aids in the optimal development of crops. With a clever portable design, the electric power tiller helps to minimise the time and cost of tilling, enhancing agricultural output and efficiency. There is now no method in place for eradicating weeds from the seed line between crop plants, thus it will assist in resolving this issue.

II. Literature Survey

The creation of a tiller for home gardening is described in this study, with a focus on design and production. The key worry is the future ecological and ageing society considerations of agricultural business, particularly in local locations like Kochi, Japan, where agriculture is the dominant industry. Although the design and manufacture in this paper appear to have practical application potential, there are still difficulties to be addressed. The battery life is one of them. Instead, solar panels were employed to define how to collect and spend such local energy. The goal of the project was to design and build a tiller that could be used for home gardening. The environment and the ageing society had been taken into account. There are still concerns with the created tiller, such as battery life and weight. [1]

This project entails the design and development of chain and sprockets, shafts, belt drives, bearings, transmission cases, and chassis, among other components, in order to convert engine speed to Power Tiller tilting speed. This power tiller is designed for weeding in sugarcane plantations with a minimum inter row spacing of 1.2 metres, as shown in this report. Owing to a goal to decrease chemical use and production costs, farmers want weed management options. There are no selective herbicides available for particular crop situations. Because human weeding is expensive, an automated system may be possible, and mechanical weed control systems can decrease or eliminate the need of herbicides. [2]

According to the study, the reaper's performance on the farm was good, and its capacity was 93 percent higher than hand harvesting, saving 35 percent in operation costs and two times the labour. Small and irregularly shaped plots of less than 150 m² were determined to be unsuitable for the machine. However, as a power tiller attachment for hilly regions, a reaper with a smaller coverage width and lighter weight will be more beneficial for smaller and irregularly shaped fields. [3]

A seeding attachment for riding type power tillers was created and developed at the Faculty of Agriculture Engineering, IGKV, Raipur, India, to reduce soil moisture loss, turnaround time, and energy loss during seed bed preparation and seed operations. The primary design concerns were to put seed and fertiliser with tractive tines during rototilling and field preparation using a rotary tiller. The rototiller did not need to be removed because it created back propulsion and boosted the power tiller's pulling capability, as evidenced by the work done and fuel consumption of the power tiller with and without the produced machine connection. As a result, sowing and tilling may be completed in a single pass, saving energy and preserving in-situ soil moisture. [4]

III. Proposed System

Tillage is the process of mechanically manipulating soil to make it more conducive to crop cultivation. It loosens the soil mass and cracks the compact surface of the ground to a particular depth, allowing crop roots to penetrate and disseminate into the soil. Ploughing, harrowing, mechanical weed removal, and soil crust cracking are examples. If it rains after seeding, the top layer of soil becomes so hard that the seed cannot germinate. Soil crust refers to the strong or hard top soil.

We are employing the use of blades. Due to the employment of multiple blades with nut bolt joints, the machine will become versatile. We can employ numerous applications on one machine because of the nut bolt joint, resulting in increased agricultural production. It will minimise operational drudgery, which will benefit farmers, as well as the cost of operation and production.

The following operations are carried out for agricultural tilling: Ploughing is the most common type of tillage, and it is used to partially or totally cut, break, and invert the soil. Ridges are formed by cutting and turning the dirt in two different directions at the same time. It's used to make ridges, plant row crop seeds in well-tilled soil, and produce ridges. It may also be used to create field channels. There are many different tilling activities, and we're just employing a handful of them in our project to increase the machine's productivity.



Fig 1: Manual tilling machine



Fig 2: Attachments of the machine

IV. Conclusion

The power tiller can do both primary and secondary tillage operations and is best suited to wet weather and small holdings. The power tiller, with the correct combination of tools and attachments, can handle the majority of field chores in intensive cultivation. The power tiller's small weight makes it ideal for operating in both wet and dry situations. Depending on the nature of the task, external attachments will be made to the tiller. As a result, this tiller will be employed for a variety of tasks. The benefit of this technology is that any farmer may use a tiny cultivator for tilling tasks with ease. This machine was created with the goal of functioning in a variety of soil conditions.

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