

Development and Design of Min-T8 HP Power Weeder

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ABSTRACT:

Power tillers have been introduced in the country from the 1960s. Most models of the power tiller being manufactured in India, is provided with a front or rear mounted powered rotary unit for forward movement as well as for tillage operation. The power tillers are being used for seedbed preparation and inter culture operation for wide spaced row crops like sugarcane, cotton etc. This paper presents about working of a power tiller and their different attachments.

A Power weeder in a mechanized agricultural popularly used to save time, human efforts and fuel in preparation of soil bed. In this paper presents the design and fabrication of maintenance free and efficient 8 HP lightweight power weeder. However, under complex abrasive environment, weeder blades are subjects to extreme surface wear, particularly in dry sand which considerably affects its service life. Working of transmission system is based on chain sprocket mechanism to reduce cost. Different component of machine are modeled by using modeling software creo 4.0. The developed model is useful for agricultural industry especially developing countries.

The literature survey indicated that portable weeders are relatively less expensive in operation and less versatile. Power tiller are considerably more expensive but also very much more versatile and can operate in variable soil conditions. Weed control is one of the most difficult tasks on agricultural farm. Three method of weed control are commonly known in agricultural. These are mechanical, chemical and biological control. Due to chemical control method soil get polluted and it is harmful to our body.

Biological method is less effective than other method so these methods are not useful. Mechanical weed control not only uproots the weeds between the crops rose but also keeps the soil surfers loose, ensuring better soil aeration and water intake capacity weeding by power tiller reduce the cost of labor and also save time. Various

type of mechanical weed has been developed. In human operated weed muscular power is required and so it cannot be operated for long time.

Keywords: soil bed, blades, chain Sprocket Mechanism, Creo 4.0

I. INTRODUCTION:

Indian agricultural has gone through different stages of power use pattern with time in 20th century. Prior to Second World War, the use of power machinery in Indian agricultural was almost nil. Appearance of large size tractors (80 hp and above) was seen for jungle clearance and rehabilitation of migrants from Pakistan to India. Use of tractors and power tillers in agricultural was introduced in early sixteen by importing few models and makes from Europe, America and Japan. However, the power tillers were imported from Japan only under some Yen credit assistance offered to India. Similar was story of the four wheel tractors. Later, production and utilization of tractors took a major leap forward but the power tiller did not catch up to the desired level of expectations. The first batch of about 200 power tillers imported into the country were distributed in rice growing states of Eastern India during 1961. Subsequently, 100 more machines were received and distributed in southern rice growing states also. The main efforts were to assess the suitability of the single axel power source for Indian conditions. After 27 years of the introduction of power tillers i.e. in 1988 the analysis of the situation in respect of the power tiller as a source of power under Indian condition is being made. Critical review will be presented to highlight the successes and failure through case studies.

Agricultural is the backbone of Indian economy as it provides direct employment to about 69% of the working people. India being developing nation agricultural and industries based on agricultural products has prime importance in the national economy. Majority of the Indian population depends on agricultural and agro-based

industries and businesses. A mechanical device to remove the weeds from an agricultural land is known as weeder.

India being farming major, the need for modern technologies in agriculture routines is undisputed. Power tiller are engine operated low power machine used for bed preparation. They are compact, handy and medium duty machine. Currently, power tiller of capacity 12 hp- 15 hp and weighing up to 350 kg are widely manufactured across the country.

The power tiller presented in this project is a 8 hp power weeder specializing in weeding operation, suitable for back soil of sugarcane cultivation. This project deals with design and development of Chain and Sprocket, shafts, Bearings, Coupling Shafts, Gears, Transmission Case and Blades etc. to change the engine speed to tilting speed of the power weeder.

This machine is specifically for sugarcane cultivation requirement and can be used for black moist silted soil. The trials performed showed considerable saving due to use of power weeder over men.

At present, most of the power tillers manufactured in the country are in the range of 12-15 hp and weight 350 kg. The power tillers are not potentially used in hilly areas due to the lack of its maneuverability on slopes. This is primarily due to its heavy weight, which needs to be optimized further. Therefore it is felt necessary to develop a lightweight power weeder fitted with 2- 4 hp engines. Considering all these factors, and as a small effort towards mechanizing agriculture and helping the 60% Indian population who depend on agriculture for their livelihood and to encourage their share in developing our economy.

The power tiller presented in this project is a 8 hp power weeder specializing in weeding operation, suitable for back soil of ginger and turmeric cultivation.

This power weeder that we present here in this report is meant for operation of weeding in sugarcane, ginger and turmeric farms with minimum inter row distance of 2.5, 1, and 1.5 Ft. This machine is easy to operate, cheap, portable and simple in construction and maintenance with easily available spare.

II. LITERATURE REVIEW:

Swapnil Kadu L.et.al^[2] In this machine chain and sprocket are used for power transmission whereas in other machine gears are used for used, cost reduction. As machine is simple in construction, accurate manufacturing and standard components are used, so machine required less

maintenance. As machine is developed by sheet metal formation hence weight of the machine is low. There are no casting parts. It is designed on the basis of optimum material consideration. The working capacity of this machine is 2.5 Acre per day. It requires 10 liters per day for the operation. Single operator can operate this machine easily.

Mr. Mahesh Gavali.et.al^[3] Portable weeders are available in various ranges in Indian market. The power rating of these weeders is from 1.5 HP to 5 HP majority of them is petrol powered for cutters and manual movement in field. Weights of these are between 10.4 kg to 44 kg as they needed to be driven manually. The weed removal rate is obviously low. They have low initial cost ranging between Rs. 15000/- to 40000 and operating cost largely depends on cost and consumption of petrol and manual labor required for operation.

Prem tiwari.et.al^[5] Three models of light weight power tiller evaluated for seedbed preparation, intercultural operation and basin preparation in the orchards. The following operational problems were observed:

1. The power tillers do not have separate transport wheels as rotavator itself served the purpose of transport-cum-rotary unit. This was the technical drawback in all the power tiller because the recommended ratio of peripheral speed of the rotary unit to the forward speed of power tiller, which should be 4-6 for efficient working, could not be maintained.
2. The power tiller had jumping action due to high forward speed and low depth of tilling.
3. Backward pulling of power tiller was required due to high forward speed.
4. High workload on operator was observed due to back ward pulling and continuous effort applied to move the power tillers in straight line.

S. Sai Mohan.et.al^[11] Weeding is an labour intensive agricultural operation and about 1/3rd of the cost of cultivation is accounted towards weed control operation alone. Any delay and negligence in weeding operation effects the crop yields up to 30-40%. Power weeder was evaluated for its performance in sugarcane crop. This test was conducted at different moisture contents of soil observed at 30, 45 and 60 DAS and different speeds of weeder. The density decreased from 0.84 to 0.65 gcm⁻³ with increased soil moisture content from 7±1 to 12±1 percent. The field efficiency of power weeder was high when operated at 4.153 km

h^{-1} during initial crop growth and gradually decreases with increasing DAS. The weeding efficiency of power weeder was observed to be high at every stage of crop with varying speeds. When operated at lower speeds the plant damage will be minimum whereas operating at high speeds will result in maximum plant damage. The cost of weeding per hectare was observed as Rs. 3,878 ha^{-1} and Rs. 8,000 ha^{-1} for power weeding and traditional weeding, respectively. It can be started and operated by farmer or any unskilled labour with ease. Also working with power weeder in between the rows is easy with a very less maintenance cost.

Power weeder Information:



Fig. [2] Power Weeder

Power weeder which are present nowadays are 8 HP takes input of 3000rpm and give output of 120rpm which is very less rpm due to which it use to take lot of time and addition to it also require additional adjustment to join the blade to power weeder i.e. first we need to remove tyre and then join the rotor blade which waste lot of time.

In our new model of power weeder like the other power weeder it takes input of 3000rpm but gives the output of 336rpm which is compared more speed than the other power. We have added a new gearbox and back rotor which also enhance its performance.

On other hand we do not need to do any additional adjustment to join the blade as rotor blades are directly connected. As a result, most of the time is saved.

Operating Condition:

1. Onion Field:



Fig.[14] Onion

Onion seeds are sown on nursery beds to raise seedling for transplanting in the field. Raised beds of size 3×0.6 and 10-15 cm in height are prepared. About 70 cm (2.5 ft) distance is kept between two beds to carry out operations of watering, weeding, etc. the surface of beds should be smooth and well levelled.

2. Turmeric Field:



Fig.[15] Turmeric

1. Minimum tillage operation should be adopted while preparing the land in Turmeric Forming.
2. To give least 50 cm (2 ft) spacing between beds, beds should be Prepared with a height of 15cm, 1m width and suitable length.
3. In case of irrigated crops, rhizomes should be planted in shallow pit on the top of the ridges and furrows should be prepared.
4. Solarization of beds is useful to check the multiplication of pests and diseases causing organisms.
5. After the work completed Polythene sheets which is used for soil solarisation should be kept away safely.

3. Ginger Field :



Fig.[16] Ginger

Land Preparation:

The land is to ploughed 4 to 5 times or dug thoroughly with receipt of early summer showers to bring the soil to fine tilth. Beds of about 1m width, 30cm height and of convenient length are prepared with an inter – space of 50 cm in between beds. In the case of irrigated crop, ridges are formed 40 cm apart. In areas prone to rhizome rot disease and nematode infestations, solarization of beds for 40 days using transparent polythene sheets is recommended.

4. Sugarcane Field:



Fig.[17] Sugarcane

1. Low rainfall areas generally optimum for this planting method, which is simplest as well as cheapest of all.
2. Shallow furrows (8-10 cm deep) are opened with a local plough or cultivator at a distance of 75 -90 cm.
3. There should be adequate moisture in the field at the time of planting and two blind hoeing are given to replace the insect damaged setts.
4. Setts are planted at end to end taking care that one three budded sett falls in each running 30 cm length of furrow.
5. After germination, two to five inter row cultivation may be given at proper interval to control the weeds and to facilitate the tillering.
6. Generally, earthing is not done but sometimes, if it is necessary the crop may be given one earthing during July- August to protect the crop from lodging and to provide drainage in the field.

Final 3D Diagram:



Fig [18] Developed Min T8 Power weeder

This is the power weeder which is totally made in India. The power weeder back rotor given 336 rpm speed.

Rotor speed is increased so it is the main advantage for farming this machine can be used for sugarcane, Ginger, onion and Turmeric etc. This works on different operating condition, creating bed for different crop.

e.g. For onion distance between two bed is 2.5 ft.
For Sugarcane distance between two bed is 3.0 ft.
For Ginger distance between two bed is 1.5 ft.

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