National Conference on 'Advances in Engineering, Technology and Applied Sciences' - NCAETAS-2019
© 2019 IJSRSET | Volume 5 | Issue 6 | Print ISSN : 2395-1990 | Online ISSN : 2394-4099

A Review on Design and Fabrication of Power Cultivator

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ABSTRACT

As that now a day's using conventional farming method for cultivating the land which is so time taking and costly too, so we develop a new method to do it. In India all the equipments were used for cultivation purpose are expensive that in result unable to buy by every farmer and also to reduce the use of ox pair; hence to overcome this problem we design and fabricate this method. The practical application of this model was performed and we achieve our target to design and fabricate of power cultivator. This paper can directly discuss the working about our design and fabrication and presents the result of study per acre consumption of fuel.

Keywords: Power Cultivator, Engine, Soil, Land, Technology

I. INTRODUCTION

Power cultivator is designed mainly for cultivating in small farms area and in hill farming. The adoption of power cultivators by the farmers for carrying out farming operations is low when compared to tractors. The concept of power cultivator came to the world in the year 1920. The first country to use power cultivator on large scale was Japan. The first successful model of power cultivator was designed in the year 1947. During the year 1950 to 1965 the production of power cultivator increased rapidly. Power cultivator was introduced in India during 1963. Power cultivator is a walking type tractor. The operator trails behind the power cultivator, holding the two handles of cultivator in his hands. Power cultivator is also called as a single axle walking type tractor, though a seat is provided in some designs. Now-a-days some models of power cultivator have an optional riding facility. Power cultivators have been especially designed and developed for use on small or medium farms where four wheel tractors are not easily available.

Now-a-days some models of power cultivator have an optional riding facility. This design and fabrication of power cultivator is for small land and where the tractor is not possible for cultivation which is expensive method. In this paper we discuss about the design and consumption of fuel per acre of power cultivator. The operator trails behind the power cultivator, holding the two handles of cultivator in his hands. Power cultivator is also called as a single axle walking type tractor, though a seat is provided in some designs.

II. LITERATURE SURVEY

Studies shows that Subrata Kr. Mandal, Atanu Maity (from 15th National Conference on Machines and Mechanisms a research paper Development and Performance Evaluation of a Light Weight Power Tiller) conducted trials the average Effective field capacity was 0.2 and 0.25 ha/day. The average fuel consumption Was 1.0 and 1.2 l/h. The field capacity found to be 0.1 ha/day (10 hrs.). During the field

studies conducted in different soil conditions Sirohi and Panwar have found that the existing weight of about 200 kg of the IRRI model.

III. OPERATION

The operation of a power cultivator involves walking with the Cultivator machine on a farming land continuously for up to the needs to cultivate. During peak seasons of seedbed preparation, farmers operate power cultivator s even for more than 8h a day. The operator has to guide/control the forward movement of the machine by actuating hand clutches provided on each handle or sometimes by pushing/pulling the handles towards sides. The operator sometimes lifts the rear portion of the machine to take sharp turns at the headlands. The main clutch is a lever on the handle. The lever can be shifted to on or off position while operating in the field. When the lever is shifted to on position, the power from the engine is transmitted through the main clutch to the various parts of the power cultivator. When the lever is shifted to off position the power from the engine is cut-off from the rest of the transmission.

Fig. ENGINE

IV. COMPONENTS OF POWER CULTIVATOR

A power cultivator consists of the following main parts:

(1) Engine
(2) Transmission gears
(3) Brakes Rotary
(4) Pedestal Bearing or Pillow block bearing.

Fig. V shaped Cultivator

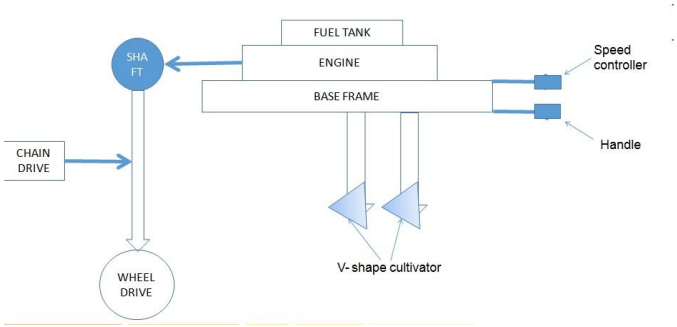
Fig. Wheel

Fig. Base Frame

All the power cultivator components are fitted with diesel engine. The makes like Kubota, Mitsubishi, Usha and Sarachi have used diesel engine in India.

V. POWER TRANSMISSION IN A POWER CULTIVATOR

For operation of power cultivator, the power is obtained from the IC Engine, fitted on the power cultivator. The engine power goes to the main clutch with the help of belt or chain. From main clutch, the power is divided in two routes, one goes to transmission gears, steering clutch and then to the wheel. The other component goes to the tilling clutch and then to the tilling attachment. The main components for transmission of power are given below:



V-belt is usually used to transmit power from the engine to the main clutch, because V-belt has very high efficiency and it works as a shock absorber also. The power cultivator remains an essential mode of power for farming operations, especially in land preparations. The Machine saves time and improves the land productivity. Wetland tillage in rice land cultivation is the main operation for which this machine is employed.

Belt Drive – It may be used as source of motion to transmit power efficiently track relative movement. Belts are looped over pulley and may have twist between the pulleys, and the shafts need not be parallel.

Type – V-Belt

Big pulley – 356mm

Small pulley – 78mm

Chain Drive – It is a way of transmitting mechanical power from one place to another. It used to convey power to the wheel of a vehicle particle.

VI. SYSTEM SPECIFICATION

Specifications of lightweight power cultivator used for performance evaluation

S. No. Particulars

1. Engine: Make Usha
2. Engine: Model UL5000SS
3. Engine: Power 5HP, 2600 RPM
4. Engine: 4 Stroke
5. Fuel tank capacity Diesel - 5lit
6. Lubrication – Central lubrication combined oil mist & splash
7. Weight of the Engine - 46 kg
8. Starting Method – Handle
9. Drive to Rotary unit Chain and sprocket, centrally
10. Overall Dimension 1510 x 730 x 910 (l x w x h)
11. Outer diameter of Rotary unit 300 mm
12. Depth of cut 100-150 mm (adjustable)
13. Total weight 120 kg

VII. CALCULATIONS

Data :

- Engine speed = **2600 rpm**
- Wheel diameter = 14”
  = 14*25.4
  = 355.6 mm
  = 0.3556 m
- Radius wheel :-
  R = 0.3556/2
  = 0.1778 m
-
  $X = \prod * D * N/60$
  $= \prod * 0.3556 * 2600 / 60$
  = 48.40

= 50 rpm

Wheel RPM is 50.

VIII. FIELD PERFORMANCE EVALUATION:

The lightweight power Cultivator was evaluated over an area of under sandy Loam soil for seedbed preparation. The 0.404 hector in 1hr with 1 lit diesel for cultivating land.

IX. ACKNOWLEDGEMENT

First of all we sincerely thank the almighty who is most beneficent and merciful for giving us knowledge and courage to complete the training work successfully. I derive immense pleasure in expressing our sincere thanks To the **Principal** Mr. Vivek Kapoor, for his permission and infrastructural facilities for the successful completion of our paper. I express our heartfelt gratefulness to Prof. Mr. Pratik Dhage, Assistance Professor ofMechanical Engineering department, for his valuable guidance and suggestions during the preparation of this paper. In addition, I would like to express my sincere gratitude to our project coordinator Mr.Mohsin Sheikh, Assistance Professor, Department of Mechanical Engineering for his support and guidance throughout the progress of my work. I also express our gratitude to all the teaching and non-teaching staff of the college especially to our department for their encouragement and help done during my work. Finally, we appreciate the patience and solid support of our parents and enthusiastic friends for their encouragement and moral support for this effort.

X. CONCLUSION

The power cultivator is capable of primary and secondary tillage operations and is most suitable for operations in hilly regions, wet conditions and for small holdings. Given the right set of implements and attachments, the power cultivator is capable of performing most of the field operations in the intensive cultivation. The light weight of power cultivator is a favorable factor for working in wet and dry land conditions. External attachments can be made on the cultivator depending upon the nature of work. So, the cultivator can be used as a multi-purpose machine.

The main advantage of this technology is that any farmer in India can easily handle this mini cultivator. For increasing the traction and torque we have reduces speed in three different stages as,

- By using V-belt drive
- By using two different chain sprocket mechanism

The 0.404 hector in 1hr with 1 lit diesel for cultivating land.

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