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DESIGN, DEVELOPMENT AND FABRICATION OF MINI CULTIVATOR AND TILLER

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Abstract: Earlier farmers were using Traditional farming method which is time consuming, hardworking and costly, hence we introduce new technology. Generally, the machines are used for the farming purpose in India which is of higher level. All machines were used in farms are costlier and not affordable to farmers, hence to overcome this problem we were make this model. This working model of mini cultivator, we were done their trial on the farms and results are being successful and achieve our main aim to make this model. In this paper we can directly discuss about the working machinery which would be work in one and half hector for tilling purpose. This modern technology we were introduce, plough will be getting moves in forward and base wheel moves rotating with blades having traction effect.

I INTRODUCTION

As we know that the soil tiller and cultivator is one of the many farm mechanization and soil/ power tillers frequently named as walking tractors has been used as an equipment to prepare/use for farming and for transportation. We were getting reference from OLEO-MAC company. The company would make rotary tiller (MH-195) which is having less torque and more speed, which is not suitable for Indian farming, hence to overcome this drawback we were making model based on combination of plough tiller and cultivator instead rotary tiller. The design development and fabrication of soil tiller and cultivator is a system which can be used in small lands around 1.5-3 acres due to its light weight (30-35 kg) and low power (4.5-6 HP). Anybody would be handled this cultivator. In most part of India, farms remain at center of agriculture and rural development and the machine which is specially designed for those farms. According to Indian Government surely there are 65-70% of farmers having less than 2.5-3 acres farming land and 50-60% farmers having income below 1.5-2 lacks per annum. Those farmers can easily afford this type of machine. By the news of “Hindustan Times” farmers are facing issues such as shortage of labour, labour cost and tractor cost. Therefore, solution need to be find for this whole problem, thus combination of users, survey and expert view point will be used to make the design and fabrication of soil tiller and cultivator.

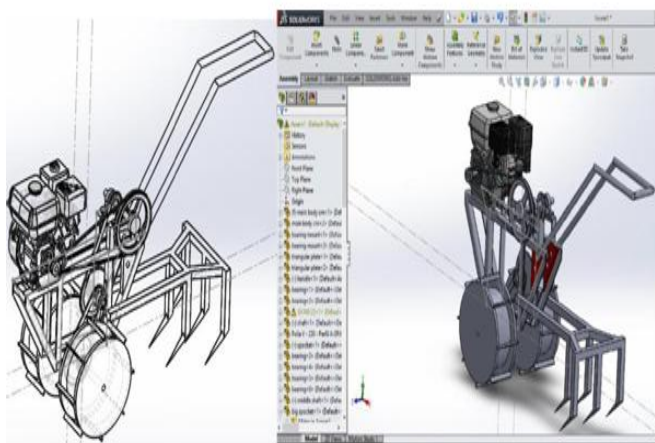
II LITERATURE REVIEW

In this review we gone through various aspects of machines set up in various parts of world for the purpose of tilling. In order to carry out this work we have undergone extensive research of topic and contribution of by various authors is as follows, D.A. Mada, Sunday Mahai, [2013] ^[1] concluded that the importance of mechanization in agricultural. The information from the paper was need of multifunctional vehicle for pre-and post-harvesting. We have taken this as base for our research and further production of our multifunctional agricultural vehicle. F.A. Adamu, B. G. Jahun and B. Babangida [2014] ^[2]. In his paper authors draws our attention towards the performance factor of a power tiller. Among those demand for light weight power tiller was sought out most. Fuel efficiency and field capacity of such parameters are also discussed. we take those points in consideration while designing a sustainable multifunctional agricultural vehicle. Md. Aqib Naque, Akhtar Ali Rizvi [2013] ^[4] This machine is developed to reduce the time and effort required for production up to the great extent. Also, this machine manufacturing cost is less as compared to other, by selecting above topic we are understand, familiar and know the details of agricultural technology, with the help of this machine we are trying to reduce labour cost, time of a middle class and small sector farmers. Kshirsagar Prashant, Kuldip Ghotane [2016] ^[5]. In this paper after completion, this

research it will of small scale farm. By employing this in real will help in faster rate of bowing, fertilizer spreading and grass erupting. Biswas H S, [1990] [6] Indian Institute of Technology, Kharagpur, India. 283p. In this research paper, we got the method for selection of tool depends on moisture contents in soil.

III WORKING PRINCIPLE

In this paper, engine is placed at top of model and with the help of engine belt of pulley going to rotated and with help belt chain is rotated. The wheel shaft is rotated with the help chain and wheel base with blades are going to start its rolling motion, due to tractive effort, plough is moving forward in linear direction. For support and changing the direction of plough handle is placed.



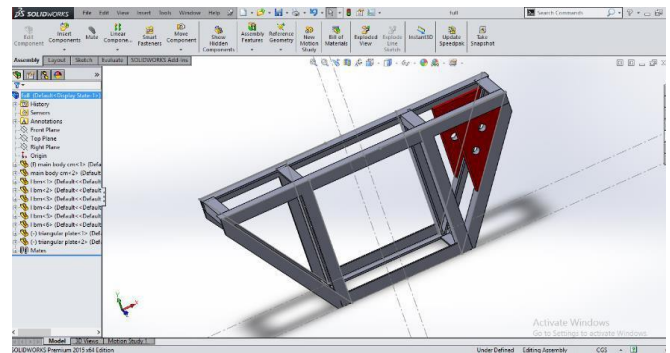
IV COMPONENTS LIST

ENGINE - Honda GX160



Engine type – Air cooled four stroke OHV
 Engine capacity – 163cc
 Power- 4.5HP Speed – 3000 rpm
 Carburetor – Butterfly
 Fuel – Unleaded 86 octane/ higher
 Engine weight – 14 kg

Main Body – On the main body we mounted all the necessary parts which is used, such as engine, wheels, plough, handle, drives etc.



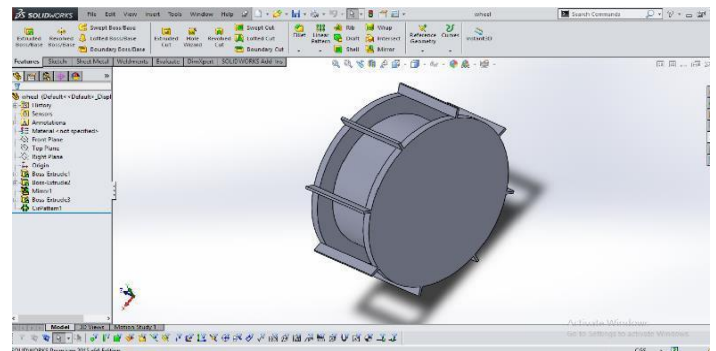
Beam – L Shape

Material – MS

Number of members – 14

Ground clearance – 180mm

Wheel– It is basically use for moving purpose which are move the overall body ahead. Blades are mounted on wheel for achieve traction effect.



Diameter – 360mm

Width – 160mm

Material – MS

Number of blades – 8 on each wheel

Number of wheel – 2

Track width – 540mm

Bearing - It is part which is used to enable rotation or linear movement while reducing friction and handling stress.



Bearing number – P204

Shaft size – ¾ inch

Bolt size – M10

Weight – 0.66 kg

Plough – The main aim of plough for initial cavitations of soil in preparation for bowing seed.

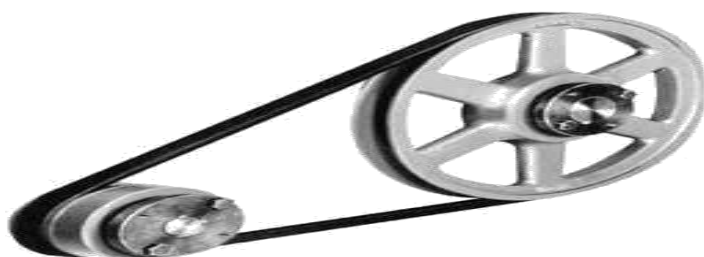


Number of blades – 5
 Material – MS
 Beam type – L shape
 Angle – 215°
 Tilling Depth – Min 4 inch

Speed reduction unit

We are using three different stages to reduce speed to get maximum torques we required for this machine, There are two units are as follows:

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 – A, V-Belt
 Big pulley – 300mm
 Small pulley – 50mm

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



Type – Simplex, ISO12A-1
 Small sprocket – 14 teethes
 Big sprocket – 39 teethes

V CALCULATION

Engine speed (N1) = 3000 rpm, Engine power (P) = 3.355 kw (4.5 HP)

Diameter of small pulley (D1) = 50mm

Diameter of big pulley (D2) = 300mm

Number of teeth on small sprocket (T1) = 14

Number of teeth on big sprocket (T2) = 39

First stage,

$$N_2 = \frac{N_1 \times D_1}{D_2} = \frac{3000 \times 50}{300} = 500 \text{ rpm}$$

$$t_1 = 64.075 \times 10^3 \text{ N-mm}$$

Second stage,

$$N_3 = \frac{N_2 \times T_2}{T_1} = \frac{500 \times 39}{14} = 139.2857 \text{ rpm}$$

$$t_2 = 177.988 \times 10^3 \text{ N-mm}$$

Third Stage,

$$N_4 = \frac{N_3 \times T_3}{T_2} = \frac{139.2857 \times 39}{14} = 390.7142 \text{ rpm}$$

$$t_3 = 492.89 \times 10^3 \text{ N-mm}$$

Final speed = 65 rpm

Final torque = 492.89 * 10³ N-mm

VI CONCLUSION

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

As increasing the traction and torque for tilling process achieving by depth of 4-7 inch. The transportation of tiller can be replaceable to bladed wheel with normal tyre. It is advance technology, by which reduces work time, man power, easily handle. The agricultural machine was designed and developed with an aim to working to machine at different speed and soil conditions, machine is able to sustain and faces frequently changing conditions. This machine is affordable to farmers and capable of performing multifunction like Plowing, Differential Cultivation, Wrapper, Pudding etc.

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