

SOLAR POWER TILLER

Waghmode R.S. ,Shinde S.R. ,Dixit A.K. ,Chanchure A.A. ,Jadhav K.H. ,Gudur S.E.

Mechanical Engineering Department, N.B.Navale Sinhgad College of Engineering Solapur,
Maharashtra, India, rohitwaghmode005@gmail.com

Professor, Mechanical Engineering Department, N.B.Navale Sinhgad College Of Engineering , Solapur,
India,**Prof.Gudur S.E.**

Abstract

The present research has dealt with solar rotary tiller design for the power tiller that is made for using in primary and secondary tillage. Comparative study for portable weeders and power tillers in the Indian market is discussed. Various methods used for weed removal in crops are also discussed. This study revealed that most of the Indian farmers, majority of which are small scale farmers can afford only portable weeders. The soil tiller and weeder is one of the many farm mechanization in promoting soil tiller and weeders especially considering the fact that the majority of farmers are having small land. It reduces human effort. The implements are mostly self guided. Working of the project is based on solar panel and it generates energy to run this machine which moves the cutter or tiller. It is a great saver of time and expenses on field operations. Thus it will have very effective uses on the farm field either for tiling as well as for weeding. Development of high capacity energy efficient versatile machines and combination machinery for increased labor productivity, reduced unit cost of operation, improved timeliness of operation and suitable for custom hiring.

Index Terms— Solar rotary tiller, Power tiller, Secondary tillage, Weeders, Small land, Self guided, cutter, etc..

1. INTRODUCTION

Agriculture is the backbone of Indian economy. India being developing nation agriculture and industries based on agriculture products has prime importance in the national economy. Majority of the Indian population depends on agriculture and agro-based industries and businesses. The soil tiller and weeder is one of the many farm mechanization. Unlike tractors, soil tiller and weeders are nonconventional so far as the displacement of labours is concerned. In promoting soil tiller and weeders especially considering the fact that the majority of farmers are having small land. So they can hardly afford costlier tractors. therefore, the soil tiller and weeder should become a useful machine in the internal cleaning of crops which having small distance between them like groundnuts, sugarcane, soya bin crops, cultivation of paddy, in particular, and other crops in general for the smaller farmers. Its main objective is to reduce the manpower as in today's scenario labors are very hard to find as well as it reduces the working time. As it could be far better than the conventional using of labors or bull for tilling purpose. Lack of mechanization or automation is one of the major road blocks to improving the productivity of agriculture. One of the major reasons for lack

agricultural productivity is weeds. A rotary tiller is a type of motorized cultivating equipment that breaks or works

the soil with the aid of rotating blades. Rotary tillers are available with advanced technologies and innovative designs which provide great performance. The rotary tiller can be self-propelled and driven forward on wheels. Featuring a gearbox, the rotary tiller enables one to increase the rotation speed of the blades more than the forward Speed of the equipment. Rotary tillers have become world famous for preparation of seedbed in fields.

These equipments are also used for breaking or working the soil in lawns, gardens, etc

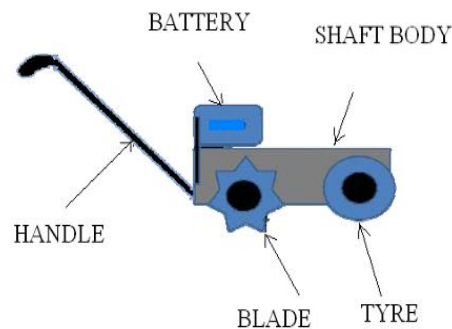


FIG NO 1 . Block diagram of proposed model
2. NEED OF THIS PROJECT-

Soil tiller and weeder reduce human effort as compared to operation by bullocks. The bullock implements require the hand and body pressure to achieve depth and alignment of the implement in use, whereas in soil tiller and weeder, the implements are mostly self guided. This reduces human drudgery to a great extent. The comparative higher output of operation by the soil tiller and weeders as compared to bullocks reduces the operational time and achieves timeliness in operation. The maintenance of the soil tiller and weeder is easy. It is ideally suited for mechanizing small farm holdings which account for 80 % of the farm holdings of the country. Cost wise the soil tiller and weeder should be an obvious choice of smaller farmers, if they are intending to have a mechanical power source for farm- operation. Soil tiller and weeder reduce the drudgery of collecting the waste grass between crops in the field during operations as compared to operations by bullocks. The soil tiller and weeder make the manual of that wastage grass by cutting it in small piece and thoroughly mixed with soil during operation.

3. WORKING

In this machine bicycle power tiller is used. In this unit there is a using of manual push type power tiller. There is steady static blade is used at rear side of tiller with shaver blade. But in this machine we modify the tooling system steady into rotary which is driven by electric dc motor of rpm 150 and 7.2 n-m torque. This motor is powered by battery pack. This rotary tool is rotate in reverse direction of entire machine which is effective for earth moving in between two lines of crops in farms. This consist a solar panel and it generates energy to run this machine The solar

radiations are immersed on solar panel By this process the solar energy is converted into electrical energy The solar energy is stored in battery Then the battery passes electrical energy to run the motor When the motor runs also the rotor runs And finally the work is done by rotor Where there is turn machine we can turn it easily. it is essential factor of this machine.

3.1. Part list –

Bicycle power tiller, Dc series motor, Battery, Rotary tool, Solar panel, Gear Box, Main frame



FIG NO 3.1.1-Bicycle power Tiller

DC Series Motor-

This type of motor very large amount of running force called torque, from a stand still because of this characteristic the DC motor can be used to operate small electric appliances, portable electric tools, cranes winches & like another characteristic is that the speed varies widely between number load & full loaded. Series motor cannot be used where a relatively constant speed required under conditions of varying load. The manor disadvantage of dc series motor is related to the speed characteristic of mention in last paragraph. The speed of series motor with number of load connected. To it increase to point, where becomes the motor will be damaged. Usually either the bearings are damaged or the winding fly out of the slots in armature. There is danger to both equipment & personal some load must always be connected to a series motor before it turn on. This precaution is primarily for large motor, small motor such as these used in electric hands drills, have enough internal frictional to load than selves. A final advantage of series is that the can be operated by using either an AC or DC power source.

Motor details-

Voltage = 24VDC,

Rated current = 2AMP, N =1000, P= (24×2) =48W,

$P = \frac{2\pi NT}{60}$, Torque (T) =0.45 N.M For motor is calculated

But, the Rpm of gear box output= Rpm of motor/ final gear ratio = 1000 / 6.75 = 148.14 = 150,

Put N =150 to calculate gear box torque = 3.05 N-M

Gear ratio –

G1:G2 = 45:09 = 5

G2:G3 = 09:46 = 5.11

G3:G4 = 46:10 = 4.6

G4:G5 = 10:54 = 5.4

G5:G6 = 54:08 = 6.75

Gear box detail-



FIG NO 3.1.2-Gear box

Table No 1-Gear box detail

Gear	Teeth	Pitch	Pitch circle dia.	Orig.dia.
G1	45	06	77	85
G2	09	06	14.5	21.5
G3	46	4.5	54	59.5
G4	10	4.5	9.2	14.5
G5	54	2.7	39	42
G6	08	2.7	4.8	07

Battery-

Table No 2-Specification of battery

Nominal voltage	12
Rated Capacity (20 HR)	7.2
Approx Weight	2.35
Charge	0 (32 F) to 40 (1040F)
Discharge	20 (-4 F) to 50 (1220F)
Storage	20 (-4 F) to 40 (1040F)

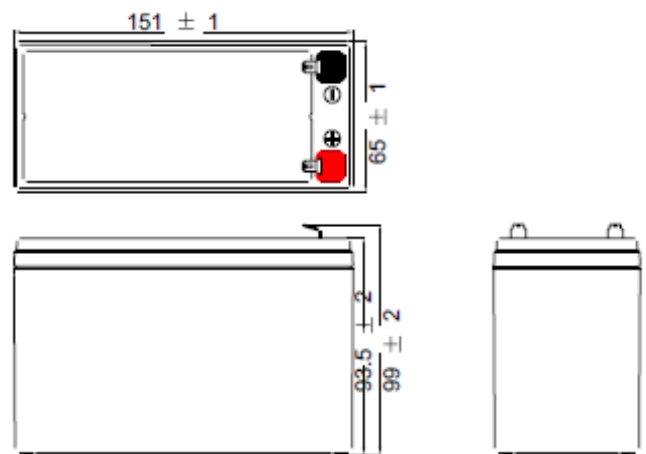


FIG NO 3.1.3-Dimensions of battery

Solar Panel-



FIG NO 3.1.4-Solar panel

Solar panel refers either to a photovoltaic module, a solar hot water panel, or to a set of solar photovoltaic (PV) modules electrically connected and mounted on a supporting structure. A PV module is a packaged, connected assembly of solar cells. Solar panels can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few solar panels available that are exceeding 19% efficiency. A single solar module can produce only a limited amount of power; most installations contain multiple modules.

Rotary Tool-



FIG NO 3.1.5- Bar Shape Tool



FIG NO 3.1.6-C Shape Tool

Direction of Rotation-

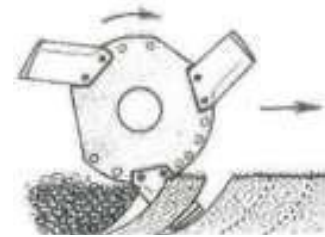


FIG NO 3.1.7-Direction of rotation of rotavator

In case of reverse rotor rotation direction more energy is consumed in tillage because of the higher speed and cutting length. That was concluded based on the observation of soil as a homogenous material. As per research scientist have found.

That in the case of reverse rotor rotation direction, the cutting principle is completely changed, thus affecting the soil resistance and quality of soil breaking.

3.2. Depth of Tillage-

Tillage depth has an important effect on physical properties of the soil layer and power requirements of the tillage tool. Tillage depth is an important parameter in the design of tillage implements. For pull-type tillage implements, the ratios of tillage depth to tillage width, and for rotary tillers, the ratio of rotor diameter to tillage depth are considered in evaluating tillage performance. For practical working conditions, the set tillage depth of rotary tillers is less than the rotor radius. The tillage depth of a pull-type tillage implement that has straight-cutting edges in a single horizontal plane is relatively constant. A combination of deep depth of tillage, with increasing blade rotational velocity, results a rapid increase in specific energy. While the energy demand increased with depth, the specific energy requirements, i.e., energy per unit volume of tilled soil, decreases.

Comparison of Various Portable Weeders on the Basis of Power Details such as Power Source, Power Generated & Transmission used is shown in Table No 3

Company Name	Prod. Name	Power Source	Power H.P.	Transmission
Rekha Agriplus	CL262 Power	4 S	1.4	Gear Box, Variable

Pvt Ltd.	Weeder	Diesel		
Maxx Engg. Pvt Ltd.	Power Weeder-PW210	2 S Petrol	1.9	Gear Box, Variable
Premier Pvt. Ltd.	Portable Weeding machine	2 S Petrol	1.8	2- speed, Gear Box
KSNM Agricultural Pvt. Ltd	Cono Weeder	Manual	1.8	None
Aspee Pvt. Ltd	Paddy Weeder	4 S Petrol	3.54	Gear Box, Variable
Aspee Pvt. Ltd	Power Weeder 50M	4 S Petrol	2.5	Gear Box, Variable
Aspee Pvt. Ltd	Rotary Tiller RT GB 55H	4 S Petrol	5	Worm Gear Box

Portable weeders are available in various ranges in Indian market. The power rating of these weeders is from 1.5 HP to 5HP 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 high initial cost ranging between Rs. 15000/- to Rs. 40000 and operating cost largely depends on cost and consumption of petrol and manual labor required for operation.

4. ADVANTAGES –

1. Simple in design
2. Easy to operate
3. Easy to maintain
4. Cheap in cost
5. Pollution free
6. Eco-friendly
7. User friendly
8. It has no running cost.
9. Solar radiations are easily available in rural area.

5. CONCLUSION-

Today in the world fuel prices rises day by and the pollution may also. To control this pollution and to save the petroleum product and bio product this project is design and developed. This system requires heavy initial investment but it gives the energy output for life time with low maintenance etc....

16. ACKNOWLEDGMENT-

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