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Design and Fabrication of Soil Scraper for Coconut Tree

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ABSTRACT: The main aim of the project is used to optimize the soil ploughing for coconut tree in agricultural field, gardens and forests. The concept is used to dig the soil for water irrigation purpose and to avoid the human hard effort and to reduce time to increase the productivity.

IC engine has more torque to dig the soil easily it is connected to the scraper tool made of steel which is in wedge shape, the main purpose of the design tool to dig the soil and guide to move the soil out of the tool once ploughing.

The design of scrapers (IC engine scrapers) allows for loading, hauling, dumping, and spreading of loose materials, guides are provided to attach to the tree stem to follow the round path along the tree. This machine is designed to help the farmers having coconut, areca nut farm etc.

INDEX TERM: Sirrigation, IC engine, ploughing, scraper, hauling,areca nut

I. INTRODUCTION

In today's scenario the growth of coconut trees is very difficult and challenging due to unwanted plants present around the trees. So farmers use traditional method for removing these plants by using hand tools, modern machines. Tractors can't remove them as it harms the roots of tree and it can damage trees, so to overcome the difficulty of the farmers a scraper tool has been designed and fabricated which will remove the unwanted plants around the trees and also it will mix the soil. By this machine human hard work, effort, time and money can be saved and it is less cost so every farmer can afford.

Soil scraper last stage in farming which takes maximum time of farmer among all farming process. In India tiller is generally done manually. Thus our intention is to provide farmer a "soil scraper IN AGRICULTURAL APPROACH".

This machine consists of simple mechanism make to run by an engine which will be economical to farmer and will take less time for tiller operation.

II. CONCEPT OF THE WEEDING PROCESS

Weeding process is the removal of unwanted plants in the agricultural field. Weeds place a very important role in the coconut farming and it has adverse effects on the yield. So in order to increase the yield, weeds around the coconut trees should be controlled effectively and also it helps in proper fertilization. The weed present around the tree absorbs or utilizes all the nutrition present in the soil.

The weed present around the tree makes hard for workers to climb as it covers the ground and this could lead for homes of many reptiles. Weed removal process is more difficult job.

Farmers use traditional and modern methods for weed removing.

Traditional method, this method is used in earlier days of formers to removing the unwanted plants in the agricultural field. This method of removing weed required more time and more labours. Some of traditional methods are weed remover by hand khurpi, by slim and long sweep blades, by animal drawn weeder and by hoes.

Modern methods are by using chemical and mechanical process. In chemical method some of chemicals are used to remove the weeds in agricultural field, it causes more damages in agricultural land and reduces the fertility of the soil in future. Mechanical methods of removing weed in agricultural field is nothing but removing weed by using mechanical equipment, it kills weed and also maintain good fertility and soil surface of agricultural land.

III. WORKING

This is the equipment used for removing the unwanted plants around the coconut trees, it is also done the softening land and ploughing the soil. The 2stroke IC engine is used in this equipment. This equipment is also used for many other application in agricultural field by displacing the working tool of the equipment.

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The engine is mounted on the frame and back side of the equipment, if the engine starts to operate, it drives the shaft by using the mechanism called sprocket and chain mechanism, due to which the device moves in forward direction therefore the main wheels of equipment also rotates and move in forward direction.

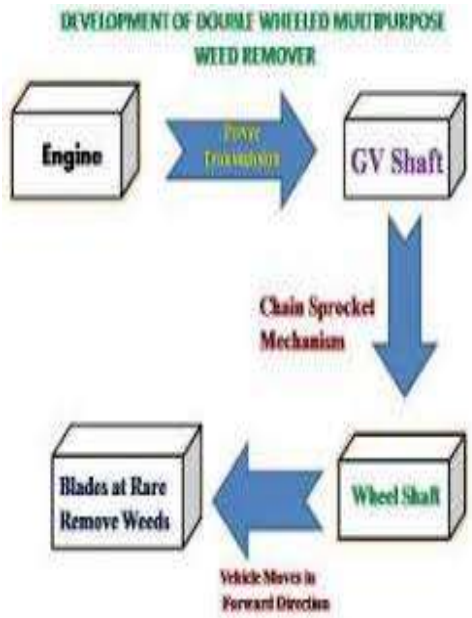

Fig.1 working process chart

The power from 2stroke IC engine is transmitted to shaftby using the sprocket and chain mechanism, due to sprocket and chain mechanism is connected between the engine and shaft .The shaft rotates which in turn drives the two wheels mounted on the bearings and wheel hubs. Then vehicle moves in forward direction and blades attached at front endenter into the soil around the coconut tree and then finally weed removal takes place.

Due to this,Many operations such as weed removal, soil scraping and ground softening can be performed, thus it increases the yield. The device is feasible and sustainable. It effectively reduces labor work and saves time. Applying the innovative ideas and advanced technology to the farms is necessary to revolutionize the Indian agriculture there by reducing the old manual methods. This is little effort to make comfort to our farmers, also this machine is manufactured in less cost as compared to other machines.

IV. DESIGN CALCULATIONS

4.1 DESIGN OF SPEED RATIO

symbols

N1 = speed of larger sprocket
N2 = speed of smaller sprocket
T = torque applied
P = N = power applied
D1 = diameter of larger sprocket
D2 = diameter of smaller sprocket

Calculation :

Torque applied = Force * length
= 100 * 0.18
=18 N

Power = (2*π*N1*T)/60
= (2*π*60*18)/60
= (2*π*60*18)/60
= 0.13 Kw

Now

N1/N2 = D2/D1

Where D1 = 180 mm = 0.18 m
D2 = 78 mm = 0.078 m
N1 = 60 rpm

Therefore

60/N2 = 0.078/0.18
N2 = 138 rpm

4.2 SPROCKET AND CHAIN:

As per the design requirements the minimum number of teeth's on the sprocket can be found out by using bore dia.

Z min = 4 ds / p + 5 for p < 25mm
Pitch p= 8mm
Ds= 15mm
Z min = (4 x 15) / 8 +15
= 12.5

The minimum numbers of teeth to be taken are 12.5, but chosen are
On bevel gear shaft = φ80mm and 24 teeth
On rear wheel shaft = φ60mm and 18 teeth.
The chosen above the minimum requirements hence the design is on safer side.

N2 /N1 = T1 /T2
N2 /N1 =24/18
=1.333
Velocity ratio = 1.33

Number of chain links can be found out by.

K = (T1 + T2) / 2 + (2 x / p) +[(T1 - T2) / 2 π]2(p / x)

Where x = centre distance
= 244.49mm

K = (24 + 18) /2 +(2 x 244.49)/8 +[(24 - 18) /2π]2 (8 / 244.49)
= 82.7392

Therefore length of chain = L = K.P
L =82.7392 x8
=661.9136mm

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V. 3-D MODEL OF AGRICULTURE EQUIPMENT

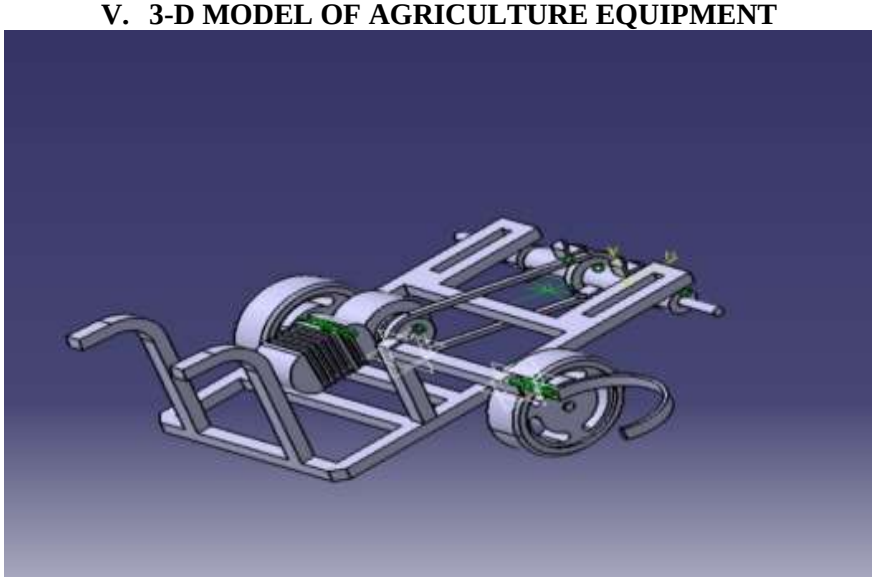

Fig.2 Isometric view of scraper machine

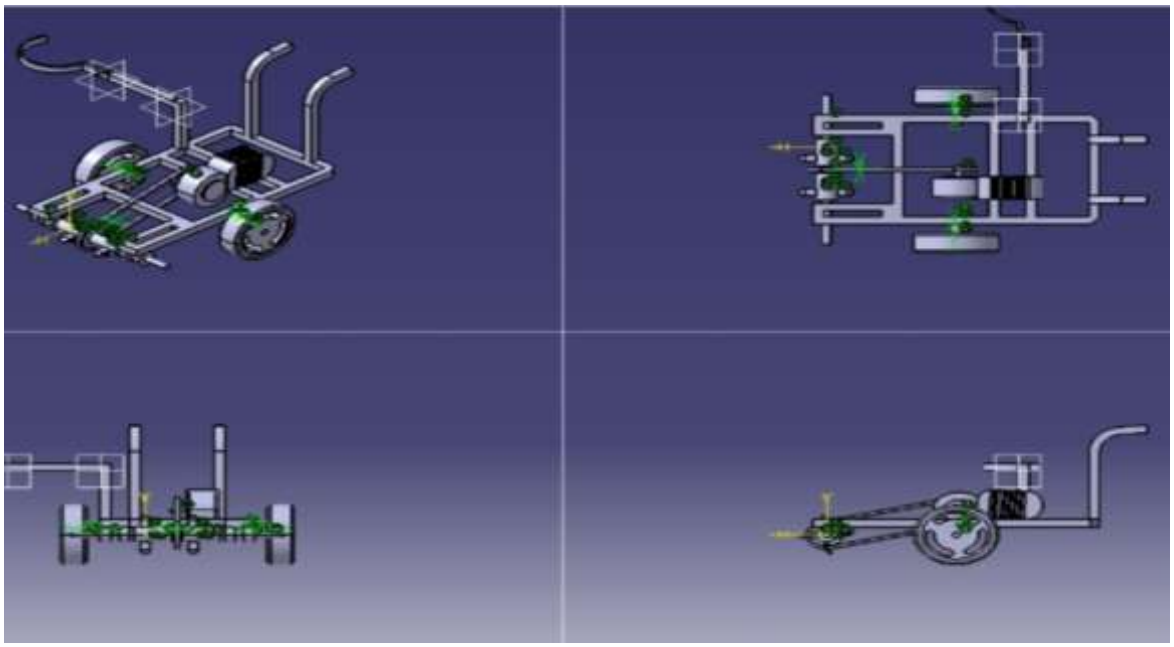

Fig.3 Front, top, back and side view of scraper machine

VI. ADVANTAGES

1. Easy in operation, Low cost, Light weight.
2.Power saving, No skill operator required, adaptable.
3.Simple construction, Automation can be implemented.
4.High performance, Multi-operational, Time saving.
5. Pure mechanical, easy maintenance.
6. One labour is enough for operation.
7.Working is very easy compared to primitive work method.
8. Environmental friendly.

DISADVANTAGES

1.Machine performs multi-operations hence unemployment increases.
2 .Exhaust harmful gases to the environment.
3.Produces less power as compared to bulky agriculture vehicle like tractor etc.

APPLICATIONS

1. ploughing
2. Weeds removal
3. For softening land

VII. CONCLUSION

The work is about integrating of mechanical system to the agriculture fields for the agriculture operations. Many operations such as weed removal, soil scraping and ground softening can beperformed, thus it increases the yield. The device is feasible and sustainable. It effectively reduces labor work and saves time. Applying the innovative ideas and advanced technology to the farms is necessary to revolutionize the Indian agriculture there by reducing the old manual methods. This is little effort to make comfort to our farmers, also this machine is manufactured in less cost as compared to other machines.

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