MULTI-PURPOSE FARMING MACHINE

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Abstract

At present farmers pay plenty of cash on machines that facilitate them decrease labour work and increase yield of crops. There are numerous machines available in the market for tilling, harvesting, spraying pesticides etc. Moreover, separate machines are required in all these operations, so that yield and profit returns from using this equipment’s is terribly less as compared to the investment. So inorder to improve productivity and quality of work it is essential to introduce a multipurpose agricultural equipment in which two operations including ploughing and grass cutting is mainly done by using this attachments it can able to perform various farming operations within less time and economically.

Keywords: Tillage, Yield, Ploughing

Introduction

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. Agricultural sector is changing the socio-economic environment of the population due to liberalization and globalization. About 75% people are living in the rural area and are still dependent on agriculture. Mechanized agriculture is the process of using agriculture machinery to mechanize the work of agriculture, greatly increasing farm worker productivity in modern times, and powered machinery has replaced many farm jobs formerly carried out by manual labour or by working animals such as oxen, horses. The entire history of agriculture contains many examples of the use of tools, such as the hoe and the plough. However, the ongoing integration of machines since the industrial revolution has allowed farming to become much less labour intensive current mechanized agriculture includes the use of tractors, trucks, combine harvesters, numberless kinds of farm implements, airplanes and...
helicopters and alternative vehicles. Precision agriculture even uses computers in conjunction with satellite imagery and satellite navigation to increase yields. Mechanization was one of the large factors responsible for urbanization and industrial economies. Besides improving production efficiency, mechanization encourages large-scale production and sometimes can improve the quality of farm produce on the unskilled farm labour and can cause environmental degradation especially if it is applied shortsightedly rather than holistically.

**Methods**

**Chassis of the Vehicle**

The choice of material for the vehicle is the first and most important factor for automotive design. There is variety of materials that can be used in automotive body and chassis. The most important criteria that a material should meet are lightweight, economic effectiveness, safety, recyclability, and life cycle consideration. Some of these criteria are the result of legislation and regulation. The material for the frame and chassis is steel. The main factors for selecting material specially for body is wide variety of characteristics such as thermal, chemical and mechanical resistant which are ease for manufacturing and durability. In the frame only the main supporting structures such as engine of the vehicle, the harvester and ploughing tool are mounted. It support the tool static and dynamic load of the vehicle.

**Frame Design**

The design is made which is suitable supporting all the operations. The frame is made for a compact size vehicle.

**Ploughing Tool**

**Concept of the Tool**

The Ploughing tool is designed in the way that it wouldn’t break due to the sudden encounter of rocks and roots present in the soil. The faults in the current tool is changed and modified. The designed new tool is durable and affordable and can be used in all kinds of geographical region. The life of the tool is increased by replacing the only the tip of the tool. The sharpness of the tool is remains constant for significantly longer period of time. The efficiency and the effectiveness of the tool is increased. The optimum weight of the tool is obtained. The breakage of the tool is reduced by using high speed steel in the tip. The material used for plough tool is High Speed Steel. is converted into rotational motion by means of a crankshaft, a piston and a rod that connects them.

**GRASS CUTTER**

A rotating tool is used for grass cutting which is fixed in the front side by welding. The drive from the crank is directed to the blade with the help of belt drive with the help of pulley.

**Mechanism and Design**

The scotch yoke mechanism is used in the harvester design. It is also known as slotted link mechanism. It converts rotational motion into linear motion. The reciprocation part is directly coupled with the sliding yoke. The components in the harvester are frame plate, scotch, yoke, supporting rods and blades. One blade is fixed stationary and the other one is fixed to the moving rod.

**Scotch Yoke Mechanism**

The Scotch yoke mechanism is a reciprocating motion mechanism, converting the linear motion of a slider into rotational motion, or vice versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating part. In many internal
combustion engines, linear motion is converted into rotational motion by means of a crankshaft, a piston and a rod that connects them. The Scotch yoke is considered to be a more efficient means of producing the rotational motion as it spends more time at the high point of its rotation than a piston and it has fewer parts.

Fabrication And Assembly

Chassis of the Vehicle
The chassis of the vehicle is made of iron square section of 800*1000 mm dimension. The section is cut and welded according to the given design dimension. 2 Fabrication of the Ploughing Tool and Frame

The plough tool is fabricated using high speed steel. The tool is machined by cutting and grinding operations. The tool is fixed to the plough frame and various supports were given in the frame for fixture of the plough frame in the vehicle.

Engine Specification

The engine used for purpose of prime mover is active engine.
Displacement : 110 cc
Engine Type : 4-stroke, Air cooled, Single cylinder,
Max. Power : PS @ 8000 rpm
Max. Torque : 8.2Nm @ 5500 rpm
Fuel Type : Petrol
Final Drive (rear): Chain drive

Design Analysis And Testing

Design Calculation for Shaft

Power of the engine, \( P = 10.297 \text{ kW} \)
Displacement = 110 cc
\[ \text{Power, } P = \frac{2\pi NT}{60} \]
\[ 4722.8 = (2 * 3.14 * 5500 * T)/60 \]
Torque, \( T = 8.2 \text{ Nm} \)
Now \( T \) is the maximum torque among all shaft, checking the shaft for failure \( T = \left( \frac{\pi}{16} \right) * 135 * d^3 \)
\[ 8200 = (3.14/16) \times 135 \times d^3 \]
\[ D = 6.76 = 7 \text{ mm} \]
But in this project, the diameter of the shaft is 35mm. So the design is safe.

Calculation for Grass Cutter

\[ \frac{\text{Rpm of the engine}}{\text{Rpm of the grass cutter}} = \frac{\text{dia of larger pulley}}{\text{dia of smaller pulley}} \]
\[ \frac{5500}{\text{Rpm of grass cutter}} = 4.5/2 \]

Rpm of grass cutter = 2450

Results

<table>
<thead>
<tr>
<th>SI No:</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cutting speed</td>
<td>2450</td>
</tr>
<tr>
<td>2</td>
<td>Diameter of ploughing depth</td>
<td>5 cm</td>
</tr>
</tbody>
</table>

Conclusion

This project entitled Design, Fabrication of Multipurpose Agriculture Vehicle is successfully completed, and the results obtained are satisfactory. It will be easier for the people who are going to take the project for the further modifications. It very useful for small-scale farmers. The cost can be reduced by using this type of vehicle. The agricultural operations is made easier. The reduction in cost of the plough tool is done and the life is increased. The cutter blade is made working by scotch yoke mechanism.
References


