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# Development of Multipurpose Agriculture Machine

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**Abstract**: *Now a day population of India is increase as day per day.so meeting the requirement of its food product, production of agriculture product is also required to increase but due to high cost of machinery available in today's market has high cost, so small farmer does not use that equipment.so It require to make a new machine which done major four operation in agri field like; ploughing, seeding, cutting of crop, pesticide sprayer.by using that four equipment in one unit , cost are reduced and small scale as well as medium scale farmer can use the equipment.*

***Keywords:*** *crop cutter, ploughing, seeding, pesticide sprayer.*

## I. INTRODUCTION

The increase in demand for the different kind of agricultural machine is arise. The Farmers are not capable to purchase all these machine individually, so we are here designing the project which functionally satisfy almost four machine requirements. The rigidness of such mechanical automatic machines hinders the changing patterns of the consumer expectations. The main purpose of machine is fulfill basic needed operation. Crop Cutting is the basic operation that performed in all agriculture activity. We are design prototype that satisfy the basic need. Small-size farms are a huge issue in mechanization because of it's against of the "economics of scale". These problems are classified into technological constraints, financial and economic problems, and environmental issues. There are machines available in the market nowadays which are generally used for large-scale farming and thus are not suitable for small-scale farming conditions of the user. Also, in developing countries, farm labor is also a big issue. The income of farmers remains also very low and the wages for farm labors are increasing day by day.

## II. IMPORTANCE OF PROJECT

This project is to help small-scale farmers to fulfill demand and supply for market, by designing a multipurpose agriculture machine it cut the crop more easily, spray pesticides, and seeding and ploughing easily. Our aim is on focus easy of cutting operation, spray of pesticides to the small land holders for cutting varieties of crop in less time and at low cost by considering different factors as power requirement , cost of equipment , ease of operation , field condition , time of operation and climatologically conditions. The operating, adjusting and maintaining principle are made simple for easy and properly handling by unskilled operators.

## III. LITERATURE REVIEW

We are creating a MULTIFUNCTIONAL AGRICULTURAL MACHINE which can perform many operations such as seed bowing, fertilizer spraying and cutting crops. In order to carry out this work we have undergone extensive literature survey and contribution of by various authors is as follows,

1) V.K. Tewari, A. Ashok Kumar, Satya Prakash Kumar, Brajesh Nare[2012] In this research papers author have done case study on farm mechanization in west Bengal as being part of India it give clear status about availability and progress in India. This ensured us to take right steps compared to current steps.

2) F.A. Adamu, B. G. Jahun and B. Babangida [2014] in this 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 such parameters are also discussed. We taken those points in consideration while designing a sustainable multifunctional agricultural vehicle.

3) Mohammad Muneer Uz Zaman Author have emphasized on designing parameters of the grass cutter and he done research on reduction of cost of the material to be used. We taken this information for our design our one of the attachment which is related to grass cutter.

4) Adamade, C.A. and Jackson B.A. [2014] fellow researcher worked on Mechanization is recognized as the necessary major means needed to accelerate agricultural production and create a period of surplus in Nigeria. Indeed food

 

sufficiency can only be attained in Nigeria by encouraging and promoting local designs and manufacture of implements and equipment at low cost. We have taken the useful data from this research paper.

5) Parminder Kamboj, Rohinish Khurana, Anoop Dixit [2012] Disc harrow, tractor, lase leveller, rotavator, BT cotton seed drill are available in more than 85% of societies. Tractors which are available in societies are ranging from 50-60 hp. Most of the hiring charges vary from 25-40 Rs. h-1 except that of laser leveller whose hiring charge is 500 Rs. h-1 and tractor hiring charge is 150-250 Rs. h-1 and rotavator hiring charge is 70-80 Rs. h-1. In more than 70% of the societies, annual use of the rotavator was 550 h. and annual usage of tractor.

6) G. Moitzi, T. Szalay, M. Schuller, H. Wagentristl, K. Refenner, H. Weingartmann, P. Liebhard, J. Boxberger, A. Gronauer [2013] The tractor-implement combination influenced via working speed and working width, the work time and fuel consumption. A tractor-implement combination operated in a high engine load had a great potential in reducing fuel consumption A well loaded "small tractor" with small implements are more fuel efficient than a worse loaded "big tractor". This data have been used accordingly.

7) P. Sarec, O. Sarec [2015] the lowest values of soil penetration resistance below the cultivated profile were determined with the cultivators equipped with chisel shaped shares, i.e. in the case of Farmet and Kockerling. Cultivators Vaderstad TopDown 400 and Farmet Turbulent 450 showed good capacity in embedding plant residues. This results have taken for our research basis.

## IV. DESIGN AND PARTS

### 4.1Components

Components used for multipurpose agriculture machine are as follows:

1. Dc motor
2. Shaft
3. Coupling
4. Bearings
5. Cutting tools (rotary blades)
6. Battery
7. Dc water pump
8. Storage tank
9. Nozzle
10. Pressure regulating valve

### 4.2Design and Parts

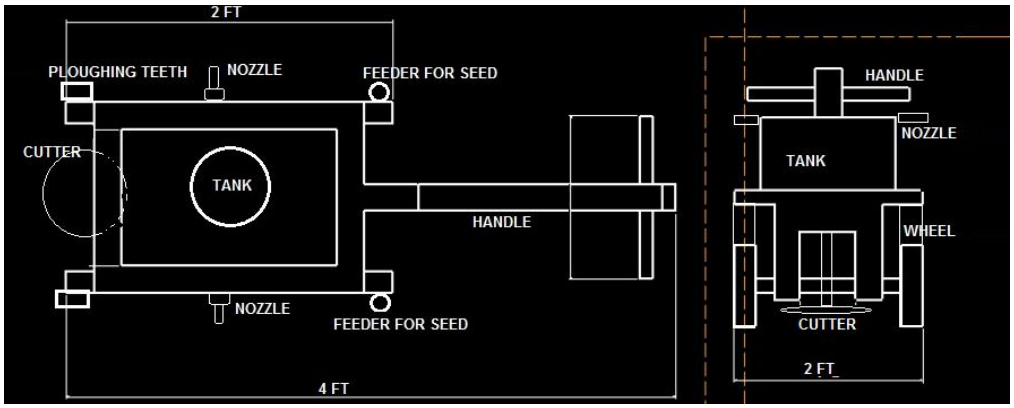


***Figure 1. Design of machine***

 

*Figure 2. Different Types of cutter*


*Figure3. Different types of nozzles*


*Figure 4. Battery*

*figure 5. Storage tank*

*figure 6. Dc water pump*

**TABLE 1**

| Component | Material |
|---|---|
| Cutter blade | High Carbon steel |
| Shaft | Cast iron and aluminum |
| Frame | Mild steel |
| 2 Ground wheel | woes rubber |
| Ploughing teeth | Cast iron |

**4.3 Design Calculations**

 

#### 4.3.1 Motor selection

For our project we select, 0.5 HP motor.5hp =372.5 watts
Rpm of motor =50
We know that , $P=2\pi NT/60$
T=71270 n.mm
Speed $v= \pi DN /60$ =130.83 mm/ s

#### 4.3.2 Design Of Shaft

Now, We know torque is 71270 N
Shaft Dia = ds
Now,
Torque Transmitted to the Shaft
$T = \pi/16 \times (ds)^3 \times \tau_{ms}$ $71270 = \pi/16 \times (ds)^3 \times 35$
$(ds)^3=7375.9$ , ds = 19.46 mm
We are selecting Diameter of Shaft 25 mm

#### 4.3.3 Design Of Welded Joint

The welded joint is subjected to pure bending moment . So it should be design For bending stress. We know minimum area of weld or throat area
$A = 0.707 \times s \times l$ Where s = size of weld l = length of weld
$A = 0.707 \times 5 \times ( 75 + 40 + 35 + 58 +35 ) = 0.707 \times 5 \times 243 = 859\ mm^2$
Bending strength of parallel fillet weld $P = A \times f_b$
$F_b = 80\ N / mm^2$
As load applied at the end of lever is 250 N . So moment generated at the welded joint is
M =P x L= 250x 450= 112500 N – mm
We know $f_b = M /Z$
$Z = \{BH^3 - bh^3 \}/ 6 H = \{40\times75^3 - 35 \times 58^3 \}/6 \times 75 = 209824$
Calculating induce stress developed in welded joint
$F_b$ induced = 112500 / 209824= 0.536 N /mm2
As induced stress value is less than allowable value, which is 56 N/mm2
So design is safe.

## V. SUMMARIES AND CONCLUSION

### 5.1 Summaries

The present work was carried out with objective to design, modification and evaluate the performance of Manual operated reaper. Observations are carried out to calculate its performance like depth of cut, efficiency, labor requirement, overall cost etc.

### 5.2 Conclusion

From this work the following conclusions were drawn for the work to be in lacer area without a multi-purpose agriculture machine or manually, whereas by using multipurpose agriculture machine we can complete the same work in the same area (1acer) with only one labor. The same throughout the day, as man get strained, whereas a machine cannot. Therefore, time can also be saved by using the multi crop cutter. It is concluded that the device is most economical.

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