

# Design and Fabrication Of Motorized Multipurpose Agricultural Machine

Mahesh Balpande<sup>1</sup>, Harish Adewar<sup>2</sup>, Pavan Wadbudhe<sup>3</sup>, Amey Bhandakkar<sup>4</sup>, Gaurav Sukhdeve<sup>5</sup>, Akshay Mankar<sup>6</sup>, Dr. S. K. Choudhary<sup>7</sup>

<sup>7</sup>Assistant Professor, Department of Mechanical Engineering K.D.K.C.E., Nagpur, Maharashtra, India

<sup>1-6</sup>UG Student, Department of Mechanical Engineering K.D.K.C.E., Nagpur, Maharashtra, India

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**ABSTRACT:** As we know the India is largely depends upon the agriculture and also the population increase day by day, as a result the farms get distributed in family because of this small land holding farmer is increases and they used mostly bulls for land preparation and their used can be in increases in farm operations such as ploughing, Harrowing, sowing, leveling and weeding. Manual method of farm operations is creating a serious back ache for the farmer. Also the economically farmer are very poor due to they are unable to purchase tractor and other costly equipment. Our project are combine to all operation such sowing, leveling, land preparation and weed removal process and to provide a multipurpose equipment. In our project we used the 250watt bldcmotor for running this motor we used a 12v battery which is used for land preparation, leveling and sowing. The multipurpose agricultural equipment is very simple to use.

**KEYWORDS:** multipurpose, Sowing, equipment, weeding

## I. INTRODUCTION

Agriculture is the one of the important occupation in India. It is also a backbone of Indian economy and it will continue for long period of time. Agriculture is nothing but the science and art of farming including cultivating the soil, producing crop etc., over the year's agricultural has been carried out by small land holder cultivating between 2 to 3 acre using human labor and traditional tool like wooden plough, yoke, leveler, harrow, etc. This tool is used sowing of seed, weeding and leveling. Modern technique and equipment are not used by small land holder because the equipment are to expensive it is very easy important to use scientific farming method

for maximum yield and good quality crops but the majority of farmers still uses primitive method of farming techniques because of lack of knowledge or lack of investment for utilizing modern equipment.

The use of hand tool for cultivation is still predominant in India because of tractors can be easily require sources so it is essential that to be improve the agricultural cultivating tool for an farmers to better in quality of crop while most of the necessary components and performance of equipment is lacking and communication between farmers and agricultural research and development department is unsuccessful.

## II. LITERATURE REVIEW

1) F.A. Adamu, B. G. Jahun and B. Babangida [2014] In this research 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 take those points in consideration while designing a sustainable multifunctional agricultural vehicle.

2.) D.A. Mada, Sunday Mahai, [2013], In this research paper author has mentioned importance of mechanization in agricultural by giving examples. The conclusion from the paper was need of multifunctional single axel vehicle for pre and post harvesting. We have taken this as base for our research and further production of our multifunctional agricultural vehicle.

3) Humbade A.B., Kalingwar C.M., Kadam. N.S., Davargave M.M., Prof. Lande. S.B

This Project presents work on the design of a new agricultural multipurpose vehicle to be used for various applications. Mechanized

agriculture has become one of the important modern agricultural methods. In India 60% population involved in agricultural work, Conventional mechanized systems may increase productivity but are less adaptive and flexible. As a consequence, there have been initiatives in developing advanced mechanized systems. They have evolved a multipurpose vehicle for a farm, which can easily use for digging, seeding, spreading fertilizer. The help of this vehicle farmer are able to improve the crop efficiency & the overall result of the quality of crop into the Indian market.

4) V.M. Martin Vimal, A. Madesh, S. Karthick, A. Kannan. In this project a multipurpose sowing machine is designed for small farmers to improve their productivity. In this machine a common seed storage place is introduced to reduce the cost of the machine. The existing sowing machine had the individual storage and separate seed metering mechanism which leads to more cost. The drawbacks in the existing sowing machine are rectified successfully in this machine. It will be more useful for small farmers and the agricultural society. The cost of the machine comes around Rs 6000/- INR

5) Dhatchanamorthy. N, Arunkumar. J, Dinesh Kumar. P, Jagadeesh. K, Madhavan. P.

They carried out a project to develop multipurpose agricultural vehicle, for performing major agricultural operations like ploughing, seeding, harvesting. The modification includes fabricating a vehicle which is small, compact in size. The project is about a machine design which makes cultivation much simpler. The design of the chassis of the vehicle is made in such a way that it is suitable for the operations. The design for automatic seed sowing equipment is made. The plough is designed and modified the currently available plough tool in such a way that it with stand the load. The harvester (cutter) is designed and working by scotch yoke mechanism.

### III. OBJECTIVE

- 1) The main objective of this project is to provide farmers with multipurpose equipment which implements all the scientific farming specifications and technology to get maximum yield and good quality crops by reducing investment and number of labor.
- 2) Multitasking in one assembly of the equipment it performs sowing, tiller and leveling. In another assembly it performs weeding application.
- 3) To manufacture seed sowing machine which can be operated by single operator.

4) To enable the machine for sowing of several of seed like maize, wheat etc

5) To maintain the same distance between two seeds at the time of sowing process

### IV. CALCULATIONS

#### 1) Calculation For Torque And Speed:

Weight on Machine =  $m = 20 \text{ Kg}$

$$\text{Load} = F = m \times g \\ = 20 \times 9.81$$

$$F = 196 \text{ N}$$

Diameter of sprocket =  $80 \text{ mm}$

Radius of spoked =  $r = 40 \text{ mm}$

Torque required to driving the wheel

$$T = F \times r \\ = 196 \times 0.040$$

$$T = 7.84 \text{ N-m}$$

The rated power =  $P = 250 \text{ watt}$

We know that,

$$P = \frac{2\pi NT}{60}$$

$$250 = \frac{2 \times 3.142 \times N \times 7.84}{60}$$

$$N = 300 \text{ rpm}$$

Required rpm,  $N = 300 \text{ rpm}$

Speed of Machine

$$V = \frac{\pi DN}{60}$$

Where D is the Diameter of Wheel

$$D = 0.46 \text{ m}$$

Speed of machine

$$V = \frac{\pi DN}{60} \\ = \frac{\pi \times 0.46 \times 300}{60}$$

$$V = 7.2256 \text{ m/s}$$

$$= \frac{7.2256 \times 18}{5} \text{ km/hr}$$

$$V = 26.012 \text{ Km/hr}$$

Speed of machine =  $25 - 30 \text{ km/hr}$

#### 2) Selection of Battery:

Required power to drive the moter is  $250 \text{ watt}$

For better life we will use only 80% power of battery

Capacity of battery should be =  $250$

$$0.8$$

$$= 312 \text{ watt}$$

We selected the sealed lead acid battery.

Voltage =  $12 \text{ V}$

Amp-hour rating =  $10 \text{ Ah}$

Total watt - hour for battery is =  $12 \text{ V} \times 10 \text{ Ah}$

= 120 Watt-hr

### 3) Design Of Furrow Opener:

The major function of furrow opener is to create a well-defined Groove in the soil where the seed can

be placed at the power depth furrow opener type used in Shovel type furrow opener material.

Forged steel Length= 25 cm

Width=4cm

Thickness=2cm

### Table of Soil type and it's Resistance value:

Type of soil	Soil Resistance (kg/cm <sup>2</sup> )
Light	0.12
Medium	0.15
Heavy	0.20
Very Heavy	0.25

### 4) Calculation of draft force:

Force exert on the opener is

$$D = K_o \times w \times d$$

Where,

D= Draft force

K<sub>o</sub>=Specific soil Resistance --> 0.25 kg/cm<sup>2</sup>

Take K<sub>o</sub>-- 3 time Higher as a factor of safety

w= width of opener (cm)

d = depth of opener (cm)

$$D = 3 \times 0.25 \times 4 \times 3$$

$$= 9 \text{ kgf}$$

Take factor of safety -- 3 ( assumed)

$$3 \times 9 \text{ kgf} = 27 \text{ kgf} = 260 \text{ N}$$

Total draft =260N

### 5) Design of seed Planting Consecutiveness distance:

Calculation for distance between the two seeds:

The seed metering plate

Is used for seed sowing purpose the seed metering plate is run by motor

Material of circular plate = steel

Diameter of circular plate = 80 mm

No of ring produce to circular plate = 4

Circumference of circular plate =  $\pi D$

$$= \pi \times 80$$

$$= 251.32 \text{ mm}$$

Distance between of sowing seed= Circumference of circular plate

$$\text{Number of ring provide on plate} = 251.32 / 4 = 62.83 \text{ mm}$$

Distance between of two sowing seed is 62.32mm

## V. CONSTRUCTION AND WORKING

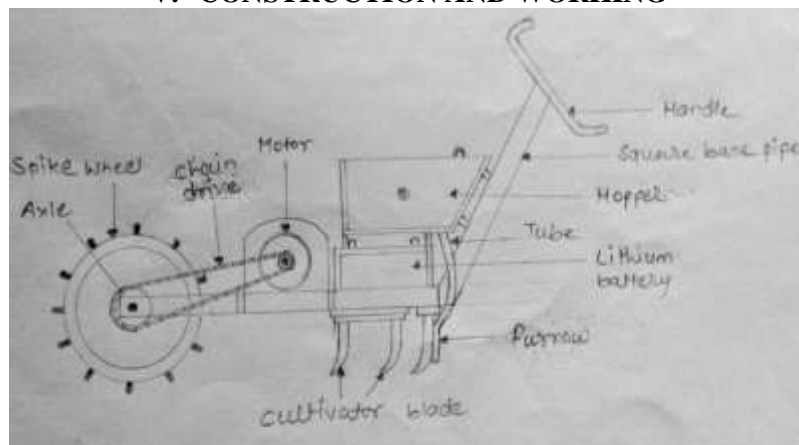


Fig. Motorized Multipurpose Agricultural Machine

The working of the machine will be based on Chain Drive Mechanism. There will be 2 gears; one gear will be on the wheel and other on motor shaft drive, which will be attached together by Chain Drive. After supplying power to the motor through DC battery, chain drive will transmit the

power from motor to wheel then the machine move forward then furrow opener on soil for seed sowing after that operator press lever for dropping a seed from hopper through tube and sowing operation will be completed. The sowing operation can be done by semi manual. The cultivating operations

can be done by cultivating tool then operator push machine forward by motor. The seed weeder operation can be done by weeding tool then operator push machine forward by motor attached to wheel.

## VI. ADVANTAGES AND DISADVANTAGES

### ❑ ADVANTAGES:

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

### ❑ DISADVANTAGES:

- Machine performs multi-operations hence unemployment increases.
- Produces less power as compared to bulky agriculture vehicle like tractor etc

## VII. RESULT AND CONCLUSION

The multipurpose agricultural equipment is very useful for small land holder farmer. This equipment can be used for sowing, levelling and weed removal purpose. The machine requires less manpower and less time compared to traditional method. Based on the overall performance of the machine we can definitely say that the project will satisfied the need of small scale farmer because,

They are not able to purchase costly agricultural equipment such as tractor and farming machinery.

The machine required less man power and less time compared to traditional methods, so if we manufacture it on a large scale its cost gets significantly reduce and we hope this will satisfy

the partial thrust of Indian agriculture. So, in this way we solve the labour problem that is the need of today's farming in India.

The vehicle has been fabricated successfully and implemented in agriculture by combining many ideas from various fields of agriculture to improve the yield by reducing the labour effort and expenses.

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