Engine Operated Multioperational Agriculture Machine For Ploughing, Sowing, Fertilizing,Weeding And Leveling

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ABSTRACT

In this modern world, every field is going throw large no of innovations. Like that only agricultural field has also gone through it. But a lot of these technological innovations are not affordable to the small scale farmer especially in India. This is due to ownership of very little piecing of land which results in following conventional practices in agriculture which are not efficient. This reduces profit margin of farmer.

To overcome this we created a small and affordable machine which will perform various important tasks. The ploughing, weeding, leveling, sowing and fertilization can be done by our machine. The machine is simply made of a small chassis on which a powerful engine is mounted which will propel the machine. By the help of gearbox various speeds can be obtained. As the machine works on petrol fuel which is easily available, it reduces the efforts of a farmer on a large scale. It also eradicates the chance of human error.

As compared to bullocks which are mainly used in agriculture, this machine will perform a lot more tasks than bullock. When compared with tractor though machine will not as much efficient and powerful like tractor but the cost of machine is very less as compared to tractor which makes it affordable.

As it is Multioperational machine different mechanism can be mounted if possible as per need. This machine is versatile and unique in nature. It is quite affordable for small scale farmer which is its basic purpose. A little more work can be done for future innovation.

It is our small step to help those farmers which are on verge of getting bankrupt.

KEYWORDS: Ploughing,sowing,weeding,leveling, fertilizing.

INTRODUCTION

India is agriculture based country. Agriculture is the demographically the broadest economic sector which employs 60% of Indian population and plays significant role in the overall social economic fabric of India. Still Indian farming is done by traditional methods. In order to increase profit from agricultural sector, raising the living standard of farmers, productivity and quality of products every farmer should use modern techniques. The current scenario is that still basic operations like ploughing, seed plantation, fertilizing is done manually. This process involves large man power and hence consumes more time and money. So it is necessity to design an"Engine Operated Multioperational Agriculture Machine for Ploughing, Sowing, Fertilizing, Weeding and Leveling".

OBJECTIVES

- To perform ploughing, sowing, weeding, leveling, fertilizing on a single machine.
- To reduce efforts of farmer by replacing hand tools with mechanism operated on engine.
- To reduce time consumption for Ploughing, Sowing, Weeding, Fertilizing and Leveling.
- Single engine operated machine which perform multi-operation with affordable rates.

METHODOLOGY

➢ Design of engine operated Multioperational machine

The designing and manufacturing of this machine has been done on machine work floor. Basic design is done by considering the standard farm land conditions, distance between two plants.

1. Design of chassis

- Length-

The length of the chassis is 92 cm. the prime reason is while doing any application the sufficient length between two crops can be maintained.

- Width-

Width is 30 cm. Width should be less than standard distance between rows of crop and length also should not be too long.

- Chassis to land surface clearance- 34 cm

General ground clearance for vehicle

- Total height- 85 cm

Average height of a person is 190 cm so the handle should be easily accessible in standing position so total height is half of it that is 85 cm

- Length of axle -40 cm

Extra length on one side for future scope or mounting

- Diameter of axle – 18 mm

Standard size to fit the bearing

- Chassis material- angle rod

Simple for joining and mounting and as well as tough

- Material- mild steel

Coloured to avoid corrosion

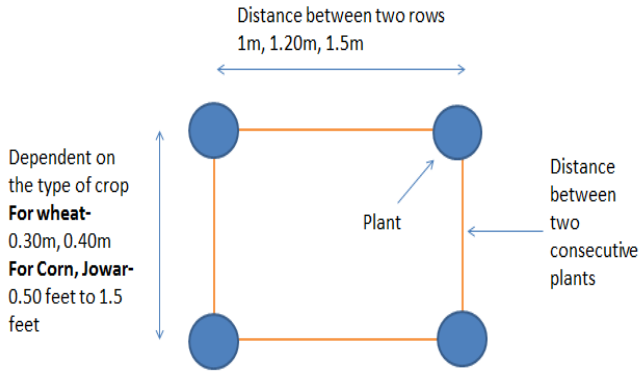

Fig 1: considerations for chassis design

2. Speedcalculation

1. Circumference of the wheel= 2Πr

=2 x π x 25 mm

= 158 mm

General speed at the first gear is 20 m/s
But in field due to resistance we will assume 5 m/s

2. Distance travelled in 1 min,
   = 158 x 5 x 60
   = 47400
   = 47.4 mm
3. Speed = distance/ time
   = 47.4/60
   = 0.79 m/s
4. Time required for traveling 1 min,
   = 1/0.79
   = 1.26 sec
5. Power transmission by chain sprocket to driving shaft

N1 = speed at crank shaft in rpm
N2 = speed at the wheel in rpm
Z1 = no of teeth on the sprocket at crankshaft
Z2 = no of teeth on the sprocket at the driving shaft

$$\frac{N1}{N2} = \frac{Z2}{Z1}$$

$$\frac{125}{N2} = \frac{42}{14}$$

N2 = 41 rpm
Speed reduction was done from 125 rpm to 41 rpm.

3. Cultivator calculation

Diameter of the circular rod= 3.5 mm
Circumference of rod = π x D
= π x 3.5
= 10.99 mm
There are 3 holes on rod so seed will penetrate at = $\frac{10.99}{3}$
= 3.66 mm
So when wheel travels by 3.6 mm the seed will be fall down.
As the sprocket mounted on shaft and one mounted on mechanism, they are in mesh with 1:1 ratio, and so the speed at which wheel will travel at the same speed the mechanism will rotate.
Each hole is drilled at 120 degrees from another.

4. Lever calculations

Lever for plough

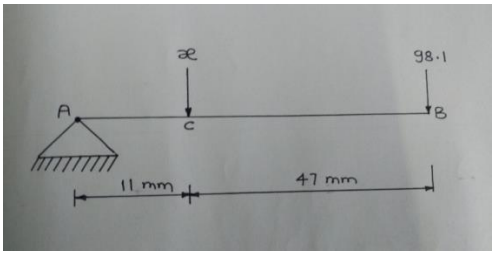

Fig 2: Plough lever

$\sum M_A = x \times 11 \times 98.1 \times 58$

$0 = 11x \times 5689.8$

$11x = 5689.8$

$x = -517.25$

$x = 517.25$ N

$\sum fy = R_A - 98.1 - 577.28$

$0 = R_A$

$R_A = 615.35$ N

Lever for cultivator

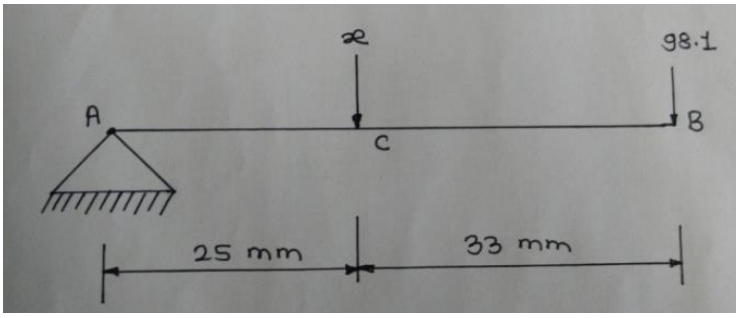

Fig 3: Cultivator lever

$\sum M_A = x \times 25 + 98.1 \times 58$

$0 = 25x + 5689.8$

$X = 227.592$ N

$\sum fy = R_A - 98.1 - 227.592$

$R_A = 325.61$ N

Lever for weeding

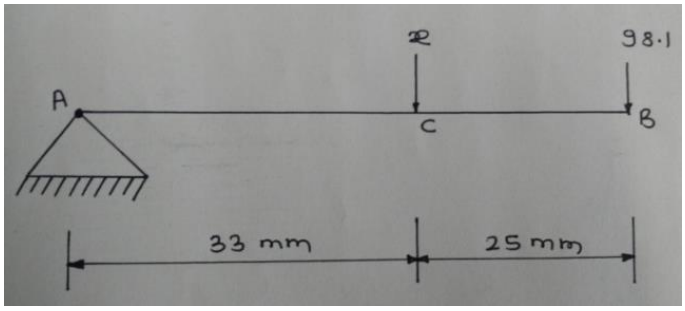

Fig 4: Weeding lever

$\sum M_A = 33x + 98.1 \times 25$

$0 = 33x + 5689.8$

$x = 172.418$ N

$\sum fy = R_A - 172.418 - 98.1$

$= 270$ N

CONSTRUCTION

1. WHEEL: The whole assembly is carried by three wheels. There are two front wheels which has great height because of which we get greater ground clearance. The rear wheel can rotate in 360 degrees which helps the machine to easily rotate in small space. It has small turning radius.

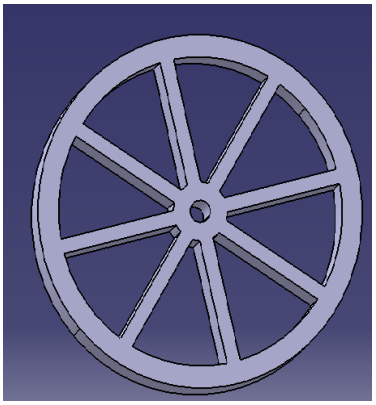

Fig 5: Wheel

2. LEVER: Themain applications are based on lever mechanism. Each lever is connected to the chassis separately and is manually operated. The lever is pressed downward as per our desired application like sowing, ploughing, weeding or leveling. And these levers are fixed with the help of nut and bolt.

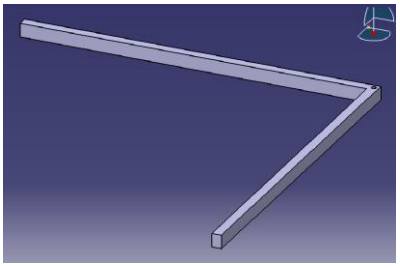

Fig 6: Lever

3. HOPPER: The hopper is attached to the MS angle support and one plastic tube is connected so that the seeds will pass through the tube from the hopper to the sowingtool which will get planted in the land. In this machine we are using two hoppers, one for storing seeds for sowing and other for storing the solid fertilizer for fertilizing.

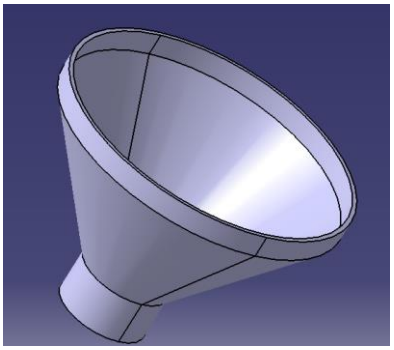

Fig 7: Hopper

4. MS ANGLE: The handle is mounted on the MS angle which is connected by means of nut and bolt. It also gives support to the hopper.

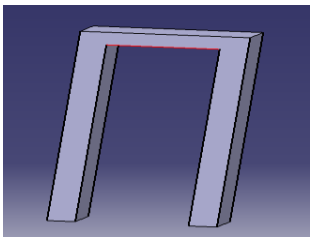

Fig 8: Mild Steel Angle

5. NUT AND BOLT: The nut and bolt is used for connecting the handle and the MS angle. Also for joining lever and MS angle. The depth of the plough inside the land can be adjusted with the help of nut and bolt.

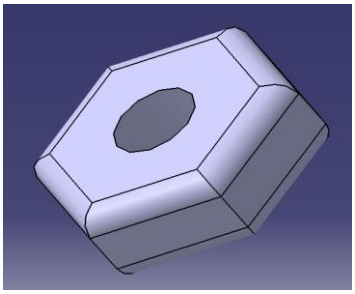

Fig 9: Nut.

WORKING

The Multioperational machine is quite easy to operatethat illiterate person can operate it easily. Agricultural functions are carried by lever based mechanism. 3 levers combine five operations. As machine works on two stroke 175 cc engine, so one have to start machine by cranking with kick thenput down 1st gear whichensures high torque. Then we have to engage the lever for respective operations with nut and bolt arrangement.

First lever is used for ploughing purpose. First of all we have to press the lever downward then we can fix that plough with the help of nut and bolt as per required depth.

Second lever will perform the sowing operation. The lever is connected to hopper with plastic tube and at the end of the hopper a small movable cylindrical rotor is fixed according to sowing type. Another hopper is provided for the fertilizing purpose. A plastic tube is connected to that hopper with a two directional valve which can be operated manually. And withthe two directional valves, we can adjust the quantity of the fertilizer as per our requirement.

Third lever is used for leveling and weeding purpose. This tool is exchangeable as per requirement.

Rear wheel can rotate in 360 degrees and allows machine to get turn in small turning radius.

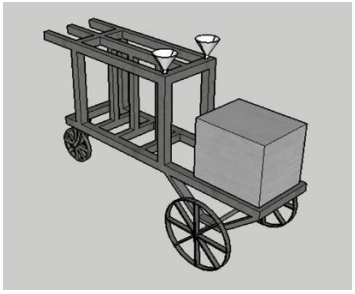

Fig: Proposed 3D model

The designed machine is only useful for the seeds shown in the table below.

Table 1: Seed name and its diameter

Sr. No	Seed Name	Diameter (mm)
1.	Wheat	2.3 to 2.7
2.	Jowar	1.9 to 2.2
3.	Bajara	0.6 to 0.9
4.	Ground nut	5 to 13
5.	Pigeon pea	4.9 to 6.9
6.	Moong	3.4 to 4.74
7.	Soya bean	5 to 11
8.	Horse Gram	4.18 to 4.63
9.	Corn	13.5

Table 2: Part list of machine components

Sr no	Part name	Part material	Quantity
1	Engine (two stroke 175 cc)	-	1
2	Front wheel	M S	2
3	Rear wheel	Plastic	1
4	Hopper	plastic	2
5	Levers	M S square bar	6
6	Handle support with brake and clutch	M S angle and M S plate	3
7	Tools	Forged iron	3
8	Allen nut	M S	6
9	Nut and bolt	M S	30
10	Two directional valve	PVC	1

CONCLUSION

To promote the use of new techniques in the farming for that we have produced this machine. The idea was to create a simple and affordable machine so it could be used by the farmers. The basic aim was to create it user friendly so that very illiterate people can use it. Secondary requirements were it should require less maintenance so that less skilled mechanic can fix it.As this machine performs the applications such as ploughing, sowing, weeding and leveling. So the basic aim is fulfilled.

FUTURE SCOPE

- Sowing mechanism only works for continuous crops like wheat, pulses etc. so it can be developed for Jowar, corn, cotton in which specific distance is to be maintained in each crop by using timing belts and timing gears.
- Little extension on the chassis can be done in order to make seating arrangement for operator.
- Cutting mechanism after yield.
- Liquid fertilization can be done by using battery or hand operated pump.

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