

# “Development And Fabrication Of Manual Rice Transplanting Machine”

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**Abstract**— Agriculture is most important sector of the Indian economy. It is most important source of employment for the majority of the work force in the country. Rice is primary and major crop cultivated in India. As the large workforce is engaged in this sector, Traditional method is costly, time consuming and labour intensive work. To make the transplanter system several attempt has been made to design and fabricate this machine. This study is focused on design analysis and fabrication of a manually operated rice transplanter for small scale Indian rice cultivators. By achieving the goals like simplifying the mechanism, reduce cost and reduced weight of present rice transplanter. The availability and use of manual rice transplanter in Western Maharashtra is very rare, so design of this project is useful to farmers.

**Keywords**—Rice plantation, mechanism

## I. INTRODUCTION

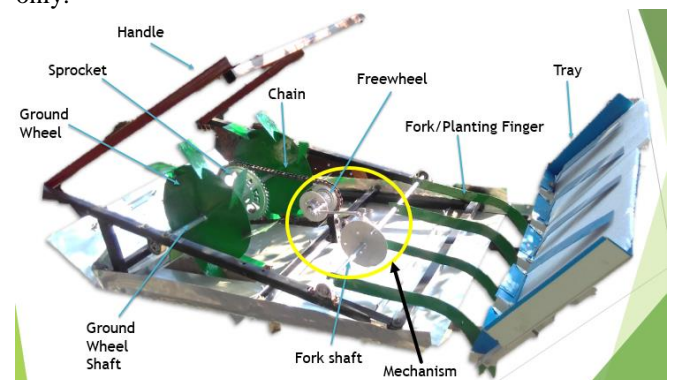
A rice transplanter is a specialized machine fitted with a transplanter mechanism (usually having some form of reciprocating motion) driven by the power from the live axle, in order to the transplant rice seedlings onto paddy field. Rice is a major food grain crop of world. Unlike upland row crops, cultivation of low land rice crop is a labour intensive process. In spite of the common belief of availability of surplus agricultural labour in India, there actually exists a scarcity of skilled agricultural workers during the peak transplanting seasons. If this operation is not done in time the yield goes down. In view of this, there is an urgent need to mechanize this operation. The rice translation process is generally manual which involves number of labour. The process of manual rice transplantation is not so efficient as compared to the mechanical rice transplantation. Machine transplanting using rice transplanter requires considerably less time and labour than manual transplanting. It increases the approximate area that a person can plant. The distribution of food grain production which shows the rice production is major in India Mechanism is needed to raise productivity in rain fed upland and rain fed lowland and to increase cropping intensity in irrigated farms. Seed drills give better plant population, reduce

cost and give higher yields of rice. Use of pregerminated paddy seeders in puddled wetland condition give similar yield like manual transplanting but reduce labour requirement by 75-80%. The manual and self-propelled transplanter reduces cost of transplanting by 45-50%.

## II. WORKING PRINCIPLE

As the process is manual the worker has to provide the initial motion. When the rice transplanter will move forward the ground wheels will get rotate. The wheels are provided with the fins so that they can travel easily in the mud. The ground wheels are used to maintain constant distance between the two successive plants. Then we have larger sprocket is provided on the same shaft with the ground wheels and hence at the same time sprocket will also rotate.

sprocket is in engagement with the smaller sprocket by using the chain drive. On the same shaft planting finger will be fixed through the four bar linkage so that it will oscillate for certain angle. As the drive is provided by the worker it will not have high speed and hence through this sprocket arrangement, we have increase the planting finger speed. As the planting finger will oscillate, it will pick the rice plant from the tray and plant in mud. The planting finger is designed in such a way that rice plant should be easy to pick during the motion and also it should pick during the downward motion only.



## III COMPONENT USE FOR FABRICATION

A) Ground Wheel:-

Ground wheel play important role in machine. It is a wheel with blades use to rotate the drive shaft. This wheel is made up of Mild Steel & having thickness of 3 mm.



Fig No.01 Groud Wheel

**B) Sprocket:-**

The main function of sprockets is to transmit torque through chain. It is a profiled wheel with a teeth, or cogs that mesh with chain. It is use in bicycle as a pedal arm.which is made up of Stainless Steel. No. of teeth on sprocket is 48.



Fig No.02:- Sprocket

**C) Chain:-**

Chain is a serial assembly of connected pieces, called links, typically made up of metal, with an overall character similar to that of a rope in that it is flexible and curved in compression but linear, rigid, and load bearing in tension. The function of chain is to transmit torque from driver to driven sprockets. The chain is simplex type. Made up of Steel Alloy. Length of chain is 110 Cm.



Fig No.3. Chain

**D) Free Wheel:-**

A device in the transmission of a motor vehicle that automatically disengages the drive shaft whenever it begins to turn more rapidly than the engine. A form of rear bicycle wheel that has a device freeing it from the driving mechanism, as when the pedal are stopped in coasting. That's why use the drive shaft when the driven shaft rotates faster than the driveshaft. It has 24 teeth on freewheel.



Fig No.4:-Free wheel

**E) Mechanism:-**

It is combination of link use to transmit rotary motion of driver shaft to oscillatory motion of forks (forks are Mounted on Driven Shaft.). It is a 4-bar linkage mechanism which is made up of stainless steel.

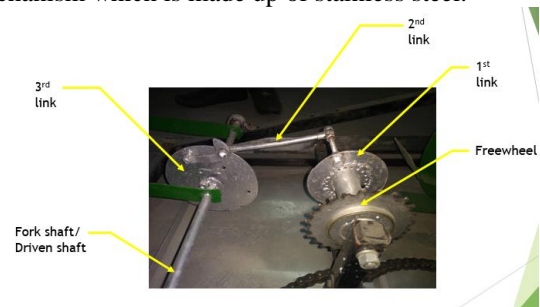


Fig No.5:- Mechanism

**F) Tray**

This is used to store the rice plant from where the planting finger pick the plant and saw in the ground. This tray has two vertical guide slots which is also use to hold the crops.



Fig No.6:-Tray

Fig No.9:- Axle

**G) Planting Finger (Fork):-**

In our project there are two chain drives one which used to control the flow rate of seeds and another which is used to transmit the power from motor to peg wheel.



Fig No.7:-Planting Fork

**H) Bearings:-**

Ball bearings are used to provide smooth, low friction motion in rotary applications. Ball bearings are able to provide high performance and long lifetime in order to transfer the load from the balls to the inner races. The balls have minimal contact with the inner and outer races due to their spherical shape and this allows them to spin smoothly. We used bearing for holding the ground wheel shaft and shaft of fork. We used 4 bearing of size 6502.

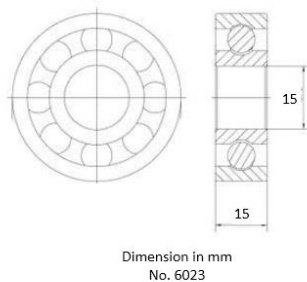
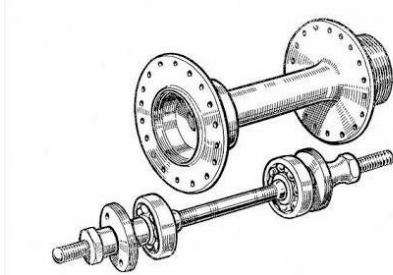


Fig No.8:- Bearing

**I) Axle:-**

We used cycle rear hub axle to holding free wheel which is connected to the machine frame. It is made up of stainless steel.



**J) Nut and Bolt**

It is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. The two partners are kept together by a combination of their threads' friction, a slight stretching of the bolt, and compression of the parts to be held together. We used nut and bolt to joint whole frame.

**IV. TESTING, RESULT AND DISCUSSION**

Type of seed: - Rice Plant

Capacity of Tray to carry Rice is 1kg

Distance (Cm)	Plant (Number)	Time (Sec)
0	4	2
30	8	4
60	12	6
90	16	8
120	20	10

30 Cm = 1 Foot

70 Cm = 2.35 Feet

30 Cm = 3.11 Feet

Area of Observation=2.35\*3.11= 7.30 feet

In 7.30 sq. feet area, we plant 5 rows (20 Plants) in 10 sec.

1 acre = 43560 sq. feet

Length = Breadth (L=B)

Length \* Breadth = 43560 sq. feet

$L^2=4356$

Length(L) =208.71 feet =Breadth(B)

**Conversion:-**

208.71 feet = 355 columns

208.71 feet = 336 rows

For 5 rows it takes 10 sec

For 336 rows it takes 672 sec (11.2 Minutes)

In 1 acre area, we plant 355 column and 336 rows (119280 Plants).

Time takes for 1 acre(X),

7.30 sq. feet = 10 sec.

Discussion :Since, after taking the complete observation of manual rice planting machine. We get higher result of machine. It complete Approximate planting capacity of the machine is found to be 1 Acre within 16.56 hrs (Approx).

#### V. ADVANTAGES & DISADVANTAGES

##### Advantages

- 1) By using rice planting machine we can cover more area in less time.
- 2) It reduces the planting cost by avoiding help of labours.
- 3) It saves the wages cost.
- 4) It reduces and decrease the fatigue and burden of farmers.
- 5) It makes planting fast and reduces time for planting

##### Disadvantages

- 1) Uniform depth of seedling is not possible.
- 2) Pushing action is not possible. It travel in only one direction

#### VI. CONCLUSION

In this study it was concluded that high labour demand during the peak periods adversely affects the timeliness of operation, thereby reducing the crop yield. To offset these problems, mechanical transplanting is the solution. Mechanization not only changes the structure of labour in agriculture, but also influences the nature of the workload. Hence there is a need of mechanization in rice cultivation sector. In this direction Rice transplanter helps us to see a bright future ahead Existing models of rice transplanters are highly efficient and effective in term of cultivation of rice in paddy field. The only problem with the existing rice transplanter is that, these transplanters are very expensive and moreover they possess very complex mechanism which could not be repaired or serviced easily at any ordinary workshop. Hence there is need for designing and developing a rice transplanter for the small scale farmers who are mostly affected by the unwanted situations or condition prevailing in ours. Country can help them to cultivate rice effectively and efficiently with less health related issues. In India since an average farmer possess land of small size in area thus a mechanized rice transplanter would be highly

helpful in the rice transplantation. It would also help in decreasing the over dependence of farmers upon labour for transplantation. Transplanter helps to acquire lesser cost of production with higher yield and production moreover the quality of produced rice is also good.

#### FUTURE SCOPE

- 1) The system can be advanced for planting rice plant in farm with particular distance between plants is adjusted. It can be automatically plant when person pull the machine in land.
- 2) The system can be modified in future and remote control to operate the machine automatically. In future we can try to increase the number of rows to planting the rice plant.

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