Design and Fabrication of Manually Operated Rice Transplanter

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Abstract- **Agriculture is the most important sector of the Indian economy. It is the most important source of employment for the majority of the work force in the country. A major population in India is engaged in agriculture. Among that highest percentage was in rice (paddy) sector. Rice is the major stable food of the country. Relesing of work force to sector other than agriculture, it is important to develop the country. To release the work force in paddy sector mechanization plays a big role. To feed growing population is a huge challenge. Mechanization of paddy sector will lead to work higher productivity with releasing of work force to other sector. The objective of this project is to design a rice (paddy) transplanting mechanism to transplant paddy seedling by small scale former in the country. The manual paddy (rice) transplanter make this provision for the user, which eliminates above observed problems like cost, skilled operator, complicated mechanism, fuel for operation etc.**

Index Terms- Droop Control, PWM, VSI, Microgrid, MATLAB/Simulink.

I. INTRODUCTION

India is predominantly an agricultural country with rice as one of the main food crop. Its produces about 80 million tons rice annually, which is about 22% of the world rice production. Paddy is the rice grain with husk. It is a wetland crop, which extensively grows all over the world. Across South Asia, labour scarcity is a major problem and there is a need to explore establishment method for rice that require less labour but still allow the crop to be transplanted on time. The use of a mechanical transplanter is one alternative to address this issue. A rice transplanter is a specialized transplanter fitted to transplanter fitted to transplant rice seedlings onto paddy field. Machine transplanting using rice transplanters requires considerably less time and labour than manual transplanting. It increase the approximate area that a person can plant 700 to 10,000 square meter per day. A rice transplanter is a machine specifically designed to aid in transplanting rice seedlings into paddy fields. While rice is grown around the world, rice transplanters are mainly use within East, Southeast and South Asia. Mechanical transplanting of rice is the process of transplanting young rice seedlings, which have been grown in a mat nursery, using a self-propelled rice transplanter.

II. OBJECTIVE

1. Less human power requirement for transplanting.
2. Preparation of 2 row transplanter.
3. Preparation for simple mechanism.
4. Lower weight of machine.
5. Less time required.

III. COMPONENTS OF MACHINE

1. Base plate
2. Chassis
3. Chain and sprocket
4. Bearing
5. Handle
6. Planting mechanism

III. DESIGN CALCULATION

Torque transmitted,

F = 300 N, D = 20 cm, d = 20×10-2m

$T = F \times D$

$= 300 \times 20\times10^{-2}$

$T = 60$ N.M

Power transmitted,

N = 15 rpm

$P=2\pi NT/60$

$=(2\pi\times15\times60)/60$

$P = 94.247$ w

The speed generated by first sprocket.

$$\frac{N2}{N1} = \frac{T1}{T2}$$

(T_1 & T_2 be the no. of teeth)

$N_2 = \frac{18}{18} \times 15$

$N_2 = 15$ rpm

Torque transmitted, first sprocket

$$P = \frac{2\pi N2T}{60}$$

$$94.247 = \frac{2\pi \times 15 \times T}{60}$$

T = 59.99 N.M

The Speed generated by second sprocket

N3/N2=T2/T3

N3 = 18/36×15

$N_3 = 7.5$ rpm

Torque transmitted,

$$P = \frac{2\pi N3T}{60}$$

$$94.247 = \frac{2\pi \times 7.5 \times T}{60}$$

T = 199.99 N-M

The Speed generated by third sprocket

$$\frac{N4}{N3} = \frac{T3}{T4}$$

$N_4 = \frac{36}{18} \times 7.5$

$N_4 = 15$ rpm

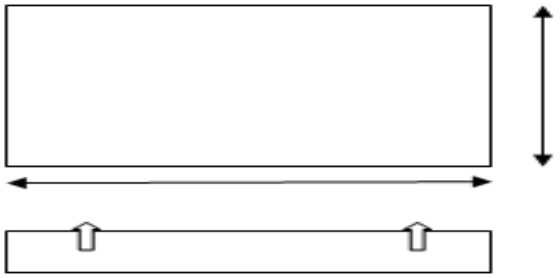
Torque transmitted,

$$P = \frac{2\pi N4T}{60}$$

$$94.247 = \frac{2\pi \times 15 \times T}{60}$$

T = 55.99 N- M

1 acre = 4046.856 m^2



Distance in two width of plant = 0.2 m

Distance in two length of plant = 0.3 m

Area in one min. = 5.8 m

L × B = 0.3 × 5.8.. .... (1 Min = 30 Plants)

= 1.74 m^2

Therefore

Time required for carry 1 acre = 4049.856

$$= \frac{4046.856}{1.74}$$

= 2325.77 min

$$= \frac{2325.77}{60}$$

Time in 1 acre = 38 hrs.

IV. CONSTRUCTION

The construction of our transplanter is based on the concept that it should fulfil the requirement of the transplanting of the rice. A long with that approaches it should be not be heavy and takes as less material as possible with good efficiency for transplanting of two row transplantation on actual field. It consist of chain sprocket mechanism, forks, seedling try, base plate, handle, bearing, shaft and etc. it is whole transplanting system mounting on base plate (wood plate) and sprocket is mounted on the shaft and rotated with it. Bearing is used for the rice transplanting device to perform smoothly operation and the chain is used for this transplanting device are one is cycle chain and other is two wheeler chain to transmitted the motion.

V. WORKING

Before the actual transplanting process, the field for the transplanting should be prepared. This required 3 to 4 or even more days as the condition of the soil. Procedure is explained before. Now, the first step towards transplanting purpose. There are obtained from different method and every farmer has his own

technique to grow them properly. Put suitably the seedlings should not have more soil attached to their roots as they are place on the tray, hence it should properly washed thoroughly. So the soil on roots should be minimum. This plant are arranged then over the tray, so that they will escape from the tray and only flow downward one by one after every planting of plants. Hence, this pick up the plants from tray and on the ground or in muddy surface. The required depth of planting is initially decided and hence the plant will penetrates inside the muddy surface. Now, during another half rotation of the crank the planting finger is allowed to escape from the mud without damaging the plants which are planted. This will achieved by providing the preferable path for finger or fork tip. This ensure proper rotation of fork tip inside the soil. Due to this there is prevention of throwing plant back outside the soil and plant in proper way inside the soil. This cycle is repeated and more plants are planted at each row by respective mechanism. After completion of transplanting the transplanter is taken out of the field and washed with water. All the attached soil mainly to base plate is removed. The chain is removed from the mechanism and proper oiling is provided to it so that it can be used for further use. After drying the wetted transplanter provide oiling to various moving joints of the transplanter so that for further use it will be easy to operate instantly without too much servicing it.

VI. ADVANTAGES OF TRANSPLANTER

1. Transplating of seedilings at the optimal age.
2. Uniform spacing and optimum plant density.
3. Higher productivity compared to traditional methods where plant spacing and density may not always be consistent.
4. Better employment opportunities for rural youth through the development of custom service business.
5. Addresses the problem of labour scarcity as requirement of labour is too low.
6. Increases farmer's net income.

DISADVANTAGES OF TRANSPLANTER

1. Requirement of labour is low hence it tends to unemployment for labour.
2. Protection from rusting is required as this transplanter has to work is wet soil.

APPLICATION OF TRANSPLANTER

1. Manually operated rice transplanter is used in agriculture fields, for RIrice seedling purpose.

VII. CONCLUSION

Manually operated rice transplanter it is use in agriculture field which reduce in seedlind time reducelabour charge and it easy for handling. The paddy seedling transplanting mechine worked satisfactorily. But, there were some improvements to be done before introducing to the farmers. The machine is driven by man power but engine can be coupled to enhance the performance. Machine can be developed to transplant several rows simultaneously. Weight of the machine should be reduced by removing sprocket, chains and adding small gears. The dapog must have thin mud layer for easy removal of seedlings.

Now, the situation by the plantation rice are:

One acre = 25 human will be worked.

One day human working cost is 150 Rs.

150×25= 3750 (In one acre)

And our machine plantation the rice is:

One acre = 38 hrs.

And our machine handled by only one worker

For one day, one worker cost is 200 Rs.

This is helpful for the former and its not costly machine.

So, farmer is easy to purchase it.

REFERANCE

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