Design And Fabrication Of Manual Rice Transplanter

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ABSTRACT

Agriculture is the most important sector of Indian economy. Rice being the major crop cultivated in India, a huge amount of work force is engaged in rice production. The common practice of rice cultivation is manual transplanting of seedlings. Besides being costly, cumbersome and time consuming it is very labour intensive task. To mechanize the transplanting system several attempts has been made to design and fabricate transplanting machines. Due to high price of an automated paddy transplanter it becomes impossible for a small scale farmer to purchase a non-subsidized automated paddy transplanter. An attempt has been made to fabricate a manual paddy transplanter which is effective as well as cheap. Selection of an efficient power transmission system and a suitable mechanism to drive the planting claw is given due considerations in its design. The objective of this project is to design a paddy transplanting mechanism to transplant rice seedlings by small scale farmers in the country.

Keyword: - *saplings, Tray, Rocker arm, wheels, paddy transplanter*

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1. INTRODUCTION

Rice being the important food crop covers about one fourth of the total cropped area and cater food to half of the Indian population. In India, average rice production per hectare is 2.2 tonne. Rice is the staple food of more than half of the world. It constitutes 20% of the total daily nutrition need of an average person. More than 3.5 billion people depend on rice for their daily demands.

A Rice Transplanter is an agricultural machine used for transplanting saplings to the field. .This is very important as it reduces the time taken to transplant

saplings (when compared to manual transplanting), thus allowing more time for harvesting. Hence, paddy transplanter is one type of transplanter which plants paddy saplings to the field. The main objective to develop a mechanism for transplanting rice seedlings is:

- To increase the efficiency of traditional rice planting method without sacrificing its basic purpose
- To achieve higher productivity, yield and reduce health risk.
- To develop an alternate source of income for rural youth through custom services.
- To develop an instrument, which will be cheap to buy, repair and maintain.
- To reduce the labour cost.

Rice transplanting requires considerably less time and labour than manual transplanting (1–2 ha/person/day versus 0.07 ha/person/day). **It also save from Tedious Farming Work** Struggle, the tedious working of planting paddy by hand.

1.1 Literature Review

1) Design & Development of Rice Planter Machine, D hanesh D Patil , Dr. Mangesh R Phate, ISSN 2347-6710, Vol. 5, Issue 7, July 2016. They used 4 row, 3 row and 2 row rice transplanter on the basis of their study of various parameters they concluded that the 3 row rice transplanter was the best among all transplanting methods. So ,Due to higher costing for 3 row rice transplanter, we are manufacturing 2 row rice transplanter.

2) Design Analysis and Fabrication of Manual Rice Transplanter , Satish Kumbhar, Sangram Khot, ISSN 2347-6710, Vol. 6, Issue 3, March 2017. The cost is cheap than motor and hand cranked mechanical rice transplanter. The four bar mechanism gives the each operating and maintenance with less parts which reduces the weight. Therefore we are using four bar mechanism for giving a simple and easy operation of rice transplanter machine.

3) Ergonomic Evaluation of Manually Operated Six-Row Paddy Tramsplanter, Rajvir Yadav, Mital Patel, ISSN 147-157, 2007 The height at which push-pull forces were applied was the most important variable in affecting the force output. They concluded that the foot placement, handle height and body postures all affected the push-pull strength. Further reported that the posture of workers while performing some tasks is another factor that can influence energy requirements. Transplanting in bending posture required the highest energy than any other posture. The body posture during the push and pull force is important factor while transplanting.

3) Impact of SRI Technology on Rice Cultivation and Cost of Cultivation, Ramapuram Jayapal Reddy, Dr. N. Sandhya Shenoy,ISSN 2250-3153, Volume 3, August 2013. They conducted an economic analysis of traditional SRI rice cultivation practices in mahbubnagar district of andrapradesh. It was concluded that the SRI (system of rice intensification)method of cultivation is advantageous to the paddy farmers as compared to traditional method. By studying the SRI system we came to know the proper area for planting.

1.2 Construction and working

Rice transplanters have seedling trays where mat-type nurseries of seedlings are laid. The tray shifts seedlings like a carriage of typewriters as pick-up forks get seedlings from the tray and put into the ground. The pick-up forks act like human fingers by taking the seedlings from the tray and pushing them into the earth.This machine is operated on wheel so no use of extra arrangement to run the mechanism. Four bar mechanism helps the machine to operate more comfortable and easier and with low noise, Low noise designed transplanting arms can help to judge transplanting condition timely. The machine is with compact structure and small volume and can operate in the field easily.

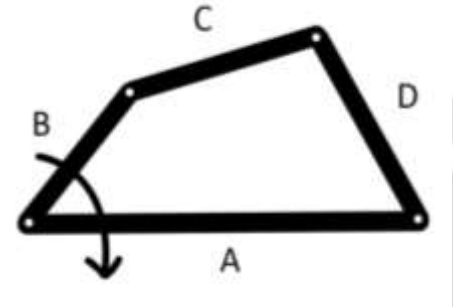

Fig1: "Four Bar Linkages"

In the Rice Transplant Machine , we are using "Four bar mechanism" to carryout the work. A Four bar mechanism consists of-

Fixed Link- fixed part in linkage

Crank-can rotate full 360 Degrees

Coupler

Rocker Arm-can rotate through limited range angle

Connecting rod-connects the crank and lever

Components of rice transplanter -The manually operated rice transplanter machine consist of the following main components:

Sprockets

Chains

Tray

Shaft

Fork

Rocker Arm

Connecting rod

Bearing

Wheels

Working- Paddy seedlings are kept in tray and allowed to flow down under gravity. The fork which is attached to shaft picks up the seedlings from the tray and keeps it in a horizontal position on the skid. The motion of the wheel and shaft is given by hand using chain and sprocket mechanism.

Fig2 : "Working Mechanism"

Here , simple four bar is used to plant paddy seedlings in the field. In this mechanism fixed Link has no motion in the mechanism, Crank will be having rotatory motion. Coupler is transmitting motion to the rocker arm. The extended portion of coupler is used to pickup the seedling from the tray which is called as the fork .Due to rotation of crank the fork will do oscillatory motion in up and down direction. Fork follows a curved path when going to downward direction. At certain point of the path the fork will grab the seedling from the tray and plant it in the soil while traveling in downward direction. After that the fork will reach its highest position and the process continuous until the rotation is stopped. Rocker arm carries out oscillatory motion with a limited range of angles.

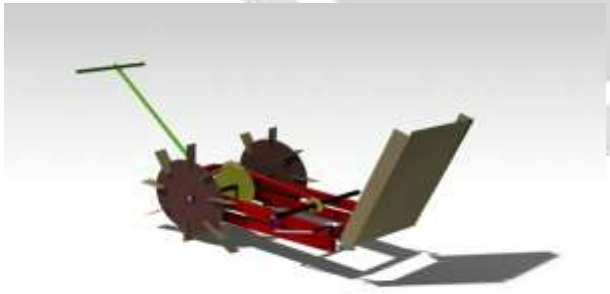

Fig 3: "Cad Model"

1.3 ADVANTAGES

Reduces the human efforts to maximum extend.

Simple design compared to the existing model.

Easy to repair by farmers itself and maintenance is less.

Pulling force is greatly reduced by decreasing the weight of the machine.

Cost will be reduced.

It saves operating time and saving on cost of operation.

It reduces the use of man power up to 50%.

Ensure uniforms spacing and optimum plant density with 2-3.

Less incidence of disease in seedlings due to less root injury.

Generates employment and alternate source of income for rular youth through custom services on nursery raising and mechanical transplanting.

2. CONCLUSION

Since the farm land is of the average size in the area thus a mechanized paddy transplanter would highly aid in the rice transplantation. It will also decrease the high dependence of farmers upon labourers for transplantation. Transplanting through the manual *rice transplanter* have got seven advantages like less water for raising the mat type seedlings, less area for raising seedlings. It saves the costly seed by 50%. The cost for uprooting of the seedlings is zero. Due to the machine transplanting, the raw to raw distance is fixed.

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