

Automatic Rice Transplantation Machine

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ABSTRACT

Agriculture is an important sector of the Indian economy. It is most important source of employment for the majority of people in the country. Rice is major crop cultivated in India. In this agricultural field Traditional methods are costly, time consuming and labour intensive work and also it is very burdensome for farmers. This study is focused on design analysis and fabrication of automatic rice transplanting machine for small scale Indian rice cultivators. To make their work more easy and accurate, by using various link mechanisms which will simplify the cultivation, it will reduce cost and reduce the working time as well as labour work. We will also work on improving the human ergonomics by which the work efficiency of the labour will increase as well as comfort level in farming will increase. By this the capital cost of farming will reduce and farmers will earn more profit by increasing the productivity. so this design is useful for farmers of India.

Keywords: Automatically, Rice plantation, Link mechanisms, Mechanical jaws, Human ergonomics, Transplantation, Machine.

I. INTRODUCTION

In agriculture, transplanting is the technique of moving a Pre grown seedling of rice from one location to another that is from mat nursery to the farm field. Seeding plants when grown directly in the ground requires specific temperatures and conditions to properly grow. In some climates those conditions don't occur so transplanting is a suitable option and is widely used in India.

Transplanting of paddy is a highly labour intensive operation and is still done manually. It has been observed that plant population planted by the contract labour is very low. Higher labour requirement of about 13 to 15 labours are required for transplanting. Also many a times due to shortage of labour, transplanting is delayed which causes progressive decrease in the output. Scarcity of labour during peak season of transplanting creates a problem to complete the transplanting operation in time. Although, production has increased considerably yet average

yield per unit area in India is low. So in India the transplanting of the rice seedling is done manually by hand which is a very time consuming process and requires more labour, so to reduce the labour as well as time consumption in planting this seedlings, there should be a mechanical method to transplant the rice seedlings from the nursery to the farm field.

II. LITRATURE SURVEY

[1] Sarafaraj J. Mulani:- The performance of the rice planting machine was investigated field conditions to optimize the design and operating parameters for rice planting. The effect of operational speed of the disc, and shape of the entry of plant spacing (coefficient of variation) then crank mechanism put the plant and pushing downward direction. Optimization of the regression equations incorporating speed of the disc and operating vacuum pressure through iteration further revealed that a disc, operating at speeds from 0.34 to 0.44 m/s, yielded similar performance. Based

on the optimized operational parameter, performance indices of the rice planting machine were determined under field condition by measuring the distribution of rice plants spacing.

[2] **Rajib Bhowmik:-** Found that the working of the paddy transplanter is found to be satisfactory. The selection of four bar mechanism turns out to be effective and simple to fabricate. The cost of fabricating the paddy transplanter is way cheaper than that of an automated paddy transplanter. It is seen that by using a two row paddy transplanter 0.04 ha/day can be transplanted while on the other hand manual transplanting can achieve only 0.2 ha/day, considering 8 working hours a day.

[3] **Satish Kumbhar:-** Studies that 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%.

[4] **Ranjit Mirig:-** Studied that manual paddy transplanter requires two persons for its operation. One person is needed to pull the machine while another for cranking the handle in order to provide drive to seedlings' trays and fingers, which place the seedling in the soil bed. The machine can transplant five rows while maintaining row to row spacing of about 18 cm and plant to plant spacing of about 15 cm. It has a field capacity of 0.3 acre/h , it was found to consume less than one-seventh of the time required for manual plantation and double the time needed by a self Propelled machine to cover the same area. The conventional way of transplanting rice seedling.

[5] **Anoop Dixit:-** Transplanting of paddy completely depends on manual labour in India. The usual practice is to hold the bunch of seedling in one hand and 1 to 2 seedling separated by the other hand are fixed in the puddle field by the farmers in bending posture. So keeping the above problems in view the solution lies in direct sowing or mechanical transplanting. Apart from saving in time and cost of transplanting which is very high in manual transplanting, it remove human drudgery and can give uniform and desired plant density. Moreover one can plant the crop in line at no extra cost and make weeding and intercultural operation easier. Though attempts have been made in different countries to develop a mechanical paddy transplanter so far transplanters have been manufactured and successfully introduced only in a few countries like Japan, Korea and China etc. With the introduction of paddy transplanter in Japan, the labour requirement for transplanting has been reduced from 30 man days to 15 man days per ha.

III. PROPOSED METHODOLOGY

Mechanical transplanting of rice is the process of transplanting young rice seedlings, which have been grown in a mat nursery, using a automatic rice transplanter. In conventional manual transplanting practice, 13-15 labourers are required to transplant one acre. However, if an automatic rice transplanter is used, three people can transplant up to two acres in a day.

The power transmitting mechanism of the rice transplanter is achieved by means of simple four bar chain mechanism. A four bar chain has four links and four pairs which are turning in nature. The links are of different lengths. One of the rotating link is known as the crank or driven and the other rotating link is D.C motors or driver. The crank makes complete revolution. To obtain a mechanism from a chain its one of the links has to be fixed. The base of the machine acts as a fixed link.

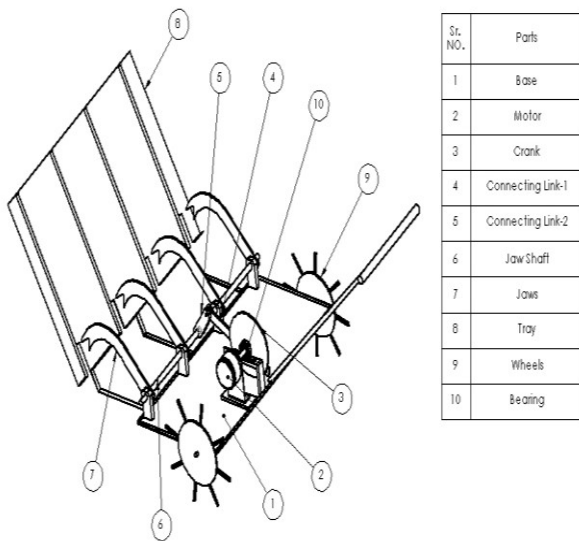


Figure 1. Design of automatic rice transplantation machine

A D.C. motor is used which will be operated by a battery, the motor is connected to the crank wheel through the adjustable bearing which rotates the crank wheel with desired speed. There will be a connecting link which will connect the crank wheel and the jaws shaft link. As the crank wheel rotates through DC motor it gives angular motion to the jaws

through the connecting link. This rotation will give motion to crank and the rotation of crank will give the motion to the jaws. These jaws acts like human hands they will pick the seedlings of rice from the tray and then plant them into the ground. In this way the mechanism will work.

Rice seedlings will be arranged in the seedling tray in a stack then the procedure of transplanting will take place in that the operator will start the machine, the jaws which will be working as human hands will pick up one seedling at a time and plant them in the ground. Four rows of The plantation of these seedlings will be done. The distance between these rows of rice seedling will be 20cm horizontally and the distance between each consecutive planted rice seedling vertically will be 15cm to 18 cm approx. In this manner the transplanting of the rice seedling using this machine will be done.

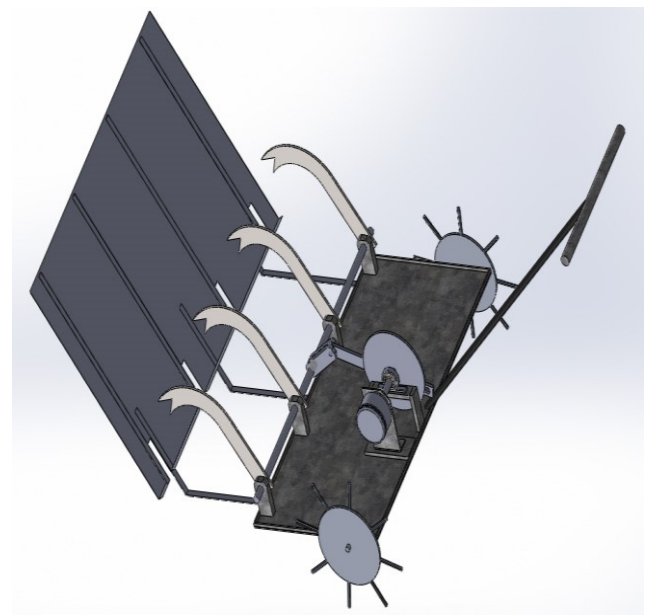


Figure 2. 3D isometric view of automatic rice transplantation machine

IV. ADVANTAGES

- ❖ The system is easy for handling and labour efficient.
- ❖ Considering the present scenario, the labours are not easily available so this system will be help-full for farmers.

- ❖ It will be a time efficient system.
- ❖ It is a cost efficient system.
- ❖ Transplanting of seedlings at the optimal age.
- ❖ Addresses the problem of labour scarcity.
- ❖ Increases farmers net income.
- ❖ Uniform and accurate spacing.
- ❖ Higher productivity compared to traditional methods.

V. CONCLUSION

The working of the Automatic rice transplantation machine is found to be satisfactory. The selection of four bar mechanism is effective and simple to fabricate. The cost of fabricating the automatic rice transplantation machine is cheaper than that of other automated transplanting machine. We can achieve four rows of seedling plantation using this machine. while on the other hand manual transplanting takes lot of time and labours. The estimated cost of rice transplanter is Rs 8500 and it is easy to handle and operate less skilled farmer can also operate this machine easily.

VI. REFERENCES

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