

RICE PLANTING MACHINE

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ABSTRACT: The ultimate aim of agriculture or farming in India is not only limited to growing of crops but is also associated with the economic growth of farmers and labours. Rice is one of the staple food crop of our country. Basically in India establishment of rice depends on the availability of moisture, climatic condition, age of the variety, availability of inputs & human labour. Mechanization in agricultural sector is advancing in developing countries like India. Rice is a labour-intensive crop and requires about 80-90 labour days per acre. Timely availability of labour and water for various activities of rice is becoming a problem. Hence to overcome these issues there is a need of mechanization in the field of rice cultivation by using rice transplanter as major tool in this process. There is also need for designing and developing an economical and user friendly rice transplanter for small scale farmers in order to increase the production as well as the quality of rice. In this paper manual rice planting machine along with their merits and demerits has been discussed by studying various aspects of transplantation related to rice and its field performance which are beneficial to the society and farmers. A rice transplanter is specialized equipment best fitted to transplant rice seedlings on the wet muddy paddy field. This paper is focussed on developing a machine which addresses labour problems faced by small scale farmers. The newly developed rice planting machine, can harvest up to two rows of paddy at a time.

KEYWORDS- Process parameters, production, rice transplanter, transplanting field.

1. INTRODUCTION

Transplanting rice is perhaps the most elaborated method where seeds are sown in one place and after the seedlings are grown a little they are transplanted to another wide spread area. This is done in order to obtain higher yield and less weeding. According to the annual report of CRRRI for 2013-14, total production of rice in the country is estimated at 106.19 million tonnes which was a new record. Production of 2013-14 is higher by 9.5 lakh tonnes than the last year's record production of 105.24 million tonnes. This may be because of rice been staple food crop of our country. Now day's farmers in our country are keen to use new methods as well as new technologies in the field of agriculture. Hence in this paper main focus is on Rice transplanting machine which could provide a huge boost to the agriculture sector specially in the field of rice cultivation. A rice transplanting machine is specialized equipment best fitted to transplant rice seedlings on the wet muddy paddy field.

The mechanical transplanting of the rice has been considered the most promising option, as it saves labour costs, ensure timely transplanting and attains optimum plant density that contribute to high productivity. In India, development and spread of rice planting progressed rapidly during 1990 and 2000. As per the latest technological trends and advancements in agricultural sector such mechanization of paddy planting

machine will definitely meet the challenges and will overcome the issues associated, so that the cultivation of paddy is continuous and will definitely is going to meet the future demands with continuous supply of defined volume.

2. AIM & OBJECTIVE

The basic aim of this paper is to study and know the research gap between the use of traditional method and the mechanized transplanters for rice transplantation in India, along with the parameters related to the existing transplanters. In India very few people are aware about different existing transplanter, their benefits and requirements in order to achieve higher productivity and yield. Hence we aim to study about Rice transplanter, their benefits, requirements and help to popularize it amongst the people especially amongst small scale labours in our country so as to minimize cost of production and have better quality of rice. Use of rice transplanter also generates an alternate source of income for rural youth through custom services on nursery raising and mechanical transplanting.

3. LITERATURE REVIEW

In this review paper mechanized rice transplanters in the field of rice cultivation are been discussed by studying various parameters related to transplanter and its field performance. Transplanting essentially refers to the planting of 20- 35 days old and 20-30 cm high

seedlings rose in nurseries and uprooted for transplanting either manually or mechanically Mehta et al., (1990). In India rice is mainly cultivated during the Kharif session. In traditional transplantation of rice in the paddy field mostly female workers are indulged. S. Pradhanand S.K. Mohanty [1] (2014) conducted an experiment by selecting fifteen female subjects of different age. 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.

Similarly, Rajvir Yadav et al. [2] (2007) had conducted an ergonomic evaluation of six row manually operated rice transplanter. Under their study the field capacity of transplanter was more than as compared to traditional method and average force required for pulling the transplanter was considered to be 130.32 N for male and 145.12 N for female subjects. Martin and Chaffin (1972), Ayoub and McDaniel (1974), and Chaffin et al. (1983) found that heights at which push-pull forces are applied are the most important variable which hugely affects the force output.

In 1985 G.Singh et al. [3] conducted study at the IRRI farm on a mechanized manual rice transplanter and reported that at this farm the transplanter performed well with field capacity of 0.034ha/h under various water depths with different aged seedlings.

During the period of 2008 A.K. Goel et al. [4] conducted an experiment on three transplanters namely OUAT, CRRRI and Yanji rice transplanter. Here they concluded that in accordance with the split plot design of experiments 32 hours of sedimentation period was suitable for operation of manual transplanter while the same was 56 hours for Yanji transplanter.

The SRI (System of Rice Intensification) transplanting method encourages the planting of one seedling per hill and spaced in 25×25 cm for better usage of water, nutrient and pest management [5].

In 2013 Rampuram Jayapal reddy & Dr. N. Sandhya Shenoy [6] conducted an economic analysis of Traditional SRI rice cultivation practices in Mahabubnagar district of Andhra Pradesh. It was concluded that the SRI method of cultivation is advantageous to the paddy farmers as compared to Traditional method. Baldev Raj Kamboj et al. [7] (2013) discovered that puddling results in degradation of soil and the formation of a hard pan, which obstructs root growth of crops. In addition to decreased availability labour during the peak session and increasing cost of labour have increased the cost of rice production through conventional methods. Because of these concerns, there is a need for mechanized transplanting of rice which is less labour-intensive and

can ensure optimum plant population under non puddled and/or no-till conditions.

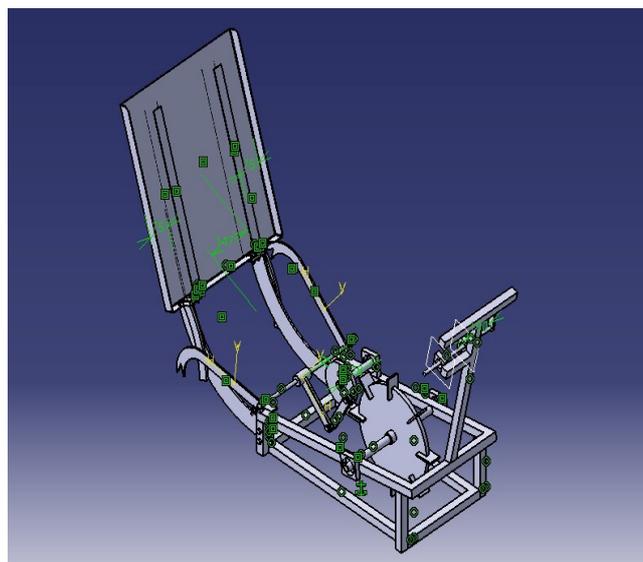


Fig. 1 Rice Planting Machine

4. COMPONENTS OF MACHINE:

1. Frame
2. Tray
3. Fork
4. Handle
5. Chain & Sprocket
6. Wheel

5. METHODOLOGY

Various parameters are indulged with the rice transplanting machines which are planting unit, seedling tray.

5.1.PLANTING UNIT

When we are designing the planting mechanism for the planting unit following aspects were considered which are as follows moving pathway, travelling speed, catching mechanism for plant, planting depth. Moving pathway consists of a four bar linkage mechanism which can be treated as planting arm for the planting unit. This four bar linkage mechanism provides the basic pick and place movement. In catching mechanism place of catching should be designed and calculated accurately so that plant shouldn't be harmed or damaged while catching or releasing executed by the transplanting arm. Other parameters such as release point, planting angle & distance of travel should also be taken into consideration. The condition of being stretched or strained (Tension) for the plant should be

enough to catch the plants and to prevent release until end point, without any damage to the plant during the course of the process.

Basically tray feeding point angle help's to decide the Angle of planting. Distance of travel can be calculated according to the average walking speed of a man on a muddy field i.e. 1.5km/hr. i.e. 25m/min. Planting depth or say depth of planting is the most important consideration for the growth of roots and for the uniform standing of the seedling with the submerged condition.

Planting depth for the machine can be set according to the ground level. Depth of planting is considered to be 4-6cm below the ground level.

5.2. DESIGNING OF SEEDLING TRAY

Seedling tray is used to carry the seedling so as to direct the plants to the planting arm. Basic factors such as width, length, angle, etc. must be considered for designing the tray mechanism. In order to constantly feed the seedlings to the planting arm, seedlings must come down to the end of the seedling tray by gravity. Higher the angle less will be the requirement of the energy for feeding seedling to transplanting arm while too much angle might affect the falling down of the seedlings to the end of the tray.

6. BENEFITS:

1. Efficient utilization of resources by saving labour & cost of overall production.
2. Timely transplanting of seedlings of optimal age.
3. Ensures uniform spacing and optimum plant density.
4. Higher productivity compared to traditional methods.
5. Less incidence of disease in seedlings due to less root injury generated due to shock while transplanting.
6. Improving soil health through eliminating puddling.
7. Generates an alternate source of income for rural youth through custom services on nursery raising and mechanical transplanting.

7.LIMITATIONS:

Expensive with respect to poor socio economic condition of labours in our country.

Can't be repaired in any ordinary workshop special workshops are required for their maintenance. Involves complex mechanism which is hard to understand and manipulate.

Skilled operators are required along with the mat type nursery raised seedling.

8.RESULT & DISCUSSION

Transplanting is a labour intensive operation along with time consuming and health issues related to it. Further from our study we could easily evaluate that high skill is necessary for the operation so as to achieve uniform number of seedlings per hill, spacing between hill to hill and as well as between the rows. It is well known fact that the time available between the harvest of one crop and transplanting of paddy is short. Hence the maximum yield can only be through timely transplanting according to the sessional approach i.e. Kharif session. So it could be said that maximum yield is a function of date of transplanting. These are few factors that basically emphasis the need for a suitable mechanical transplanter in India which suits the small scale labours and moreover which are easy to handle and maintain. Japanese transplanters are hugely successful worldwide, but Japanese transplanter possess certain limitations for introduction in India. These transplanter are very expensive hence looking towards the poor-socio economic condition of labours in our country these transplanter could not gain that much popularity. Japanese transplanters are well composed of complex and precise mechanism which could not be repaired or serviced in the local workshops. According to study in this paper it is clear that out of all the mechanical transplanters a self-propelled type is considered to be more advantageous. But there is need of designing and developing a cheap, simple and effective indigenous transplanter suited to perform well under Indian conditions.

9.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 our

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.

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