

Cad Modelling and Analysis of Axle Shaft of Rice Planting Machine

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Abstract- 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.

Keywords- Rice transplanter, crops, cultivation. Machine transplanting.

I.INTRODUCTION

Rice is grown under varying conditions in India from 8° to 25° N latitude and from sea level to about 2,500 metre altitude. It is a tropical plant and requires high heat and high humidity for its successful growth. The temperature should be fairly high at mean monthly of 24°C. The average annual rainfall required by rice is 150 cm. It is the dominant crop in areas of over 200 cm annual rainfall and is still an important crop in areas of 100-200 cm rainfall.

The 100 cm isohyet forms the limit of rice in rained areas. Lesser amount of rainfall is required as the harvesting time approaches. The fields must be flooded under 10-12 cm deep water at the time of sowing and during early stages of growth. Therefore, the fields must be level and have low mud walls to retain water. Rice can be grown on a variety of soils including silts, loams and gravels and can tolerate acidic as well as alkaline soils.

However, deep fertile clayey or loamy soils which can be easily puddled into mud and develop cracks on drying are considered ideal for raising this crop. Such soil requirements make it dominantly a crop of river valleys, flood plains, deltas and coastal plains and a dominant crop there. In old days rice transplantation process is generally done manually. All the processes from the sowing the rice seeds to rice transplanting from the one place to other place to the cultivation of rice to the harvesting of rice and lastly to the collection of rice was done only by manually. During

the sixties India became self-efficient in food grain production but the benefit was restricted to irrigated areas and rich farmers. This traditional method of rice transplanting is labour intensive, hazardous with low per acre plantation of plants and time & cost consuming.

Due to these factors the completion of rice cultivation suffers within the optimum transplanting period consequently farmers face the problem of low per acre production with high production cost. Therefore technology for small holding size plays a very important role in developing countries.

II. LITERATURE REVIEW

D.N. Chaitanya and Arunkumar Design and developed of low cost and efficient farm implement plays a vital role in sustaining the farmers holding small fields due to the sparse availability of laborers. Several designs though available in the market cannot be afforded by these farmers due to high initial investment and maintenance.

Hence a simple and cost effective rice planter is the most promising in these circumstances. Nevertheless, there are few limitations with these transplanters as for the planting mechanism concerned. Due to the circular trajectory of the planter, the seedlings are planted in an inclined direction which is susceptible for extrication and improper growth. Hence, a new planter design is proposed in this work which overcomes this problem. With the proposed design,

seedlings are planted vertically to the ground at sufficient depth by making the planter to travel in the straight path.

Sourabh Kadam and Avinash Zambare, rice planting machine has been designed and fabricated satisfactorily. Finally we can say that it is a user friendly and efficient machine with low production cost. But, there is always a room for improvement. So, the improvements can be done before introducing it 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.

Satish Kumbhar et.al. designed working is found to be satisfactory. 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.

After further improvement, this two row paddy transplanter can be transplanter 0.2 to 0.3 hectare/day while manual hand operated gives 0.1 to 0.1.5 hectare/day by considering 8 hours per day of working. The total cost which include material and fabrication cost is Rs. 6000 and easy to operate. This will reduce to Rs. 5000 with mass production.

III. PROBLEM STATEMENT

Rice is a major agricultural grain crop along with long life of about 1 year. Rice is a major food item in a daily diet of many people around the world. Harvesting of Rice crop is starts in month of June and ends in month of October.

Harvesting of rice is usually done by rice transplantation process. Rice transplanting is a time consuming process and required more labour and hence large amount money required. Also the rice transplantation process should be completed within a less time as possible because it is be done in muddy field specially prepared for rice transplantation purpose.

That's why the rice transplantation process requires more labour for short period of time. As well as due to individual's own work there is problem of shortage of labour in these days arises. This problem is explained by many of farmers we have taken opinion from them and find out that we can develop such a machine that may helpful for the farmers very much. Hence we experienced that it need to develop machine which overcome above problems economically.

- Rice transplantation is active area of manufacturing and research.
- The performance of rice transplanter can be based on models that represent the phenomena involved in transplantation: physics, theory of machines, machine design.

- Rice transplantation is very lengthy process hence atomization is required to achieve this in less time.
- Mechanical rice transplanter machine saves time and money.
- Proper transplantation of rice seedlings depends upon proper design of the machine and working mechanism.

So in order to make ordinary farmers beneficial it needs to provide them such type of systems that can be helpful to get more profit.

IV. PARTS OF RICE TRANSPLANTER

Table 1. List of parts of Rice Transplanter.

Part No.	Part Name	Material	Quantity
1	Square Pipe	MS	1
2	Ground Wheel	MS	1
3	Blades on wheel	MS	12
4	Sprocket	Plain bore carbon steel	2
5	Chain	Carbon steel	1
6	Bearing	White Metal	4
7	Metal sheet	MS	1
8	Connecting rod	MS	2
9	Lever	MS	2
10	Crank	MS	2
11	Bolt	MS	6
12	Shaft	MS	2
13	Fork	MS	1
14	Allen screw	Nichrome	8
15	Cotton string	Cotton	2

V. WORKING OF RICE TRANSPLANTER

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. The larger sprocket is in engagement with the smaller sprocket by using the chain drive.

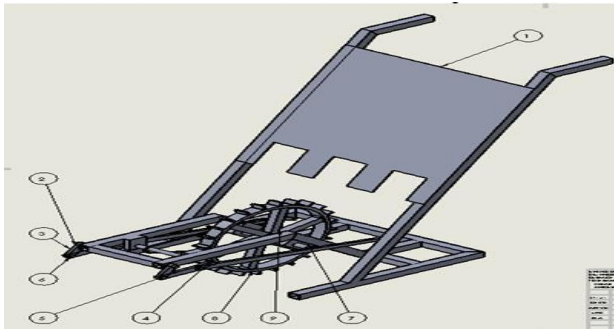


Fig 1. Assembly of Machine.

As the power will get transmitted to the smaller sprocket, it will rotate. The speed is increased from driver to driven shaft as we used 3:1 speed ratio. 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.

VI. CONCLUSION

In this way our manual rice transplanter machine is effective and simple from ease of operation for rice transplantation process at proper time with less time, manpower and money. It is also affordable to all common farmers.

Unskilled worker can operate the machine easily. It substitutes for conventional process of rice transplantation. Hence it is reliable system. Static analysis of axle shaft is carried out using Mild steel and Gray Cast Iron Material. The Mild steel material gives optimum values of stress, displacement and strain. The result table is given below.

Table 2. Conclusion Table.

Comparison	Manual	Machine
Man Power	12	2
Time	2 Days	1 Days
Cost	3600	500

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