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Multipurpose Rice Transplanter Machine

Nikita Y. Kadam[1], Swapnil C. Sawant[2], Inkesh D. Choudhari[2], Shubham A. Waghmare[2], Shubham S. Wavhal[2]

[1]Assistant Professor in Department of Mechanical Engineering S.S.J.C.O.E. Dombivli E, Maharashtra, India
[2]BE Students in Department of Mechanical Engineering S.S.J.C.O.E. Dombivli E, Maharashtra, India

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Abstract –*One of the most important sector in Indian economy is agriculture contributing a large amount in Indian economy. Agriculture requires large workforce for various operations such as Ploughing, transplanting, sowing etc. rice is the main crop cultivated in India which is second in the world after china. Because large workforce is involved in this process, the process becomes time consuming and costly. Several attempts has been made in designing and fabricating transplanting machine for paddy transplantation. The study is basically focused n design and fabrication of multipurpose rice transplanter by providing additional tools. For ploughing and clod crushing processes for small scale Indian farmer to reduce their efforts by combining multiple operation in one machine with reduced cost.*

Keywords:- Transplanter, Ploughing, Clod Crushing, Cam and Follower, Multipurpose

1. INTRODUCTION

1.1 Background

Across south Asia, labour scarcity is major problem and there is a need to explore establishment methods. rice transplanter require less labours but still allow the crop to be transplanted on time as well as other processes like ploughing and clod crushing to be done by a single machines, so that it will be more useful to farmers. Also, rice is primary and major crop cultivated in India. So, requirement of this cost is increasing every year due to increase in population. But, traditional rice transplanting is done manually and hence it is not so efficient. Formers faces lots of problem like health issues, hygiene issues labour cost etc. we have created multipurpose transplanter to address this problems.

1.2 Idea and Scope

A multipurpose transplanting machine is fitted with transplanting mechanism (usually having some form of cam and follower) which is driven by the power from wheel axle in order to transplant rice seedling onto paddy field. It also consists of a tool for ploughing as well as mud making process. The clod crushing tool will be rotated by an electric motor. Thus, this machine has capacity of doing three processes in rice cultivation so it will be very useful to small scale Indian farmer.

The multipurpose transplanter deals with various operational and manage mental issues that need to be addressed. It will help in extending staff, service providers and innovative farmers to use mechanical transplanting with or without puddling with an easy, step-by-step guide. In conventional manual transplanting practise, 8-12 labours are required to transplant one acre. However, if a self propelled transplanter is used, three people can transplant up to four acres in a day.

2. LITERATURE REVIEW

Dushyant kalchuri and prof, P. N. shende presented "An Overview of Rice Transplanting Machine".[1] From this paper we got to know that, rice is one of the stable food crops of our country. In India, rice cultivation depends on various factors such as availability of moisture, climate conditions, availability of labour, and quality of soil. Amongst these availability of labour plays a major role on deciding the method of establishment of rice. Labour shortages and labour cost is one of the major problems… hence, to overcome such issues, there is need of some mechanization in rice transplanting process. Also, studying through "Agricultural Research Paper Communication Centre Journal" titling "Comparative performance of different paddy transplanter developed in India".[2] We come to know that transplantation essentially refers to planting of seedling in a nursery and raising them for 20-30 days and 20-30 cm high seedlings raised in nurseries are uprooted for transplanting either manually or mechanically. P.B.Gaikwad, P.U.Shahare, S.V.Pathak, V.V.Aware presented "Development and performance evaluation of four row self propelled paddy transplanter". [3]In this research paper, a four row self propelled paddy transplanter was developed and evaluated. This transplanter consisted of fifteen parts. An engine with 3.5 horse power (hp) was used to drive this transplanter. The chain and sprocket mechanism was used to drive this transplanter. The performance of this transplanter was tested under laboratory conditions. The speed of transplanting mechanism and number of seedling per hill were measured. These measured values indicated that the developed transplanter would transplant the paddy seedling effectively. Subsequently, the performance of this paddy transplanter was tested under field conditions. While conducting this field test, as many as nine parameters were measured. Some of them include, transplanting depth of the paddy seedlings, operating speed of the transplanter and cost of operation. The cost of operation was found to be 359 INR per hour and 2580 INR per hectare area. The results of the

tests conducted under both laboratory and field conditions were found satisfactorily. Finally, it is claimed that the adoption of this four row self-propelled transplanter in place of manual transplanting will facilitate to save 48.45 percentage of running cost. It is also claimed that the application of the self-propelled 4 row paddy transplanter will result in the saving of 2420 INR per hectare. While concluding, it is claimed that this self-propelled four row paddy transplanter will be suitable for application in areas where in the tracks are fragmented.

TABLE -1: PAPERS REVIEWED FOR REFERENCE

Paper Title	First author	Year	Work done
Rice Transplanter Machine	Prof. S. K. Pawar	2017	Studied the benefits of mechanical rice transplanter over manual rice transplanter
Development and Optimization of Mini Tractor Mounted Clod Crusher	C. J. Jinoya	2019	Uses and design of clod crusher tool
Plough for Agricultural Mechanized Robot	Jukanti Vishwas	2019	Design of ploughing tool

3. PROBLEM DEFINITION

1. Existing paddy transplanter consists of complex mechanism: paddy transplanter uses four bar link mechanism which is more complex than cam and follower mechanism.
2. It create problem like back pain and fungal infection in feet: In manual rice transplanting, labours can suffer from back problems, fungal infection on legs, increased stresses in hands and other body parts.
3. Frequent replacement of link: four bar linkages need to frequent replacement because of disengagement and broke down linkage joint.
4. Farmer cannot repair by their own: because of four bar linkage and complex design it is hard for farmer unless he is skilled worker.
5. Pulling force requirement is more: because of wait its get hard to pull as well as it in mud so for manual transplanting pulling force is more.
6. Costly: in this process labor cost per acre is about 1500-2000rs, while machine operation spends only 300rs per acers which gives more profit to farmer.

4. OBJECTIVES

1. To obtain uniform spacing and optimum plant density.
2. To achieve higher productivity (0.5-0.7 t/ha) compared to traditional methods where plant spacing and density may not always be consistent.
3. To lower stress, drudgery and health risks for farm laborers.
4. To create better employment opportunities for rural youth through the development of custom service business.
5. To Increase farmers' net income.
6. To lessen transplanting shock, early seedling vigor and uniform crop stand.

5. CONSTRUCTION

The various components used in this model are as follows.

1) Chain: In this mechanism use simple type of chain. The function of chain is to transmit torque from driver to driven sprocket.

Fig 5.1 Chain

2) Sprocket: In this mechanism two sprockets are needed. The main function of sprocket one driver and other drive mounted on respective shaft.

Fig 5.2 Sprocket

3) Tray: there are tray needs depends on how many rows need to plant. This is used to store the rice planting finger pick the plant and saw in the ground this tray has two vertical guide slot.

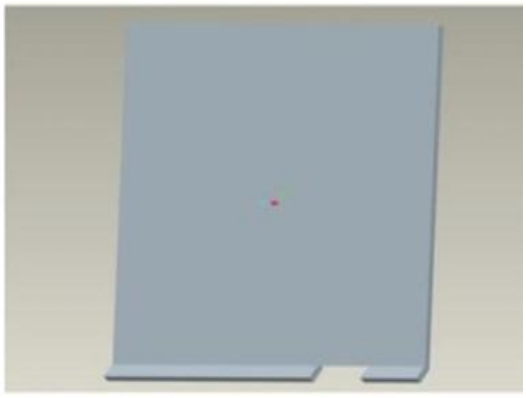

Fig 5.3 Tray

4) Fork (planting finger): the main element which is responsible for the plantation of the nursery seed. It has specific shape which pick the nursery seed [from tray] and plank in mud it is caused as fork or planting finger.

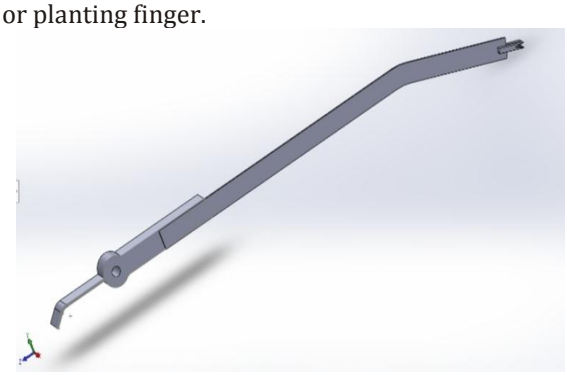

Fig 5.4 Fork

5) Ploughing tool: it is a tool or from implement used for initial cultivation to loosen or turn the soil in preparation for sowing seed or planting.

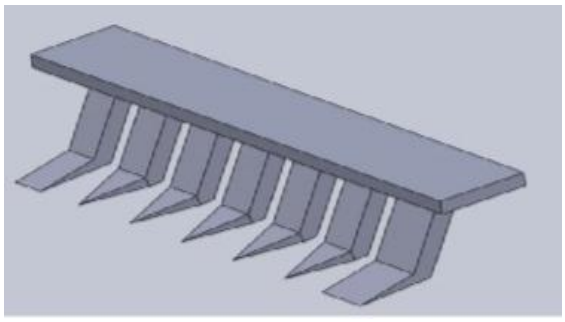

Fig 5.5 Ploughing tool

6) Mud making tool: It is roller having teeth over its periphery which is used to make mud in the farm for planting.

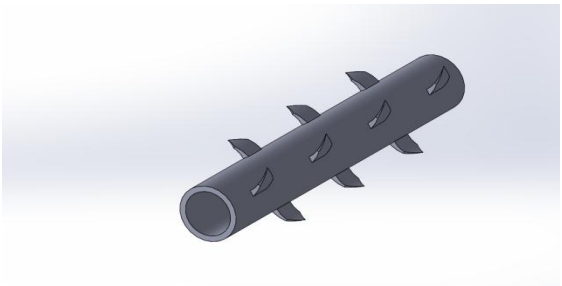

Fig 5.6 Clod Crusher

7) Clod crusher: the function of clod crusher is to break the clods that are formed in field. This operation is done after ploughing.

6. WORKING

Ploughing is the first step for rice transplantation. In this process, ploughing tool is used to plough the field. The power supply is given to rear wheels through motor. Through motor power, pulling force is generated for ploughing and thus, operation is performed. After ploughing, second process is done and it is called clod breaking operation. For this, clod crusher is required for breaking of clods for better seed bed proportion. As for ploughing process power is supplied to rear wheel through motor, this power will be supplied to clod crusher through chain and sprocket mechanism. Thus, clod crusher will rotate and operation will be performed. Also, during this process, ploughing tool can be removed and vice versa.

The main process or operation is rice transplanting. In this process, premature rice crops are kept on tray and with the help of cam and follower oscillating and oscillating follower mechanism. The wheels are provided with fins so that they can easily travel in mud. The power is transmitted from front axle to Driven shaft on which cam is connected and fork is connected to oscillating follower which causes fork to pick crop from the tray and plant is into mud during its downward motion. During this operation both ploughing tool and clod crusher are removed.

7. CONCEPTUAL DESIGN

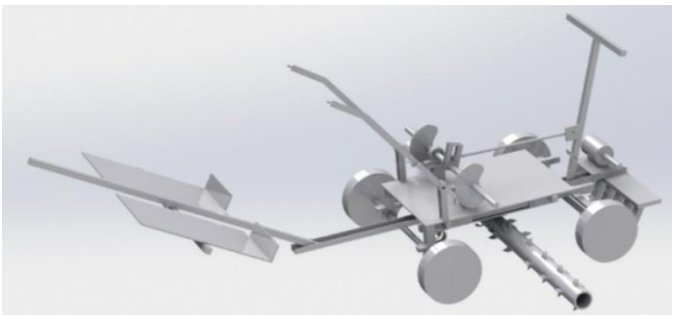

Fig 7.1: Conceptual design of multiple purpose rice transplanter in solidworks

8. CONCLUSION

We would conclude that, the paddy seedling transplanting machine worked satisfactorily and it has the ability to perform these operations i.e. rice transplanting, ploughing, and clod crushing with proper balance of weight. Row spacing is also proper but, there were some improvements to be done before introducing to the farmers during transplanting. Also, the model is of minimum investment, so, it will be affordable to farmers.

9. FUTURE SCOPE

1. Further advancement can be made by making it fully automatically installing sensors and controlling it through mobile application.
2. Also, by adding multiple operations like seed sowing, pesticide sprayer etc.
3. Weight of the machine can be reduced by removing sprocket and chain and adding small gears.

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