RICE AND ONION TRANSPLANTING 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 focused on developing a machine which addresses labour problems faced by small scale farmers. The newly developed rice planting machine, can harvest upto two rows of paddy at a time. Outcomes are Reduction in manpower by 80%., Reduction in time by 50%, Reduction in production cost by 50%, Increase in product quality.

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

INTRODUCTION:

Rice is one of the most important food crops in India and second in world. It is the staple food for more than 60% of the world's population and hence popularly called as 'Grain of life'. India is the largest rice growing country. India has largest area under rice cultivation of about 43.38 million hectares with the total production of about 104.3 million tonnes (Statistical Year Book India, GOI, 2017). Being the staple food for more than 62% of people, our national food security hinges on the growth and stability of its production (Ganapathi and Kumar, 2015). Transplanting is the largely practiced method in establishment of paddy in India. It is mostly done manually by hand. Manual transplanting is a tedious and very time-consuming operation requiring about 250-300man-h/hawhichisroughly25%of the total labour requirement (Sinal.,1985). Manual transplanting, mostly done by female workers, requires frequent bending down and straightening up of body posture which causes higher discomfort and fatigue to them. It was found that, this process results in high level of musculoskeletal disorders in back,neck, shoulders, legs and thighs of the workers (Ojha and kwatra 2011). Shortage of labour during

peak time and high operation costs are the main factors leading to mechanization of paddy transplanting. Timeliness of rice transplanting is also essential for optimizing the yield and this can be achieved only through the mechanical rice transplanting. Mechanical transplanting has been considered as the most promising option because it reduces the labour requirement to 50 man-h/ha (Dixit etal.,2007). Apart from saving in time and cost of transplanting, it removes human Weeding and inter cultural operations easier. The initial cost of self-propelled paddy transplanters were more than 1 lakh rupees, thus due to this higher input cost it has become difficult for small scale farmers to purchase them. In the context of the above knowledge, there is a strong need for development of small and low-cost manual operated paddy transplanter, to suit small and marginal farmer economic conditions as there could be considerable reduction in labour, time and The Andhra Agric. J 65 (spl): 69-76, 2018 cost of operation. Considering the need, an attempt to develop a manual operated women friendly paddy transplanter is taken with the objectives to develop a manual operated women friendly paddy transplanter without using mat nursery and evaluate the performance of developed paddy transplanter.

AIM & OBJECTIVES:

The basic aim of this paper is to study and This technology is used with pre- germinated, seedlings. The machine cost ranges from 100,000 to 700,000 THB (32 THB = 1 USD) depending on the features that the product comes with know the research To develop a mechanism for transplanting rice & onion seedlings using the method of analytical synthesis, To develop a four row transplanter and an optimized-planting using the above mechanism, Experimental testing and correlating results, Design a mechanism for transplanting paddy seedlings, Test the performance of the transplanting mechanism. Hence, we aim to study about Rice transplanter, their benefits, and requirements and help to popularize it amongst the people especially amongst small scale labours in our country so as to drudgery and can give uniform and desired plant density with better crop stand contributing to higher productivity. More over one can plant the crop in line at no extra cost and make mechanical minimize cost of production and have better quality of rice.

LITERATURE REVIEW:

(1) Design of Rice Transplanter (Arunkumar Sa, G. Bhanu Akhilesha, etal) Journal Name: - Materials Science and Engineering Volume: -377 PublishingYear: -2018there 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. (2) Development of an onion-set planter based on Design criteria of plant transplanters (Ram Reddy Sadhu) Journal name: -manual Transplanting vs. Mechanical transplanting of Paddy: Pg. no:- 224 Publishing Year:-1979 By mechanical planting. Considerable labour savings can be achieved using this onion- set planter. One man with one, two-row planter could cover 8.75 acres in a 7-hour This compares with only one acre planted by approximately ten hand labourers per day. (3) The field capacity of transplanter (Rajvir Yadav, Mital Patel, S.P.Shuklaand S. Pund) found that heights at which push- pull forces Are applied are the most important variable which hugely affects the force output.
(4) Information on different cultivation technologies currently in use to increase rice yields (Deanna

Cavallaro, Paramon Chimtawan, Michael Chin) Journal name:- Degree of Bachelor of Science in cooperation with Chulalongkorn University This technology is used with pre-germinated, seedlings. The machine cost ranges from 100,000 to 700,000 THB(32 THB = 1 USD) depending on the features that the product comes with problem when shafting gets long.

Fig.1 Rice and Onion Transplanter Machine

COMPONENTS OF MACHINE:

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

METHODOLOGY:

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

PLANTING UNIT:

When designing the planting mechanism following aspects were considered:

I. Moving pathway, speed of traveling
II. Plant catching mechanism
III. Depth of planting

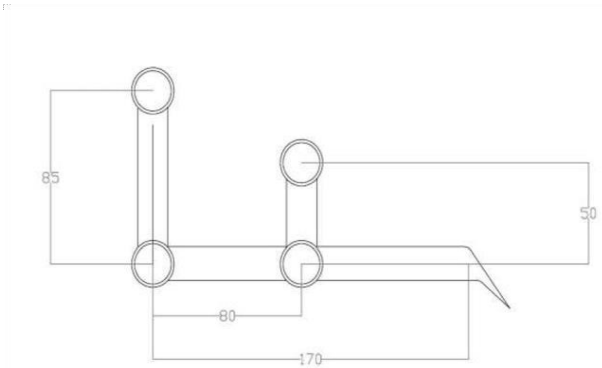

Fig.2 Dimension of the planting arm

I. Moving pathway

Prototype design (Figure 2) was build using wood, nuts and bolts and evaluated to get the required measurements. The design was simple and with less number of moving parts.

II. Plant Catching Mechanism

There are several parameters were considered in designing the plant catching mechanism:

- Place of catching
- Number of plants per catching
- Distance of travel
- Releasing Point
- Tension on plants
- Angle of Planting

Plant should not be damaged while catching and releasing by the planting arm. Suitable speed, position and angle of catching and angle of planting, height of tray, width and length of figures are the factors governing the proper planting mechanism.

Distance of travel was calculated according to walking speed of a normal man.

Man walking speed = 1.5 km/ hour

=(1.5 km/hour)*(1000m/km)*(1hour/60min)

=25m/min

Diameter of the ground wheel =30cm Perimeter of the ground wheel =2πr

=2*π*30/2

=94.277cm

Distance of plants

Number of plants per one ground=25cm

Wheel rotation =3.77 ≈4

Planting arm and fingers are made of flat iron. Fingers are welded to the arm. Tension of the plant should be enough to catch the plants and to prevent release until end point and not to damage the plant during the process. Angle of planting was decided by tray feeding point angle and moving direction.

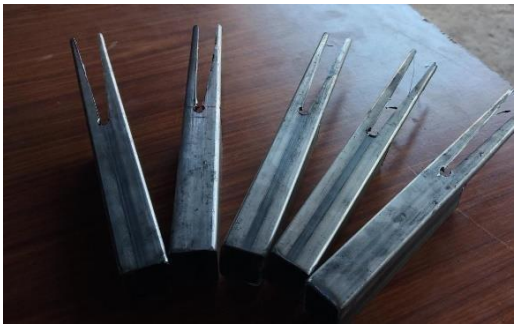

Fig.3 Planting arm

iii. Depth of planting

Planting depth is important for growth of roots and to stand with the submerge condition. Planting depth was controlled using height adjustable floater. Figure shows the floater and planting arm at lowest position.

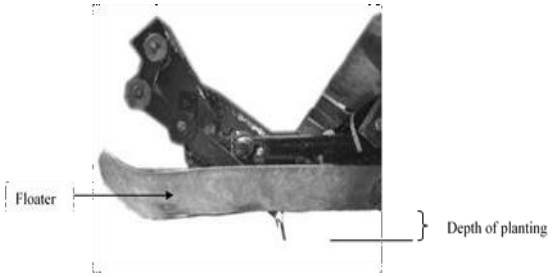

Fig.4 Planting arm at lowest position

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 track.

Fig.4 Tray moving mechanism

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.

LIMITATION:

1. Transplanting is tedious and time- consuming (up to 30-man days/ha) Planting laborers can suffer from back problems (health risk).
2. Difficult to get enough labour at peak periods to plant on time.
3. Difficult to maintain optimum spacing and uniform plant density, especially with random transplanting and contract labor.
4. Low plant density with contract transplanting on area basis lowers yields.
5. Possible Risk that in rain fed areas seedlings (especially of modern varieties) may get too old before rain falls and the field is ready to be planted.

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 approaches.

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 labors 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 transplanters are very expensive hence looking towards the poor-socio economic condition of labours in our country these transplanters 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.

OUTCOME:

1. Reduction in manpower by 80%.
2. Reduction in time by 50%.
3. Reduction in production cost by 50%.
4. Increase in product quality.

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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