IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 7, Issue 1, January 2020

An Approach on Rice Planting Machine

A.B. Tupkar[1], Ankit S. Bitturwar[2], Mohnish Shende[3], Prashant R. Pande[4], Vaibhav J. Tonge[5]

Assistant Professor, Mechanical Engineering, B.D. College of Engineering, Sevagram, Maharashtra, India[1]

Students, Mechanical Engineering, B.D. College of Engineering Sevagram, Maharashtra, India[2,3,4,5]

Abstract: India is an agrarian country. About 70% of Indians are dependent on agriculture for their livelihood. India is one of the world's largest producers of rice, accounting for 20% of all world rice production. Rice is usually grown by planting rice paddy in the fields manually with hands. With this method of planting rice paddy, labor cost increases and it is a very time consuming process. These problems can be solved with the help of proposed new design rice planting machine. This proposed machine reduces labor cost and time to plant rice paddy. This machine has a simple mechanism and it is eco-friendly. This machine requires only a single person for its operation and working. This machine can bring revolution in rice production in our scenario. So, the main aim of this proposed work to design and develop a rice planting machine which will help the farmers to make the whole rice planting process mechanical resulting in reduction of labor, cost and time to a large extend.

Keyword: Agriculture Efficient Machine, Rice Planting Machine, Green Revolution, Paddy mechanization

I. INTRODUCTION

India is a country of villages, having large population around two third of its population are dependent on agriculture. The sole culprit for slogging in pace of accretion in agro industry is dependency on traditional approaches and equipment. For enhancing the per capita agricultural production, various innovative efforts are made at national level under the name Agricultural Revolution. Revolution is confined to economic growth which may result from various economic factor but technological progress has been and will continue to be the primary source of development. Technology refers to the application of scientific approach for practical purpose as well as industrial purpose for enacting and enriching goods and services.

India is one of the world's second largest producers of white rice and brown rice, accounting for 20% of all world rice production. Rice is India's pre-eminent crop, and is the staple food of the people of the eastern and southern parts of the country. Production increased from 53.6 million tons in FY 1980 to 74.6 million tons in year 1990, a 39 percent increase over the decade. By year 1992, rice production had reached 181.9 kg, second in the world only to China with its 182 kg. Since 1950 the increase has been more than 350 percent. Most of this increase was the result of an increase in yields; the number of hectares increased only 0 percent during this period. Yields increased from 1,336 kilograms per hectare in FY 1980 to 1,751 kilograms per hectare in FY 1990. The per-hectare yield increased more than 262 percent between 1950 and 1992.

The country's rice production had declined to 89.14 million tons in 2009-10 crop years (July–June) from record 99.18 million tons in the previous year due to severe drought that affected almost half of the country. India could achieve a record rice production of 100 million tons in 2010-11 crop years on the back of better monsoon this year. The India's rice production reached to a record high of 104.32 million tons in 2011-2012 crop year(July–June).

Rice is one of the chief grains of India. Moreover, this country has the largest area under rice cultivation, as it is one of the principal food crops. It is in fact the dominant crop of the country. India is one of the leading producers of this crop. Rice is the basic food crop and being a tropical plant, it flourishes comfortably in hot and humid climate. Rice is mainly grown in rain fed areas that receive heavy annual rainfall. That is why it is fundamentally a kharip crop in India.

II. LITERATURE SURVEY

An attempt has been made in the present chapter to review some inter linked literature on this aspect from home and abroad. The inter linked reviews are conveniently presented on the major objectives of the study as far as possible. Here the review of literature is presented into two groups:

1. Assumption of the study and
2. Review of literature related to the previous work regarding rice trans planter.

Garget al. (1982) conducted an experiment on Influence of Selected Seedling mat parameters and planting speed on performance of rice trans planter. The performances of OUAT (T1) and Yanji (T2) rice trans planter with respect to the dependent parameters like number seedlings per hill, missing hills, floating 5 hills, mechanical damaged hills were studied and the data were analysis in accordance with split plot design of experiments.

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 7, Issue 1, January 2020

Singh et al. (1985) reported that irrigated rice is largely grown by manual transplanting of seedlings. Manual transplanting of rice seedlings takes about 250-300 man-hours/ha, which is roughly 25 percent of the total labor requirement of the crop.

Garget al. (1997) conducted a study on development and field evaluation of manually operated six row paddy trans planter. Agricultural Mechanization in Asia, Africa and Latin America. They reported that rice is grown either by direct seedling i.e. broadcasting, drilling, sowing, transplanting. In India, higher and more stable yield was obtained from transplanted rice than direct seeded rice. In most provinces of India, transplanted rice had 10 to 20 % higher yield than broadcasted rice.

Umar et al. (2001) The evaluation of diffusion possibilities of mechanical transplanting method revealed that on economic grounds, although this method is more expensive as compared with the conventional method. however, the yield benefits due to higher population stand makes it profitable to adopt. The introducing farmers showed some reservations regarding the spread of this technology in the area. The danger of massive displacement of 8 farm labor cannot be ruled out. However, the big industrial set-up already present in the area may not allow this problem to become more severe.

Nagasakaet al. (2002) has developed an Automated rice trans planter with RTKGPS and FOG. This study's objective was to develop an automated operation system to make precise operation more efficient. A real-time kinematic GPS (RTKGPS) was used to locate the position and fiber optic gyro (FOG) sensors to measure the direction and the inclination of the vehicle. RTKGPS has 2-cm precision at 10-Hz data output, but the vehicle inclination influences the position data and the position data has about 70-ms delay.

Tripathet al. (2004) reported that due to rapid industrialization and migration to urban areas, the availability of labor became very scarce and with hike in the wages of labor, manual transplanting found costly leading to reduced profits to farmers. Under such circumstances a less expensive and labor saving method of rice transplanting without yield loss is the urgent need of the hour.

Remesanet al. (2007) conducted a study on Wet Land Paddy Weeding - A Comprehensive Comparative Study from South India. They reported that the advent of mechanical rice trans planter to Indian agriculture encouraged farmers to use inter-row weeding tools like Rotary weeder, Conoweeder etc. These instruments are now popularizing among farmers instead of tedious and low productive hand weeding.

Ghafooret al. (2008) carried out an experiment on factors responsible for poor mechanization of rice transplanting in Pakistan. The study indicated that nursery raising with specific technique was the major factor arresting mechanical transplanting. Secondly, land leveling was also found an impeding factor in the technology. The influence of the vehicle inclination is corrected by measuring the inclination with FOG sensors.

Aswiniet al. (2009) studied on Effect of seedlings age on performance of rice trans planter. Observations on speed of operation, depth of placement of seedlings, number of seedlings per hill, number of missed hills, time taken for turning, time taken for loading of seedling mat on to the trans planter, total time taken for transplanting, total area covered, width of coverage and quantity of fuel consumed for the operation were recorded.

Pateriyaet al (2012) conducted an experiment on design modifications of mat type rice trans planter, the observations indicated that all the modified components worked satisfactorily. From the results, it appears that the percentage of missing hill varied 8.06 to 9.75, plants per hill ranged 2 to 4, planting depth was 50 to 65 mm. The hill to hill spacing was 95 to 102.5 mm at low gear and 147.7 mm at high gear, the row to row spacing varied 230 to 235mm.

Pragyaet al. (2012) carried out an Ergonomic Study on Human Drudgery and Musculoskeletal Disorders by Rice Transplanting. They reported that the 7 majority of respondents were suffering from pain in neck, both shoulder, upper back, lower back and thighs because they were compelled to adopt bending and sitting posture during manual uprooting and transplanting. To solve the problem of high physiological workload, human drudgery and musculoskeletal disorders mechanical rice transplanting could be considered as the most promising option.

III. PROBLEM STATEMENT

- To reduce the human effort and consume less time for transplanting rice.
- This machine covered more area in less time.
- This machine is a labor saving device and is required to less space to move compared to the other sources.
- There is no required to fuel.
- Small farmers cannot afford to buy the power operated machine or tractor mounted machine, due to that this is need for the farmer.
- This machine is adjustable according to number of rows and distance between the plants.

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 7, Issue 1, January 2020

IV. AIM AND OBJECTIVE

- Ensure uniform spacing and planting depth of transplanted rice
- Save time and cost during period so peak-labor demand.
- Create new forms of employment through creation of seedling nursery entrepreneurs and transplanting service providers.
- Improve farmer's socio-economic conditions.
- Design a mechanism firm transplanting rice plant.
- Test performance of rice transplanting mechanism.
- To increase the operational cost by using improved and new mechanisms.
- To overcome labor shortage problem.
- Design cost effective machine which can be used to transplant rice plants easily.
- Single mechanism can be used to plant two rows simultaneously.

V. METHODOLOGY

As the process is manual the worker has to provide the initial motion by rotating the hand wheel. When the rice trans planter will move forward the padded wheel will get rotate. The wheel is provided with the spokes so that it can travel easily in the mud. Then we have larger gear is provided on the same shaft with the padded wheel and hence at the same time gear will also rotate. The larger gear is in engagement with the smaller gear by using the chain drive. As the power will get transmitted to the smaller gear, it will rotate. On the same shaft planting finger will be fixed through the 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 gear arrangement we have increase the planting finger speed. As the planting finger will oscillate, it will pick the nursery seed from the seedling mat and planted in mud. The planting finger is designed in such a way that nursery seed should be easy to pick during the motion and also it should pick during the downward motion.

Table 1: Comparison Between Traditional Method and proposed Machine

Area of field	**1 Acre**		**3 Acre**		**10 Acre**	
Way of Plantation	**Manual**	**Machine**	**Manual**	**Machine**	**Manual**	**Machine**
No of labor	12	2	12	2	12	2
Cost of Labor	Rs.2400	Rs.400	Rs.2400	Rs.400	Rs.2400	Rs.400
Time Taken	1 Day of 6 Hrs.	2 hrs.	3 Days	1 Day of 6 Hrs.	10 Days	4 Days
Total Cost	Rs.2400	Rs.400	Rs.7200	Rs.400	Rs.24000	Rs.1600
Cost of Machine		Rs.10000		Rs.10000		Rs.10000

Figure 1: Proposed Design for Rice Planting Machine

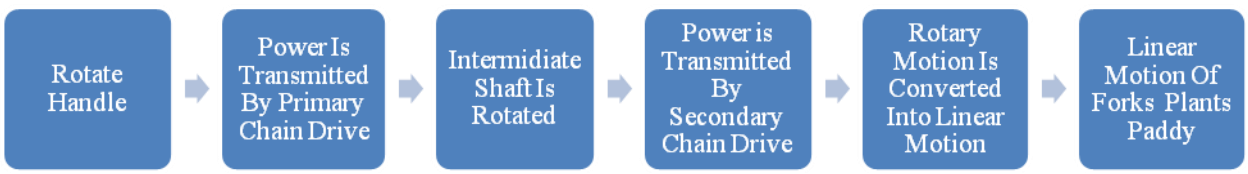

Figure 2: Block Diagram Of Working of Proposed Rice Planting Machine

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Vol. 7, Issue 1, January 2020

Table 2: Bill of Materials of Proposed Rice Planting Machine

Sr. No.	Component		Material	Specification	Quantity
1.	Frame	Square	M. S.	25*25*1.3 mm & Length 8000 mm	11 kg
		Angle	M. S.	25*25*1.3 mm & Length 1700	3 kg
2.	Handle		M. S.	Length 350mm & Diameter 20 mm	0.25
3.	Shaft		M. S.	Length 1500mm & Diameter 20 mm	4 kg
4.	Sprocket	Small	Alloy Steel	18 Teeth	2 Nos
		Large	Alloy Steel	44 Teeth	2 Nos
5.	Chain	Small	Alloy Steel	Length 2500 mm	1 Nos
		Large	Alloy Steel	Length 570 mm	1 Nos
6.	Fork		M. S.	2 mm	2 Nos
7.	Tray		G. I. Sheet	0.5 mm	1 Nos
8.	Tub		G. I. Sheet	Required Specification Thickness 0.5 mm	1 Nos
9.	Wheels		S. S.	Diameter 550 mm	2 Nos
10.	Bearing		Chrome Steel	UCB204	5 Nos
11.	Plate		M. S.	2 mm	4 Nos

VI. CONCLUSION

The mechanism has been designed. The trial machine proves to be more beneficial as regards to increase the rate of productivity, is easier working operation, less fatigue to the labor, accuracy of high degree can be obtained from this also because of its portability property. The following objectives are expected to satisfied

- Ensure uniform spacing and planting depth of transplanted rice.
- Saves time and cost during period of peak-labor demand.
- Create new forms of employment through creation of seedling nursery entrepreneurs and transplanting service providers.
- Decreases the operational cost by using improved and new mechanisms.
- Overcomes labor shortage problem.
- Single mechanism can be used to plant two rows simultaneously.

REFERENCES

[1]. "Development of System Rice Intensification (SRI) Paddy Transplanter" Ibrahim B and Ismail WIW. 2014. Asian Journal of Agricultural Sciences 6 (2): 48-53.
[2]. "Studies on the performance of selfpropelled rice transplanter and its effect on crop yield" M.V. Manjunatha, BG Masthana Reddy, SD Shashidhar and VR Joshi. 2009.. Karnataka Journal of Agricutural Sciences 22(2): 385-387.
[3]. "Status, challenges and strategies of farm mechanization in India" Mehta CR, NS Chandel, T Senthilkumar, 2014. Agricultural Mechanization in Asia, Africa and Latin America 45(4): 43-50.
[4]. "Field performance evaluation of a manual rice transplanter" Singh G, Sharma TR and Bockhop CW. 1985. Journal of Agricultural Engineering Research 32: 259-268.
[5]. "Self-propelled rice transplanter for economizing labour" Tripathi SK, Jena HK and Panda PK. 2004. Indian Farming 54: 23 - 25.
[6]. "Mechanized Transplanting of Rice" Baldev Raj Kamboj, Dharam Bir Yadav, Ashok Yadav, Narender Kumar Goel, Gurjeet Gill, Ram K. Malik, Bhagirath Singh Chauhan, (Oryza Sativa L.) In Nonpuddled and No-till Conditions in The Rice-wheat Cropping System in Haryana, India, American Journal of Plant Sciences, 2013, 4, 2409-2413
[7]. "Ergonomic Evaluation of Manually Operated Six-row Paddy Transplanter" Rajvir Yadav, Mital Patel, S.P. Shukla, S. Pund, International Agricultural Engineering Journal 2007, 16(3-4):147-157
[8]. "Design & Development of Rice Planter Machine" Dhanesh D. Patil & Dr. Mangesh R. Phate, Imperial Journal of Interdisciplinary Research (IJIR) Vol-2, Issue-8, 2016, 1241-1246.
[9]. Design Data Book by B.D Shivalkar
[10]. Theory of Machines by R.S. Khurmi and J.K. Gupta. Reprint 2011, Eurasia Publications House Private Limited, New Delhi.
[11]. Design of Machine Elements by V.B. Bhandari. Volume 3, Tata McGraw Hill Education Private Limited New Delhi.
[12]. Design of Machine Elements by M.F. Spottsand T.E. Shoup. Seventh Edition, Pearson Education (Singapore) Private Limited, New Delhi
[13]. A Text Book of Machine Design by R.S. KHURMI and J.K. Gupta. Reprint 2012, Eurasia Publications House Private Limited, New Delhi.