The Pharma Innovation Journal 2023; 12(5): 1380-1385

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(5): 1380-1385

www.thepharmajournal.com
Received: 02-02-2023
Accepted: 06-03-2023

VK Pandey
Scientist, Department of Agricultural Engineering, KVK Chatra, Birsa Agricultural University, Ranchi, Jharkhand, India

RK Singh
Senior Scientist and Head, KVK Chatra, Birsa Agricultural University, Ranchi, Jharkhand, India

VP Rai
Scientist, Department of Animal Science, KVK Chatra, Birsa Agricultural University, Ranchi, Jharkhand, India

D Oraon
Scientist, Department of Plant Protection, KVK Chatra, Birsa Agricultural University, Ranchi, Jharkhand, India

Zunaid Alam
Young Professional, NICRA, KVK Chatra Birsa Agricultural University, Ranchi, Jharkhand, India

Corresponding Author:
VK Pandey
Scientist, Department of Agricultural Engineering, KVK Chatra, Birsa Agricultural University, Ranchi, Jharkhand, India

Enhancing the productivity and profitability of rice through mechanization in NICRA Village of Chatra district Jharkhand

VK Pandey, RK Singh, VP Rai, D Oraon and Zunaid Alam

Abstract
Rice is the main crop of Jharkhand as well as the Chatra district. It is labour intensive crop and requires about 700 to 800 labour hours for cultivation of one hectare of rice crop of different field operations i.e. seedling through seed drills, transplanting weeding through mechanical weeder and harvesting together consume labour force and if these managed timely and efficiently by the farmers could enhance production and productivity. An experiment was conducted at Krishi Vigyan Kendra, Chatra (Birsa Agricultural University, Kanke, Ranchi) at NICRA village, Mardanpur to assess the performance of machines used in cultivation of rice crop. Different M/C were evaluated for particular operation. For mechanical transplanting a paddy transplanter (eight row) and paddy, drum seeder (eight row) were used. For weeding manually operated cono weeder and self-propelled weeder and for paddy harvesting self-propelled reaper were also evaluated. An eight row self-propelled paddy transplantor was found very effective for timely transplanting in large area. Its average capacity was 0.20ha/hr. The use of paddy drum seeder (eight row) was most effective for line sowing of sprouted paddy in puddled field condition. it reduce 52 percent cost of cultivation compared to farmers practice. On the other hand weeding efficiency was found maximum 79.3 percent with cono weeder. It way observed that average cost of paddy transplanter (eight row) was found 72.2 percent. Cono weeder was 52.2 percentages and self-propelled vertical conveyar reaper was 63.75 percent less as compare to manual transplating weeding and harvesting operation respectively.

Keywords: Mechanical, transplanter, paddy drum seeder, self-propelled reaper

Introduction
Rice is cultivated 44 million ha in India and is the largest areas in the world. During the past 55 years there has been removable increase in production of rice. The area under rice increased 1.5 times while the production increased by over four times to the tune of 99 million tones. The productivity has increased from 0.7 t/ha to 2.4t/ha. To mitigate the growing population rate rice production should rise to 120 million tones by 2020. This could be achieved only through suitable farm mechanization and increase of productivity as the area in plateau used

The production and productivity of rice has been influence by farm mechanization as follows

1. 5-10% improvement in yield by proper and timely seed bed preparation.
2. 5-30% improvement in yield by efficient control of weeds.
3. Reduces losses by 4-5% through efficient harvesting and threshing
4. 8-10% losses reduction by proper post-harvest process and storage.
5. Up to 2.5 increase in head rice recovery by efficient milling.

Often the farmers face the problem of shortage of labours during peak period i.e. soiwng transplanting, weeding and harvesting season. Due to this timely complete operation is very difficult. It has been reported that delay in transplanting by one and two months has a yield reduction of about 25-70%. Due to late transplanting the turn-around time available for the next crop is very small which again affect the yield of the subsequent crop. The following table gives the operation wise labour requirement in rice cultivation (Chaudhary and Varshney, 2003) [1].

Table 1: Show the percentage of labour requirement

S. No.	Operations	Percentage of total labour requirement
01	Puddling	11
02	Transplanting	38
03	Weeding	19
04	Harvesting	20
05	Threshing	12

Transplanting, Weeding and harvesting operation consume most of the labour requirement in rice cultivation and hence thrust should be given for the mechanizing these operation in order to reduce the labour requirement in rice cultivation. High labour demand during peak periods adversely affect timelines of operation there by reducing the crop yield. The steady driff of agricultural labour to industrial sector is addiging more to the woes of the rice farmers. Because of drudgery and notion that the farm operations are below the dignities labour availability in general has decreased considerable to farm operations. To affect these problems stress on mechanization is the need of the hour.

Keeping this facts an experiments were conducted at NICRA village Mardanpur, Block-Chatra district Chatra Jharkhand to evoluate the performance of Farm machinery for enhancing production and productivity of rice.

Methodology

The on farm trial (OFT) were conducted a NICRA village, Block chatra district chatra Jharkhand under supervision of Krishi Vigyan Kendra, Chatra. The on Farm Trial consisted of evaluation of field performance of Mecha, rical puddler self-propelled transplanter mechanical weeder, paddy drum seeder, Self-propelled conveyer reaper and power thresher in comparison with manually operated puddler, transplanting weeding, harvesting and threshing. For this on Farm trial a four row self-propelled transplanter used for transplanting sampling (Two weeks old) drum seeder for soacked in puddled field self-propelled conveyer reaper for harvesting operation.

The detailed technical specifications used and its working field operation specification were shown in table-2 and fig. 1.

Fig 1: Self-Propelled Four Row Rice Transplanter

The self-propelled rice transplanter require a tray size 18” x 10” x 1”. The soil was sieved and mix with equal propotion of FYM. The sprouted seeds were spread unifamly on tray. They were covered with paddy straw and water spray friquently for 5 days. After five days the paddy straw were removed and seedling were grown normally by requalr watering. After 14 days the seedling were ready for transplanting and the seedling were removed from tray and put on rice transplanter. In case of manual transplanting method reice nursery was raised following the recommended practices.

The transplanting was done using self-propelled four row rice transplanter by running length wise of the field on the puddled and levelled. The field was prepared one days before transplanting and the water level in the field kept less than 1.0 cm. All the parameter of rice transplanter were recorded i.e. depth of placement of seedling number of seedling per hill, number of mised hill spead of transplanter time taken per heactare in transplating fuel consumption etc. were recorded. Other method of line sowing in puddled field is with paddy drum seeder. This manually operated eight row plastic paddy drum seeder suitable for pregermited paddy seed. It consist of eight drum both side hole, metalic axlle, hollo type iron handle, platic wheel, (Fig-2). The machine was pulled backward an puddled field. It was 8 row with spacing of 20 cm between two cans equtine rows. The details specification of plastic drum seeder is given in table 3 Figure 2.

Fig 2: 8 row paddy drum seeder

The mechanical weeding was carried out with the help of cono paddy weeder, 15, 30, 45 days after transplanting. All field observation i.e. speed, field capacity, weeding efficiency were recorded and analyzed. This shows in table 4 & fig. 3

Fig 3: Conoweeder

The harvesting of rice crops was carried out with the help of self-propelled vertical conveyer reaper (Manjunatha *et al*., 2009 I and Singh *et al*. 1988) [2]. The detail technical parameter of machine operating in field shown in table-5 and Fig-4.

Fig 4: The detail technical parameter of machine operating in field

The threshing rice crop was carried by tractor operated axial flow thresher, It threshing capacity were recorded 15q/ha fuel consumption was 5 lit/hr and 6 labour was required.

The puddling operation performed to reduce deep percolation of water to suppress weeds by decomposing therm and facilitate transplanting of paddy seedling by making the soil safler (Fig-4). The tractor operated rotavetor were used for puddling its capacity were recorded.

The puddling operation performed to reduce deep percolation of water to suppress weeds by decomposing therms and facilitate transplanting of paddy seedling by making the soil sofler (Fig. 4). The tractor operated rotavator were used for puddling its capacity were recorded 0.3ha/hr fuel consumpher 4.5 lit/hr.

Results and Discussion

The paddy transplanting was carried out using self-propelled four row paddy transplanted. Based on field operations conducting during Kharif 2018 and 2019. The result shows that the number of seedling transplanted per hill was 3.-4 per hill and the deth of seedling transplanted about 4-5 cm. In case of mechanical transplanting (Chaudhary *et al*. 2003) [1]. The average field capacity of self-propelled four row paddy transplanter was 0.127 ha/hr with field efficiency 82.5 and average operating speed of transplanter was 1.65 km/hr. The fuel consumption was 850 ml/hr (Table-2) the labour requirement was found to be 05 mandays/he compare to 33 mandays lf labour per hectare in manual transplanting of paddy. Thus saved 28 mandays of labour/ha (Tripathi *et al*., 2004) [6].

The effective field capacity of paddy drum seeder was 0.75 ha/days and one mandays required per hectare. The number of row were 8 and spacing between two rows was 200mm and capacity of per drum was 2.0kg. How the field capacity of hand broad casting was 0.23 ha/hr. In traditional hand broadcasting the seeds were scattered random making no plant to plant and row to row distance so that operation of conoweeder is not possible for weed control.

The result show that the sowing of rice with drum seeder help in case of weeding through conoweeder hence reduce cost of cultivation and grow yield was also found more than broadcasting of rice. The seeds rate was also less than broadcasting and same 40 kg/ha seeds. (Table-3)

Weeding efficiency is the percent removed of weeds per hectare. The average weeding efficiency was found 82.75 in cono weeder and average field capacity of cono weeder was found 0.135 ha/hr weeding is most labour consuming part of agriculture. So that it could be minimize using mechanical tools, the cost of weding with conoweeder almost found 40% as compare to manual weeding (Table-4) (Singh *et al*. 2012) [5]. In Kharif season paddy crop was harvested using vertical conveyer self-propelled reaper with working width 1.25 meter average speed 3.0 km/hr. The average fuel consumption was required for paddy harvesting was 1.10 lit/hr (Makoto, 1977) [3] (Table-5) From graph (Fig-5). It was observed that the average cost of self-propelled paddy transplanter with four row 85% mechanical conoweeder was 58% and harvesting with self-propelled conveyer or reaper was 72% less as compared to manual transplanting, weeding and harvesting operation respectively (Singh and Hensel 2012) [5].

The operation wise cost of rice cultivation for particular manual operation has been reported in (Table-6) and (Fig.-5).

The grain yield has been reported in table (7) and graph (Fig.6) the data revealed that maximum grain yield 38.5 q/ha used with self-propelled 4 row paddy transplanter 37.6 q/ha with manually transplantation 30.6 q/ha with paddy drum seeder and 25.3 q/ha with manually broadcasting respectively.

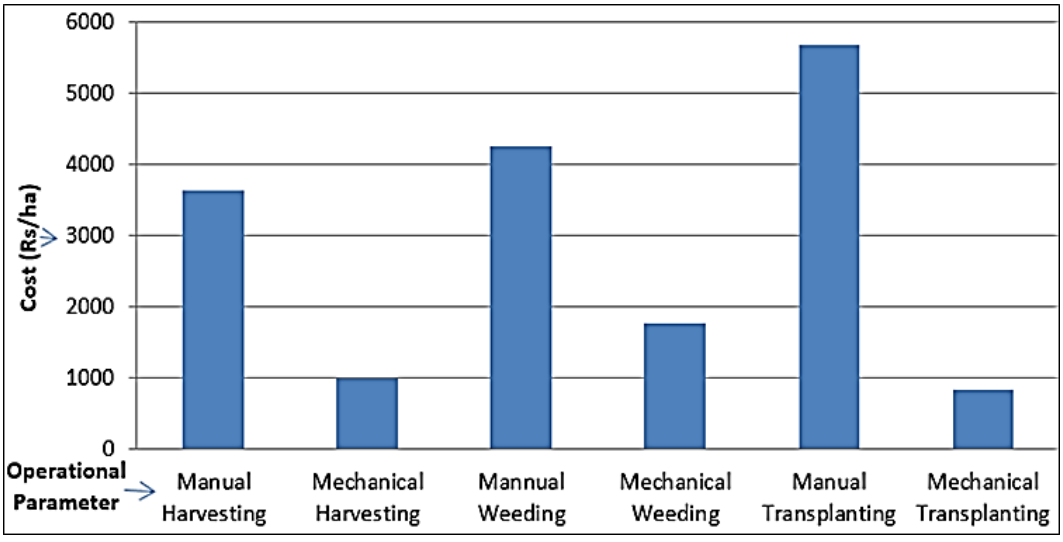

Fig 5: Comparative cost economic of manual and mechanical operation of rice cultivation

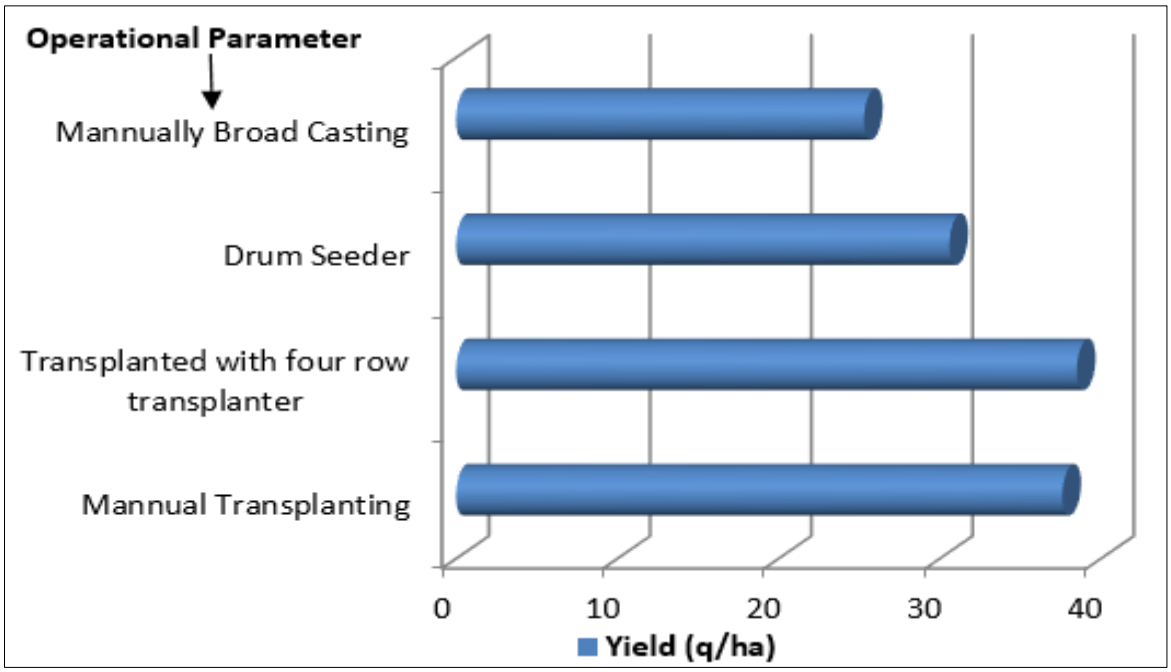

Fig 6: Rice Yield (q/ha) recorded in different methods

Table 2: Field performance of four row self-propelled paddy transplanter

S. No.	Parameter	2018	2019
01	Speed of paddy transplanter (km/hr)	1.62	1.69
02	Actual hill spacing (Cm)	20	20
03	Fuel consumption (lit/hr)	.80	.90
04	Field capacity (ha/hr)	0.128	0.126
05	Field efficiency (%)	82	83
06	Cost of self-propelled paddy	840	865
07	Transplanter/ha labour requirement mandays/ha	05	05

Table 3: Techanical specification of manually operated paddy drum seeder

S. No.	Parameter	Dimension
01	Power source	One-man hand operated
02	Number of drum	4
03	Number of row	8
04	Diameter of drum (mm)	460
05	Capacity of drum (kg)	2
06	Operating speed (km/hr)	1.5
07	Diameter of drive wheel	600mm
08	Row spacing (mm)	200
09	Field capacity (ha/day)	0.75

Table 4: Field performance of conoweeder

S. No.	Parameter	2018	2019
01	Effective width (cm)	20	20
02	Weeding efficiency (%)	82	83.5
03	Field capacity (ha/hr)	0.013	0.014
04	Labour required (ha/day)	7	7
05	Cost of operator (Rs./ha)	1750	1785

Table 5: Performance of self-propelled conveyer reaper

S. No.	Parameter	2018	2019
01	Crop	Rice	Rice
02	Fuel consumption lit/hr	1.0	1.2
03	Average speed of harvesting (km/hr)	3.0	3.0
04	Actual field capacity (ha/hr)	0.195	0.192
05	Field efficiency (%)	70%	69%
06	Total cost (Rs./ha)	950	1050

Table 6: Operation wise cost of rice cultivation for particular manual operation

S. No.	Parameter	2018	2019
01	Mandays required per ha transplanting (hr)	200	206
02	Cost of transplanting (per/ha)	5000	6375
03	Mandays required per ha in weeding (hr)	167	167
04	Cost of weeding/ha	4200	4305
05	Cost of harvesting/ha	3600	3690

Table 7: Field observation of rice crop (Variety-Abhishek)

Method of sowing	No of effected tiller/m^2	Plant height (cm)	Av. hill spacing (cm)	Panicle length (cm)	Grain yield (q/ha)	Gross Income (Rs./ha)	Net Income (Rs./ha)	BC ratio
Manually transplanted	318	56	12	19	37.6	73680	27580	1.73
Transplanted with 4 row rice transplanted	326	58	18	21	38.5	76000	41000	2.17
Drum seeder	296	52	5	17	30.6	63880	30980	1.94
Manually Bored casting	282	49	2.5	15	25.3	50140	24640	1.62

Conclusion

Carrying out timely operation and reducing cost of cultivation is the prerequisite for enhancing the production and productivity of rice. The self-propelled paddy transplanter, conoweeder, self-propelled conveyer reaper are the best suitable agricultural equipments for farming. These machinaries help increase production and brink down the cost of cultivation 30-45 percent.

References

1. Chaudhary V, Varshney BP. Influence of seedling mat characteristics and machine parameters on performance of self-propelled rice transplanter. Agric. Mechanization Asia, Africa & Latin America. 2003;34:13-38.
2. Manjunatha MV, Masthana BG, Reddy SD, Shashidhar Joshi VR. Field performance evaluation of vertical conveyor reaper: Karnataka J Agric. Sci. 2009;22(1):140-142.
3. Makoto, Hoki. Farming operations and Labour requirements for paddy cultivation in Sarawak, East Malaysia, South East Asian Studies. 1977;15(3):457-471.
4. Šingh S, Hensel O. On farm research (OFR on transplanting paddy: A Best-Bet prototype for drudgery reduction. Internat. J Agric.: Res. & Rev., 2012, 2(4).
5. Singh V, Mahendra Kumar R, Viraktanath BC. Selective mechanization in rice cultivation for energy saving and enhancing the profitability. Rice Knowledge Management Portal (RKMP), Research Theme. Directorate of Rice Research. Rajendranagar; c2012. http://www.rkmp.co.in 1-14.
6. Tripathi SK, Jena HK, Panda PK. Self- propelled rice transplanter for economizing labour. Indian Farming. 2004;54:23-25.