

The Effect of Transplanting Methods on Field Capacity and Two Rice Cultivars Yield

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ABSTRACT

A field experiment was carried out in the mashkhab rice research station of the Agricultural Foundation of Researches at the Ministry of Agriculture, during the growing season of summer 2015. Two rice cultivars included amber 33 and Jasmine, which represented main plots, and three levels of transplanting methods included mechanical transplanting by riding transplanter, mechanical transplanting by walking transplanter and manual transplanting, which represent sub plots were used in the experiment. Fuel consumption, actual field capacity, ratio of hill missing, Percentage of hill damage and grains yield were measured in this study. Split plot design under randomized complete block design with four replications was used in this study. Least significant differences (LSD) at 5% level was used to compare the mean of treatments. The results were showed: The superiority of walking transplanter consumes less amount of fuel amounted 8.56 liters / hect. compared with riding transplanter which consume 11.20 liters / hect.. The riding transplanter Achieved field capacity amounted 0.2380 hect / h which significant superior than manual transplanting and walking transplanter, which achieved a capacity stood 0.0038 and 0.1370 hectares / h respectively. Hand transplanting recorded less ratio of hill missing stood 5.93% comparing with riding transplanter which recorded ratio of hill missing and walking transplanter which recorded a rate of 8.14%. 5.42% percentage of hill damage for riding transplanter comparing with 7.77% for manual transplanting. There was not significant differences appear in the grains product for used transplanting. It appears from the research results that the mechanical transplanting achieves more field capacity compared with manual transplanting. Demonstrating the success of using rice mechanic transplanting in Iraq.

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Introduction

The rice is second most important crop after wheat, and it is a staple food for half the world's population, Ziadi, (2010). Younis, (1993) indicate that in 2020 the world will need to double from current production to meet the needs of the population. Rice can be grown in all parts of Iraq.

Rice is grown in many methods such as dry, wet and transplanting. Transplanting method considered the best one because it is characterized by shortening the period of growth, saving 30% of seeds, saving water use, reducing the ratio of the bushes, and give a good and clean yield. The transplanting gives high production about 10-20%, needless amount of water and the maturity is in compared with the way agriculture seeds Garg, (1997). The method of manual transplanting is prevailing, but industrial development, expensive of living and high wages, Lead to leave agriculture In this method because it is tiring, slow and high costs. The manual transplanting has become limited because the inability to achieve agricultural engineering requirements of plant density both in were the distance between rows or between hill, and the distances irregular, not straight and depend on the observation labor Chandra, et, al, (2013). That led to the search for a convenient,

easy, quick and low cost method to make transplanting process. Mechanical transplanting is the appropriate method to do so. The mechanical transplanting which needs fewer workers, achieve the best plant density, and increases production by (3-11) % Kamboj, et, al, (2013).

Given the importance of the study of the effect of mechanical cultivation of rice came this study.

Materials and Methods

The experiment was conducted to evaluate the effect of transplanting methods on field capacity and two rice cultivars yield in Almishkhab rice field experiment Najaf region south of Baghdad, during the summer growing season of 2015. The experiment conducted in accordance with the split plot design under randomized complete block design (RCBD) with four replications was used in this study, Alrawe (1980). Two factors were studied in this experiment, first one is two types of rice cultivars included amber 33 and jasmine, the second factor is three types of planting methods included 6-row riding type, 4-row walking type and manual transplanting. The land was planted with wheat, after the harvest was plowing by tractor Valtra and mold board plow, and settled using the

machine compromise, The experiment field divided by the experimental design used in the experiment.

Prepare seedlings

The preparation of seedlings according to the method used by Khatun, (2011): where soak the seeds in water for 48 hours and then grown in dishes plastics extrusion dimensions 58 * 28 * 3 cm and needs 340-320 dish per hectare. We used soft soil in the dish, and settled well up 2 cm, sprinkle with water till saturation of soil then disperse the seeds in the dish uniformly and covered with a layer of dirt to ensure adequate moisture seed for all, Put the dishes in place away from the influence of air currents and direct sunlight, then covered with empty dish upside down. Put the dishes on top of each other with bags of wet cover to preserve the moisture. Dishes remain for five days until the arrival of the seedlings to the length of 2.5 cm and then transported to the nearby arboretum of the field .It was settlement arboretum nursery presence of water before transferring the dishes. Thr dishes arranged in two line side by side and press down well to avoid a space between the dish and the soil, then covered with a thin cloth to avoid damage to seedlings from birds and the sun's rays, for three days. Watered the seedlings each day until it reaches height of 20-15 cm where they are ready for the transplanting in the field, where they are watering the field and settled manually by labor, then dried field for 48 hours for the purpose of the cohesion of the soil, at day of agriculture flooded field with water up 3-2 cm , the seedlings are placed in a drum then the process of agriculture was done. We used in the experiment riding type transplanter RGO-6, Chinese origin with a capacity of 18 horsepower, 6 rows, with 30 cm distance between them, and technical specifications are shown in table (1) and the figure (1)

Table 1. Technical specifications of the riding type transplanter.

specifications	riding type transplanter
Model origin	RGO6 China
Dimensions (length, width, height) m	1.62 * 2.2 * 3.075
Weight (kg)	625
Horsepower (hp / (Cycle / min)	18/3600
Fuel Type	Gas
The number of rows	6
The distance between rows (cm)	30
The distance between the hill (cm)	12,14,16,18,22
Depth (cm)	1.4-4.4
Plant density (hill / m 2)	27.2,24.2,21.2,18,1
transplanter speed (cm/s)	0.6
Movement speed (cm/s)	1.6



Figure 1. riding type.

Also used of walking type tranplanter WI30G, Korean origin with the capacity of 5 horse power 4 rows and the technical specifications are shown in Table (2) and Figure (2)

Table 2. Technical specifications of the walking type transplanter,

specifications	walking type transplanter
Model origin	WJ30G
Dimensions (length, width, height) m	2.1 * 1.63 * 0.91
Weight (kg)	162
Horsepower (hp/ (Cycle / min)	5/3600
Fuel Type	Gas
The number of rows	4
The distance between rows (cm)	30
The distance between the hill (cm)	12,14,16,18,22
Plant density (hill / m 2)	15,18,21.2,24.2,27.2
Depth (cm)	
transplanting speed (m/s)	0.33-0.77
Movement speed (km / h)	0.5-1.5



Figure 2. walking type

Studied Indicators:

1. Fuel consumption (liters / hectare):

Measure the amount of fuel consumed by using the following equation proposed by AL-Graah,1998:

$$V_{co} = V \times 10000 / ST \times BP \times 1000 \dots \dots \dots (1)$$

Where as:

VCO = the amount of fuel consumed per hectare (L / hectares)

V = the amount of fuel consumed in the transaction (ml)

ST = length of treatment (m)

BP = actual width of the transplanter (m)

2. Field capacity actual of transplanter (ha/ h)

Was calculated field capacity to the actual machine transplanter using the following equation proposed by Islam, et. al., 1997:

$$EFC = (A / T) \dots \dots \dots (2)$$

Whereas:

EFC = field capacity actual transplanter (ha / h)

A = treatment area (ha)

T = time transplanting treatment (h)

3. The ratio of hill missing % :

The ratio of hill missing is calculated using the following equation proposed by Garge, et, al, 1997:

$$Hpm = (Hm / Ht) \times 100 \dots \dots \dots (3)$$

Where as:

Hpm = ratio of hill missing %

Hm = number ofmissing hill

Ht = total number of hill

4. The percentage of damage hill % :

Percentage hill damage by using the following equation proposed by Garge, et, al, 1997:

$$Hpd = (Hd / Ht) \times 100 \quad \dots\dots\dots (4)$$

Where as:

Hpd = ratio of hill damage %

Hd = Number of hill damage

Ht = total number of hill

5. Grains yield (ton/hectare)

It was harvested square meters of each transaction and then studied plants manually, and was grain weight the balance electric sensor (g / m²) and at 14% moisture, and then converted to ton / hectares, Al-Mashhadani (2010) .

Results and Discussion:

1. Fuel consumption (liters / hectare):

Figure (3) showed that the transplanting by walking type consumed 8.56 liters/ hectare of fuel in compared with mechanical transplanting by riding type that consumed 11.20 liters/ hectare. This was due to the small engine for walking type (consists of a single cylinder with 5 horse power, while the engine for riding type consists of 2 cylinders with 18 horsepower, these results are consistent with the results which obtained by Chandra,2013. and BRRI, 2013.

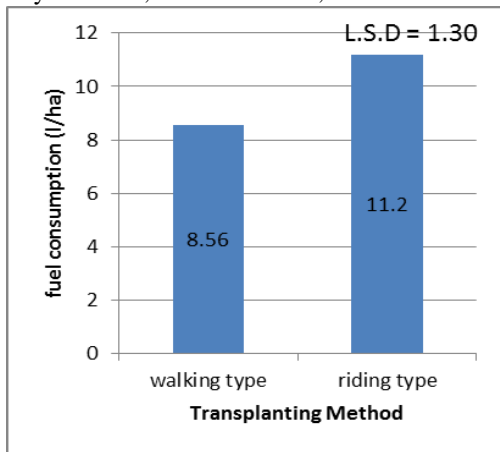


Figure 3. The impact of the transplanting method on fuel consumption (l / ha).

2- Field capacity (ha / h):

Figure (4) showed that the effect of the transplanting methods on the field capacity (ha / h). The mechanical transplanting by riding type got more field capacity reached 0.2380 hectares / h, compared with 0.0038 hectares / h for manual transplanting, and that may be because the riding type was planting six hill in one time at speeds of up to 0.6 m \ s, while the labor to do planting one hill at speeds of up to 0.1 m \ sec, and this consistent with the result which obtained by Abdul Awal, 2013 and Pradhan, (2014).

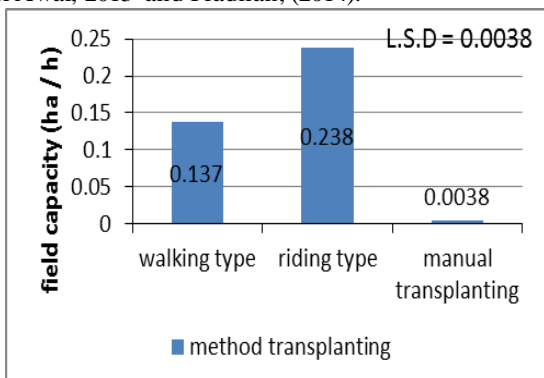


Figure 4. The effect of the transplanting method on the actual field capacity (ha / h).

3.The ratio of hill missing % :

Figure (5) showed the impact of the transplanting method on the ratio of hill missing%. This study was found that the ratio of hill missing for manual transplanting was 0% compared with walking transplanter stood 8.14% , and this result consistent with the results which obtained by Gole, (2009) and Dixit, (2011) .

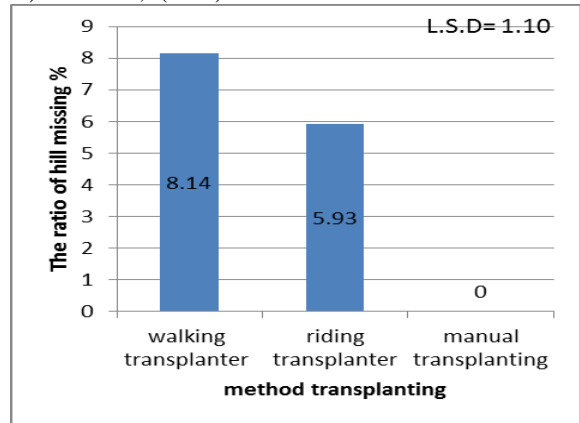


Figure 5. the impact of the transplanting method on the ratio of hill missing% .

4. The percentage of hill damage % :

Figure (6) shows that the impact of the method transplanting in the percentage of hill damage %, this study illustrated that the riding transplanter is less ratio of hill damage than walking transplanter and manual transplanting (5.42% , 6.41% , 7.77%) respectively, due to damage of plantings roots when translated from dishes to hill , and this result is consistent with the findings of Munnaf, (2014) .

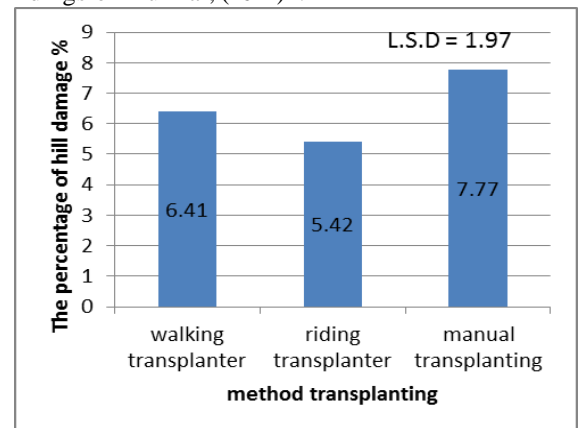


Figure 6. the impact of the transplanting method on the percentage of hill damage% .

5. Grains product (ton/ hectares):

The table (3) showed the impact of the cultivars and transplanting methods on the grain yield (ton/hectares).This study found that the grain yield for yasmin cultivar was 7.515 tons / hectare compared with amber 33 cultivar stood 5.463 tons \ hectare , and that was due to the genetic traits for each variety, and this result is consistent with the findings of AL Ziadi et al (2014).

This study also showed that the transplanting methods have no significant effects on grain yield.

The interaction between cultivars and the transplanting methods got a significant effect on grain yield. Yasmin cultivar and riding transplanter got grains yield stood 7.732 ton/ hectare compared with the amber 33 and walking transplanter which got 5.311 tons / hectare.

Table 3. The impact of cultivars and transplanting method on the grains yield, ton/hectares.

Varieties	Method of Transplanting			Average of Cultivar
	Riding Transplanter	Walking Transplanter	Manual Transplanting	
Amber 33	5.311	5.475	5.603	5.463
Yasmin	7.160	7.732	7.653	7.515
L.S.D=0.05	0.105			1.14
Average Method of Transplanting	6.240	6.600	6.63	
L.S.D=0.05	N.S			

Conclusion

The results showed the superiority of mechanical transplanting gaining more actual field capacity rate of (0.1370, 0.2380) hectares / hour, recording the lowest percentage of damage hill was (5.83 and 5.42)% for riding transplanter and walking transplanter respectively, compared with manual transplanting which got the lowest rate of capacity field reached 0.0038 hectares / h, and this indicate that the success of the mechanical transplanting.

Recommendation :

Using the riding transplanter in the process of transplanting is recommend, and conduct further studies on other types of replanters in order to select the riding transplanter that achieve the highest field capacity with minimum damage and increase production, as well as the adoption of this method and dissemination.

References:

12 - Khatun. A, (2011). Developments of entrepreneurship for custom hire service of rice transplanter in bangladesh, Department of Farm Power and Machinery Bangladesh Agricultural University.

1- AL-Garrah, Muthana Abdul Malik Nuri al (1998) tug loaded with two types of plows and measurement of specific fuel consumption indicators under rain-fed agriculture conditions, Master Thesis, Department of Agricultural Mechanization, Faculty of Agriculture and Forestry, Mosul University.

10 - Goel Aswini. K, S. Swain, Debaraj Behera, (2009), Effect of Seedlings Age on Performance of Rice Transplanter , Agricultural Mechanization in Asia, Africa and Latin America VOL.40 NO.3 : 41-45.

11 - Kamboj, B.R, Ashok Yada., Bhagirath Singh Chauhan, Ram K. Malik, Gurjeet Gill., Ashok Yadav, Narender Kumar Goel, Baldev Raj Kamboj, -Dharam Bir Yadav, (2013) Mechanized Transplanting of Rice (*Oryza sativa* L.) in Nonpuddled and No-Till Conditions in the Rice-Wheat Cropping System in Haryana, India. *American Journal of Plant Sciences*, 4, 2409-2413..

13- Munnaf.M.A, M. M. Hossain and F. Y. Ruma (2014) Techno-economic performance of imported kukje self-propelled rice transplanter J. Bangladesh Agril. Univ. 12 (1): 161-166, 2014 ISSN 1810-3030.

14 - Murumkar. R.P, U.R. Dongarwar, D.S. Phad, B.Y. Borkar and P.S. Pisalkar. (2014), PERFORMANCE TESTING OF FOUR ROW SELF PROPELLED PADDY TRANSPLANTER. *International Journal of Science, Environment and Technology*, Vol. 3, No 6, 2014, 2015 – 2019.

15 - Pradhan. S, and S.K. Mohanty, (2014) .Ergo-Economical Analysis of Different Paddy Transplanting Operations in Eastern India. *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*. Volume 6, Issue 6 (Jan. 2014), PP 23-27

2 - Arrawi, Khashea Mahmoud, Abdul Aziz Mohammed Khalaf Allah (1980). Design and analysis of agricultural experiments, National Library Directorate of Printing and Publishing , the University of Mosul, the Ministry of Higher Education and Scientific Research, Iraq.

3 - Ziadi, S. H., A.H.Rashid, S.F.Hassan, A.Y.Hadi, J.A.Alawy (2014) Rice crop response and bush associated with rates of pesticides bush. *Iraqi Journal of Agricultural Science* -45 (6): 641-650.

4 - Abdul Awal, Md, A.T.M. Ziauddin, (2013) Present Status Of Rice Transplanter Use For Paddy Cultivation In Bangladesh, Bangladesh Agricultural University.

5 - BRRI,(Bangladesh Rice Research Institute) (2012-13) Annual Report Summary. Gazipur 1701, Bangladesh.

6 - Chandra.S, Sanjay Kumar, Vishal Kumar (2013) Comparative Performance Evaluation of Self Propelled Paddy Transplanters in Calcareous Soil Agricultural Mechanization in Asia, Africa and Latin America. Vol. 44, No. 2, pp. 33-38.

7 - CSISA (Cereal Systems Initiative for South Asia), New Delhi, India (2015) Operational Manual for Mechanical Transplanting of Rice.

8 - Dixit J. Khan J.N. (2011) Comparative Field Evaluation of Self-Propelled Paddy Transplanter with Hand Transplanting in Valley Lands of Kashmir Region. *Agricultural Mechanization in Asia, Africa and Latin America* VOL. 42, No.2,

9 - Garg, I. K., Sharma, V.K., and Mahal, J .S., (1997), Development and Field Evaluation of Manually Operated Six Row Paddy Transplanter Agricultural Mechanization in Asia, Africa and Latin America. 28 (4): 21-28 .

10-Islam, M.N., S. A. Sattar (1997) of Power Tiller For Bangladesh Farmers, *Agricultural Mechanization in Asia, Africa and Latin America* VOL.28, NO.4 :18-20.