Journal of Experimental Agriculture International

Volume 46, Issue 5, Page 681-685, 2024; Article no.JEAI.115521
ISSN: 2457-0591
(Past name: American Journal of Experimental Agriculture, Past ISSN: 2231-0606)

Transplanted V/S Direct-Seeded Method of Rice: A Review

Poojitha K [a++*], Pravalika K M [b++], Theerthana T [a++] and Prashanth D V [c#]

[a] Department of Agronomy, University of Agricultural Sciences, Bangalore, India.
[b] Department of Agronomy, College of Agriculture, V C Farm, Mandya, University of Agricultural Sciences, Bangalore, India.
[c] Department of Soil Science and Agricultural Chemistry, Keladi Shivappa Nayaka University of Agricultural Sciences, Shivamogga, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JEAI/2024/v46i52422

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/115521

Review Article

Received: 02/02/2024
Accepted: 06/04/2024
Published: 10/04/2024

ABSTRACT

As rice traditionally grown as transplanted crop in puddled land leading to various problems because of labour shortage *i.e*., unavailability of labours during the peak period of work *i.e.,* during nursery preparation, maintenance and transplanting. Other than that, rising of nursery needs extra care and management. So there is a need for other methods of establishment of rice which produce higher or similar yields compare to transplanting. Direct seeding is one of the methods which includes wet and dry seeding. Long term research has to be done in order to know the sustainability of direct seeded rice over transplanting.

Keywords: Rice; semidry; drum seeded; transplanting; yield.

[++] Ph.D Scholar;
[#] Research Associate;
**Corresponding author: E-mail: poojitha054@gmail.com;*

1. INTRODUCTION

Rice (*Oryza sativa* L.) is one of the world`s predominant staple food crops in about 40 countries and for more than 65 per cent of the population in India. Hence, rice can be called as 'The stuff of life'. World rice production demand was projected to increase by 25% from 2001 to 2025 to keep pace with population growth.

Traditional method of transplanting of rice is becoming difficult due to acute shortage of labour, especially during the peak periods of operation apart from higher labour wages. But rice growers across the country seek out elevated levels of productivity to counterbalance increasing costs of production. Also in transplanting method of establishment, the major operations such as nursery preparation, seedling rising, pulling from nursery, transporting and distribution of seedlings to main field and transplanting operation consumes 30-40% of total cost of cultivation [1]. Besides being laborious, this method of establishment also causes drudgery to womenfolk [2]. To reduce the labour requirement and cost on production, a need has been felt to replace the manual transplanting with scientific, economically feasible and environmentally safe establishment method [3]. Hence an alternative to transplanting, direct seeding of rice can be practiced to overcome the above problems with an additional advantage of reduced crop duration and comparable grain yield [4].

1.1 Effect of Crop Establishment Methods on Growth of Rice

Akkas *et al*. [5] reported that significantly taller plant height was recorded under transplanted rice (106.1 cm) compared to direct-seeded rice (98.5 cm).

Thirumurugan and Malarvizhi [6] reported that puddled manual transplanting recorded significantly higher plant height (96 cm) over unpuddled machine planting (82.6 cm).

Bheru et al. [7] reported that, the higher plant height (71.09 cm) and dry matter (1371.92 g m^{-2}) was recorded in transplanted rice compared to direct seeded rice. The higher plant height (72.54 cm) and dry matter (945.90 g m^{-2}) at harvest was with drum-seeded rice over dry seeding [8].

Prakhar et al. [9] revealed that growth parameters *viz*., plant height, number of tillers m^{-2} and dry matter production at harvest were on par between transplanting, direct seeded wet and dry rice.

Among rice establishment methods, transplanting recorded significantly higher leaf area index at 90 DAS (4.44), plant height (100.64 cm), number of tiller (589.04 m^{-2}) and dry matter accumulation (999 g m^{-2}) at harvest than drum seeded and direct seeded rice [10].

Ravindra Nath and Jai Dev [11] observed significantly higher plant height (82.42 cm) and leaf area index (3.05) in transplanting over drum seeded and direct seeded method of establishment.

1.2 Effect of Crop Establishment Methods on Yield and Yield Parameters of Rice

Jamil and Hussain [12] observed that transplanting of rice produced significantly more number of productive tillers (14.51 $hill^{-1}$), more number of spikelets (124.53 $panicle^{-1}$) at harvest and paddy yield (2.77 q ha^{-1}) than direct sowing. The wet seeding by drum seeder was recorded higher grain yield (56.57 q ha^{-1}) and it was on a par with the transplanting method of establishment [2].

Ali et al. (2006) observed that among establishment methods, transplanting recorded higher number of filled spikelets (68 $panicle^{-1}$) and panicle length (25.8 cm) at harvest as compared to drum seeding and dry seeding, however, the grain yield was on par. The higher grain yield (5329 kg ha^{-1}) and straw (8247 kg ha^{-1}) yield recorded in transplanting method of rice establishment over drum seeded rice [13].

Jagtap et al. [14] reported that among crop establishment methods, transplanting recorded significantly higher growth attributes, grain (52.58 q ha^{-1}) and straw yield (61.98 q ha^{-1}) over dibbling of seeds.

Sandhya et al. [15] reported that among establishment methods, transplanting recorded significantly higher panicles (430 m^{-2}), total grains $panicle^{-1}$ (135) and filled grains $panicle^{-1}$ (125) over drum seeded rice, but was on par with semi dry rice. However, grain and straw yields were on par among establishment methods.

Bheru et al. [7] study revealed that significantly higher effective tillers (360.58 m^{-2}), length of panicle (21.07 cm), weight of panicle (2.15 g),

filled grains per panicle (97.08), test weight (22.24 g), grain (41.97 q ha^{-1}) and straw (47.42 q ha^{-1}) yield were in transplanting method of rice establishment as compared to drilling method of rice establishment.

Sanjay et al. [8] recorded significantly higher effective tillers (274.89 m^{-2}), grain (40.62 q ha^{-1}) and straw (53.31 q ha^{-1}) yield in drum seeded rice than dry seeded rice. The higher grain yield of 5.63 t ha^{-1} was in transplanting over direct seeded rice [16].

Prakhar *et al.* [12] observed that panicles m^{-2}, number of grains $panicle^{-1}$, panicle length, panicle weight, grain weight $panicle^{-1}$, harvest index and 1000-grain weight were on par between transplanting, direct seeded wet and dry rice establishment methods. However the straw yield (52.48 q ha^{-1}) and grain yield (39.11 q ha^{-1}) were significantly higher in transplanting over direct dry seeding, but was on par with direct wet seeding. The higher grain yield of 3833 kg ha^{-1} obtained in transplanting and lower with wet drum seeding after dry tillage [17].

Ravindra Nath and Jai Dev [11] observed significantly higher grain $panicle^{-1}$ (112.81), length of panicle (23.23 cm), grain (51.45 q ha^{-1}) and straw (64.24 q ha^{-1}) yield in transplanting over drum seeded and direct seeded method of rice establishment. However, test weight was found non-significant.

Bhardwaj et al. [18] observed significantly higher panicles (282.00 m^{-2}), panicle length (23.46 cm), grains $panicle^{-1}$ (124.10), filled grain $panicle^{-1}$ (106.27), grain (44.18 q ha^{-1}) and straw yield (68.43 q ha^{-1}) in conventional transplanting followed by drum seeding of sprouted seeds. Among rice establishment methods, normal transplanting performed good by registering higher yield attributes and grain yield of 42.36 q ha^{-1} [10].

1.3 Effect of Crop Establishment Methods on Nutrient Uptake and Nutrient use Efficiency of Rice

Chander and Pandey [19] noticed significantly higher N (112.8 kg ha^{-1}), P (17.0 kg ha^{-1}) and K (172.3 kg ha^{-1}) uptake under transplanting method of establishment than direct seeded rice.

Sandhya et al. [20] reported that significantly higher N (87.8 kg ha^{-1}), P_2O_5 (35.1 kg ha^{-1}) and K_2O (143.7 kg ha^{-1}) uptake at harvest by rice were in transplanting than drum seeded rice, but was on par with semidry rice. The higher total N (82.80 kg ha^{-1}), P (16.05 kg ha^{-1}), K (102.21 kg ha^{-1}) uptake were observed in transplanted method of rice establishment than direct seeded rice [10].

1.4 Economic Feasibility of Crop Establishment Methods in Rice

Budhar and Tamilselvan [2] revealed that rice registered the higher net income of Rs.19,039 and Rs 18,587 ha^{-1} with a B:C ratio of 2.33 and 2.29 in manual broadcasting and drum seeded rice, respectively.

Hugar et al. [13] recorded net returns of Rs. 35,903 and 30,387 ha^{-1} in transplanting and drum seeded methods of establishments, respectively. The higher B:C ratio of 1.87 recorded in drum seeded method of establishment.

Sandhya et al. [20] reported that, gross return of Rs.57,200, 56,389 and 53,882 ha^{-1} with a B:C ratio of 1.25, 1.65 and 1.45 in transplanting, semidry rice and drum seeder methods of establishment, respectively.

Bhardwaj et al. [18] observed that net returns of Rs 45,704 and Rs 49,294 with the B:C ratio of 2.34 and 1.80 in drum seeded and transplanting method of rice establishment, respectively. The higher net return and B:C ratio (Rs 20,574 and 0.58, respectively) in transplanting method and B:C ratio (0.77) in direct seeded wet and dry rice method of establishment [9].

Vinay et al. [17] observed that higher B:C ratio of 1.70 in dry seeded rice with drum seeder and lower with wet drum seeding after dry tillage [21-23].

2. CONCLUSIONS

Though transplanting is the popular method of establishment it is cumbersome. nursery raising, transporting of seedlings to the main field and transplanting. Direct wet seeding and Direct dry seeding better options of crop raising as it saves considerable amount of time, labour and water requirement and there is a possibility of increasing the cropping intensity in case of direct wet sowing. Transplanting can be replaced by direct seeding under puddle condition.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. RANI TS, JAYAKIRAN K. Evaluation of different planting techniques for economic feasibility in rice. Electronic J. Environ. Agric. Food Chem. 2003;9(1): 150-153.
2. BUDHAR MN, TAMILSELVAN N. Effect of stand-establishment techniques on yield and economics of lowland irrigated rice (*Oryza sativa*). Indian J. Agron. 2002; 47(1): 57-60.
3. SANJAY MT, SETTY TKP, NANJAPPA HV. Productivity, Energetics and economics of different systems of crop establishment in rice. Crop Res. 2006; 31(3): 350-353.
4. SHARMA SK, PANDEY DK, GANGWAR KS, TOMAR OK. Effect of crop establishment methods on performance of rice (*Oryza sativa*) cultivars and their effect of succeeding wheat (*Triticum aestivum*). Indian J. Agron. 2005;50(4):253-255.
5. AKKAS AM, LADHA JK, RICKMAN J, LALES JS. Comparison of different methods of rice establishment and nitrogen management strategies for lowland rice. *J.* Crop Improv. 2006;16(1):173-189.
6. THIRUMURUGAN S, MALARVIZHI P. Establishment methods, crop residues and nitrogen effect on yield and economics of rice (*Oryza sativa* L) in Cauvery old delta. Trends in Biosciences. 2015;8(10): 2537-2542.
7. BHERU LK, VIRESH GOVIND CHAVAN VA, RAJEMAHADIK VM, KANADE RV, DHOPAVKAR HK, AMETA, TILEKAR RN. Effect of different rice establishment methods on growth, yield and different varieties during *kharif* season. IJPAJX-CAS-USA. 2016;6(2):127-131.
8. SANJAY K, ASHOK KS, SINGH G, NARESHMANI P, AJIT K, DINESH K. Effect of establishment methods and weed management practices on the growth and yield of direct seeded rice (*Oryza sativa* L.). J. Pharmacognosy Phytochemistry. 2018;7(1): 164-168.
9. PRAKHAR KSK, CHOUDHARY, ABHINANDAN S. Effect of nitrogen scheduling on yield and yield attributing characters in rice under different establishment methods. Int. J. Curr. Microbiol. App. Sci. Special. 2018;7:5153-5160.
10. RAJNESH T, SINGH NB, VIPUL S, DEVESH K. Effect of planting methods and integrated nutrient management on growth parameters, yield and economics of rice. J. P. P. 2018;7(2):520-527.
11. RAVINDRA NATH, JAI DEV. Effect of establishment methods under different weed management technique on rice and associated weeds. J. Pharmacognosy Phytochemistry. 2018;7(5):807-810.
12. JAMIL M, HUSSAIN A. Effect of different planting methods and nitrogen levels on growth and yield of rice (BASMATI 385). Pak. J. Agri. Sci. 2000;37(1-2):83-87.
13. HUGAR AY, CHANDRAPPA H, JAYADEVA HM, SATHISH A, MALLIKARJUN GB. Influence of different establishment methods on yield and economics of rice. Agri. Sci. Digest. 2009;29(3):202-205.
14. JAGTAP DN, MAHADKAR UV, CHAVAN LS, SRINIVASARAO C. Performance of rice (*Oryza sativa* L.) influenced by different crop establishment methods and fertilizer sources. Indian J. Dryland. Agric. Res. Dev. 2012;27(2):55-58.
15. SANDHYA KM, RAMANA AV, RAMANA MURTHY KV. Effect of different crop establishment techniques and nutrient doses on nutrient uptake and yield of rice (*Oryza sativa* L.). Karnataka J. Agric. Sci. 2014;27(3): 293-295.
16. RAVI S, RAMAKICHENIN B. Evaluation of different nutrient management practices for enhancement of the productivity in different rice establishments methods. Int. J. Curr. Microbiol. App. Sci. 2018;7(3):1726-1731.
17. VINAY K, SHAILENDA S, VIDYASAGAR, MAURYA ML. Evaluation of different crop establishment method of rice on growth, yield and economics of rice cultivation in agro-climatic condition of eastern Uttar Pradesh. J. Pharmacognosy Phytochemistry. 2018;7(3): 2295-2298.
18. BHARDWAJ R, SINGH MK, SINGH CS, SINGH AK. Efficacy of crop establishment methods on yield and economics of rice (*Oryza sativa* L.) under puddled condition. Int. J. Curr. Microbiol. App. Sci. 2018;7: 3625-3631.
19. CHANDER S, PANDEY J. Nutrient removal by scented basmati rice (*Oryza sativa*) and associated weeds as affected by nitrogen and herbicides under different rice cultures. Indian J. Agron. 1997;42(2): 256-260.
20. SANDHYA KM, Appraisal of nutrient requirement of rice (*Oryza sativa* L.) under different crop establishment techniques.

M.Sc. (Agri.) Thesis, Acharya N. G. Ranga Agricultural University; 2014.

21. ANBUMANI S, CHANDRASEKHARAN B, KUPPUSWAMY G. Evaluation of establishment methods and NPK levels in rice and their impact on succeeding crops. Agric. Sci. Digest, 2004;24(3): 190-193.
22. ANONYMOUS. Status paper on rice in Karnataka; 2008.
23. BANERJEE H, PAL S, MAITI S. Integrated effect of organic and inorganic fertilizer on the productivity and profitability of rice grown under rice-rice crop sequences in the Gangetic West Bengal. J. Crop Weed. 2006;2(1): 40-44.
24. SANGEETHA C, BASKAR P.Influence of different crop establishment methods on productivity of rice–a review. Agri. Review. 2015;36(2): 113-124.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/115521