Advances in Economics and Business Management (AEBM)
p-ISSN: 2394-1545; e-ISSN: 2394-1553; Volume 4, Issue 2; January-March, 2017, pp. 61-64

http://www.krishisanskriti.org/Publication.html

Economic and Constraint Analysis of Rice Cultivation by DSR Technology in Karnal District of Haryana

Ravinder Kumar[1] and S.C. Batra[2]

[1,2]Baba Mastnath University, Asthal Bohar –Rohtak 124021
E-mail: [1]ravi.agriecon@gmail.com, [2]ravi_jakhar@rediffmail.com

Abstract—*The present study was conducted on economics and major constraints in rice cultivation by DSR (direct seeded rice) technology in Karnal district of Haryana was conducted during 2014-15. For conducting the study six villages of two blocks were selected and 20 farmers from each village were selected for primary data collection with the help of pre- defined and pre-tested schedule. The data on cost-return aspects and various constraints in adoption of DSR technology in rice cultivation were collected from 120 farmers. The collected data were analyzed by using tabular analytical tool. Total costs in rice production amounted to be ` 96631.41/ha. The Average yield was 38.50 quintal/ha. The gross return was found ` 98452.50 while the net return was observed as ` 1821.09/ha. The cost of production of rice by DSR technology was computed as ` 2509.91. Among various constraints in production of rice with DSR technology higher weed infestation, lack of suitable varieties for DSR, comparative lower yield than rice produced by conventional transplanted method, lack of technical guidance about the technology, higher cost of weedicides were the major constraints in rice production by DSR technology.*

1. INTRODUCTION

Rice (*Oryza sativa* L.) is the staple food of more than half of the world population. The population of the world at present is 7.4 billion. In India the present population (2016) is 1,329 million which will increased to 1,708 million and rank first by 2050 (34 years after) i.e. 11.15 million person per year. India requires increasing rice production by 3 million tonnes every year to ensure food security (Dass, *et al.,* 2015).

Rice-wheat is the major cropping sequence in India and India is the second largest producer of rice preceded by China. It was the largest exporter of rice in 2015-16 followed by Thailand, Vietnam and Pakistan (Commodity Profile, 2015-16). Basmati rice trade was 2.02 million tonnes in 2009-10 which increased to 4.04 million tonnes in 2015-16 (Commodity Profile, 2016). The area under rice cultivation was 427.54 lakh hectares during 2012-13 which increased up to 438.56 lakh hectare during 2014-15. The production was 105.24 million tonnes in 2012-13 and decreased 104.80 million tones. The yield of rice was 2461 kg/ha during 2012-13 which decreased to 2390 kg/ha during 2014-15 (Annual Report, 2015-16).

Rice is grown in 18 districts of Haryana. Out of which seven districts are in high productivity group, that is, yield more than 2,500 kg/ha (RKMP). It is grown by transplanting during wet season from June to October. Direct seeded rice (DSR) refers to the process of growing rice crop from seeds sown in the field rather than by transplanting rice (TPR) seedlings from nursery. To save water, reduce labour requirement, and mitigate green house gas (GHS) emission, Direct Seeded Rice (DSR) is a feasible alternative to conventional puddle transplanted rice with good potential. Mechanization of the farming practices can overcome the crisis and help in drudgery reduction (Din *et al*., 2012).

Exploring ways to produce more rice with less water is essential for food security and sustaining environmental health in Asia (Tuong and Bouman, 2003). The machines used in direct seed rice can also influence the costs as compared to transplanted paddy. DSR is a cost effective alternative leading to similar yields under good weed control and water management practices. Also, the attitude of the farmers has to change for the reason being that the resource like water if available in abundance, must not be used in an inattentive way. Land preparation duration was significantly reduced in direct seeded rice compared to transplanted rice. This led to a significant reduction in irrigation and total water input (rainfall and irrigation) before crop establishment. Keeping in view of the above reasons, the present study was conducted in Karnal district of Haryana state.

2. MATERIALS AND METHODS

The study was conducted in Department of Economics, Baba Mastnath University, Asthal Bohar, and Rohtak in Haryana during 2014-15.

2.1 Selection of site and respondents

Based on the area and production of paddy crop in the state, two districts namely Kaithal and Karnal were selected purposively for the present study. The data was collected for production of TPR and DSR from selected farmers (240).

2.2 Estimations of various costs

Variable cost includes preparatory tillage, pre-sowing irrigation charges, seed, manures and fertilizer, hoeing/weeding, plant protection, harvesting, threshing, interest on working capital, etc and fixed costs include rental value.

3. 3. RESULTS

A. Economics analysis of DSR technology

3.1 Working capital

The working capital of TPR and DSR was ` 43101.31and `34393.49 per hectare respectively. The expenditure incurred on preparatory tillage was ` 7171.88 per hectare in TPR as compared to ` 4530.00 per hectare in DSR, likewise, sowing cost was ` 5007.29 per hectare in TPR as compared to ` 1980.21 per hectare in DSR, irrigation cost ` 9330.00 per hectare as compared to `5670.94 per hectare in DSR The weed management costs were lower in TPR (`1394.17/ha) as compared to DSR (` 2742.71/ha). The cost of farm yard manure, harvesting and threshing, there was no difference. Also, the cost of fertilizers application, plant protection cost and pre-sowing irrigation were almost same in both the methods of sowing.

3.2 Total cost

Total cost incurred on TPR was `107498.76 per hectare while it was `96631.41 per ha in case of DSR. Total costs include variable cost, management charges, risk factor, transportation and rental value of land.

3.3 Gross and net returns analysis

The yield of TPR was 42.00 quintal per hectare and 38.50 quintal in case of DSR. The gross return from TPR was ` 107255.00 per hectare and ` 98452.50 per hectare in DSR. The net returns of TPR and DSR was ` -243.76 and ` 1821.09 per ha. The net return DSR was Rs. 2064.85 higher than TPR. The cost of production of TPR was ` 2559.49 and `2509.91 per ha in DSR.

Impact analysis of TPR and DSR

Working capital and total cost of TPR was higher than DSR by 25.32 and 11.25 per cent i.e. ` 8707.82 and ` 10867.35 per ha respectively. The gross returns were higher in transplanted method of sowing of rice than DSR i.e., by ` 8802.5 per ha. However, the net returns of ` 1821.09 per ha were obtained in DSR than ` -243.76 per ha in TPR.

B. Constraints Aanalysis in adoption of DSR over TPR

The result of economic analysis clearly indicates that Direct seeded rice (DSR) technology is having cutting edge over traditional transplanted rice method in terms of lower cultivation cost and higher net return. But inspite of various benefits of this resource conservation technology the adoption rate of this technology among farmers is much slower .The present study analyzed following constraints which inhibiting the adoption of this technology(Table 2)The respondents were asked about the major constraints which inhibiting the farmer community in adopting this resource conservation technology (DSR).Among various constraints reported by the respondents higher weed infestation was the top most hurdle in its adoption (Table 2 & Fig.1). About (83.33%) farmers considered it as main constraints. We have also found in our study that are higher cost involved in managing weed under DSR method as compare to TPR. Lower yield of rice under DSR method as compare to TPR was found the second most important constraint as (54.16%) farmers from Karnal district reported it as second biggest constraint. Third important constraint was lack of technical knowhow about the technology. 54(45%) respondents found it a constraint. 35(29.16%) respondents given fourth rank to lack of exposure visits to farmers who have adopted this technology, while 23.33 percent farmers were of a view that availability of irrigation water particularly canal water at very lower rate was also a major constraint in adoption of DSR over TPR. This is very important point to note that due to availability of cheaper irrigation water farmers tends to use it injudiciously.

Table 1: Costs and Return from TPR and DSR in Karnal District. (`/Ha)

SN.	Particulars	TPR	DSR
1	Preparatory Tillage	7171.88	4530.00
2	Pre- Sowing Irrigation	1171.35	945.10
3	Sowing	5007.29	1980.21
4	Seed Cost	537.19	1019.90
5	FYM	3927.08	3927.08
	Fertilizer Nutrients		
	(A) Nitrogen	1459.79	1267.25
	(B) Phosphate	1454.74	1119.47
	(C) Zinc Sulphate	622.40	611.46
6	Total Fertilizer Expenditure	3536.93	2998.18
7	Fertilizer application	491.56	454.06
8	Irrigation	9330.00	5670.94
9	Hoeing/Weeding	1394.17	2742.71
10	Plant Protection	5810.94	5502.60
11	Harvesting/Threshing	3475.00	3475.00
12	Miscellaneous	1247.92	1147.71
13	**Working Capital (1 to 12)**	43101.31	34393.49
14	Interest on working capital	1724.05	1375.74
15	Variable Cost	44825.36	35769.23
16	Management Charges	4482.54	3576.92
17	Risk Factors	4482.54	3576.92
18	Transportation	1375.00	1375.00
19	Rental value of Land	52333.33	52333.33

20	**Total Cost**	107498.7	96631.41
21	Production (qtl)	42.00	38.50
	(a) Main	105630.0	96827.5
	(b) By Product	1625.00	1625.00
22	**Gross Return**	107255.0	98452.5
23	**Return over variable cost**	62429.64	62683.2
24	Net Return	-243.76	1821.09
25	Cost of Production(Rs./qtl)	2559.49	2509.91

4. DISCUSSION

The preparatory tillage was 58.32 per cent higher in TPR over DSR. The sowing cost was 152.87 per cent higher; irrigation cost was 64.52 per cent higher in TPR as compared to DSR. The weed management cost was 96.73 per cent lower in case of TPR as compared to DSR. The management of weeds was found more costly in DSR due the reasons that weed flora composition changed drastically with a shift from CT-TPR to some form of alternative tillage and rice establishment methods (Singh *et al.*, 2009). Tomita *et al.* (2003) observed more species-rich vegetation and diverse weed flora in Dry-DSR than in CT-TPR. Some new grass and broadleaf species that were not adapted to CT-TPR appeared in Dry-DSR. Higher numbers and more diverse flora in Dry-DSR could result in lower efficacy of weed management strategies, including herbicides (Singh *et al.* (2009). The total cost of TPR was 11.25 per cent higher over DSR.

Gross and net returns analysis

The yield of TPR was 42 quintal per hectare and 38.50 quintal in case of DSR. The gross returns from TPR were higher by 8.94 per cent over DSR. The main reasons of lower gross returns in DSR were lower yield per hectare. The yield of DSR was 9.09 per cent lower as compared to TPR. The main reasons could be (1) uneven or poor crop establishment (Rickman *et al.*, 2001), (2) inadequate weed control (Johnson and Mortimer, 2005; Kumar *et al.*, 2008; Rao *et al.*, 2007; Singh *et al.*, 2005), (3) higher spikelet sterility than in puddled transplanting (Bhushan *et al.*, 2007; Choudhury *et al.*, 2007). The net returns of TPR were lower due to higher total cost as compared to DSR, and the main cost which decreased the net returns was preparatory tillage, sowing and irrigation cost (Table 1). Sowing of transplanted rice required higher manual labour as compared to DSR in which DSR seed drill was used for sowing.

Impact analysis of TPR and DSR

Working capital and total costs were higher in TPR as compared to DSR. The gross returns were higher in transplanted method of sowing of rice than DSR but finally the net returns per hectare were found higher in DSR. This resource conservation technology not only helps in reducing the cost of cultivation but also in saving the irrigation water up to a great extent. It was also predicted that farmers used irrigation water without pre-judicious use in TPR due to lower rates of canal water and electricity charges.

5. CONCLUSION:

DSR technology is better than transplanted method of rice cultivation by reducing irrigation and human labour requirement per unit area and found more profitable in terms of net returns per hectare. DSR technology is very help full in conserving the resources like irrigation water and human labour. Quality irrigation water is a scarce resource which is decreasing day by day due to over exploitation and its injudicious use in cultivation of crops.DSR can be alternative to conventional transplanted rice (TPR) without much compromising the yield.

There are some constraints which inhibits the adoption of this technology. Among various constraints higher weed infestation, lower yield than transplanted rice, lack of technical knowhow, lack of suitable varieties for DSR and availability of canal irrigation water at cheaper rate are major constraints.

Table 2: Constraints in adoption of DSR technology in Karnal district.

S.N	Constraints	No.of farmers responded	% of farmer responded	Rank
1	More weeds problem	100	83.33	I
2	Lower yield than TPR (trans-planted Rice)	65	54.16	II
3	Lack of awareness about technical know how	54	45	III
4	Availability of irrigation water at low prices	28	23.33	V
5	Lack of suitable varieties for DSR	35	29.16	IV
6	Lack of exposure visit	25	20.83	VI
7	High cost of DSR machine	20	16.66	VIII
8	Lack of govt. promotion	15	12.50	IX
9	Not adequate quantity of DSR machine on subsidy	24	20	VII

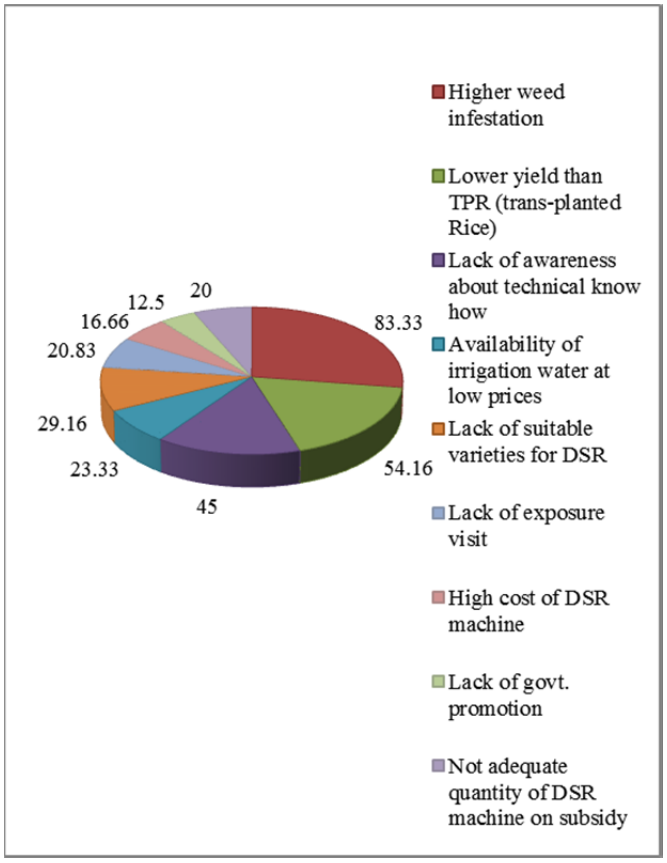

Fig. 1: Major Constraints in Adoption of DSR Technology

REFERENCES

[1] Annual Report, 2015-16, Department of Agriculture, Cooperation & Farmers' Welfare, Ministry of Agriculture & Farmers' Welfare, Government of India, Krishi Bhawan, New Delhi-110001.

[2] Bhushan, Lav, Ladha, J. K., Gupta, R. K., Singh, S., Tirol-Padre, A., Saharawat, Y. S., Gathala, M., and Pathak, H. 2007. Saving of water and labor in rice-wheat systems with no-tillage and direct seeding technologies. *Agron. J.* **99**, 1288–1296.

[3] Cabangon, R.J., Tuong, T.P. & Abdullah, N.B., 2002, Comparing water input and water productivity of transplanted and direct seed rice production system. *Agricultural Water Management*, **57**, 11-31.

[4] Cai, X. M. & Rosegrant, M. W., 2003. World water productivity: current situation and future options. Chapter 10, pp. 163-178. *Water productivity in agriculture: limits and opportunities for improvement*. Edt. Kijne, J.W, Barker, R. Moden, D.

[5] Castin, E. M., and Moody, K. 1989. Effect of different seeding rates, moisture regimes,and weed control treatments on weed growth and yield of wet-seeded rice. In "Proceedings of the 12th Asian-Pacific Weed Science Society Conference, Seoul, Korea", pp. 337–343.

[6] Choudhury, B. U., Bouman, B. A. M., and Singh, A. K. 2007. Yield and water productivity of rice-wheat on raised beds at New Delhi. *India Field Crops Res.* **100**, 229–239.

[7] Commodity Profile for Rice-October-2016. Department of Agriculture, Cooperation & Farmers' Welfare, Ministry of Agriculture & Farmers' Welfare, Government of India, Krishi Bhawan, New Delhi-110001.

[8] Dass, A., Chandra, S., Choudhyary, A.K. Singh, G. & Sudhishri. S., 2015. Influence of field responding pattern and plant spacing on rice shoot characteristics, yield and water productivity of two Modern cultivars under SRI Management in Indian Mollisels. *Paddy Water Environ*. DOI 10.1007/s 10333-015- 0477-z.

[9] Din, M., Mishra, P., Patel, S.P. & Mohapatra, P.C., 2013, CRRI Implements for Rice Mechanization, *CRRI Bulletins*, 8-14.

[10] Johnson, D. E., and Mortimer, A. M. 2005. Issues for integrated weed management and decision support in direct-seeded rice. In "Rice Is Life: Scientific Perspectives for the 21st Century" (K. Toriyama, K. L. Heong, and B. Hardy, Eds.), pp. 211–214. International Rice Research Institute, Los Ban ˜os, Philippines and Japan International Research Center for Agricultural Sciences, Tsukuba, Japan.

[11] Kumar, V., Bellinder, R. R., Gupta, R. K., Malik, R. K., and Brainard, D. C. 2008. Role of herbicide-resistant rice in promoting resource conservation technologies in rice–wheat cropping systems of India: A review. Crop Prot. 27, 290–301.

[12] Rao, A. N., Johnson, D. E., Sivaprasad, B., Ladha, J. K., and Mortimer, A. M. 2007. Weed management in direct-seeded rice. Adv. Agron. 93, 153–255.

[13] Rickman, J. F., Pyseth, M., Bunna, S., and Sinath, P. (2001). Direct seeding of rice in Cambodia. In "Proceedings of an International Workshop", 30 October–2 November. ACIAR Proceedings No. 101, Vientiane, Laos.

[14] RKMP http://www.rkmp.co.in/content/rice-cultivation-in-haryana

[15] Shwetha M. K., Mahajanashetti S. B. and Kerur N. M., 2011. Economics of paddy processing : A comparative analysis of conventional and modern rice mills. *Karnataka Journal of Agri Sciences.* **24**(3) : 331 - 335.

[16] Singh, U. P., Singh, Y., Kumar, V. and Ladha, J. K. 2009. Evaluating and promotion of resource conserving tillage and crop establishment in the rice-wheat system of eastern India.

[17] Singh, Y., Singh, G., Johnson, D., and Mortimer, M. 2005. Changing from transplanted rice to direct seeding in the rice-wheat cropping system in India. In "Rice Is Life: Scientific Perspectives for the 21st Century" (K. Toriyama, K. L. Heong, and B. Hardy, Eds.), pp. 198–201. International Rice Research Institute, Los Ban ˜os, Philippines and Japan International Research Center for Agricultural Sciences, Tsukuba, Japan.

[18] Tuong, T.P., & Bouman, B.A.M., 2003, Rice production in water-scarce environment, chapter 4, pp. 53-67, Book: *Water productivity in agriculture: limits and opportunities for improvement*. Edt. Kijne, J.W, Barker, R. Moden, D.