An Evaluation of the Use of Drills and Transplanted Paddy Cultivation Techniques in Bhandara District of Nagpur, India

ABSTRACT

In order to compare the costs, savings, and returns for the drill and transplanted methods of paddy cultivation, the current study, was conducted as a Research Review Committee Project in the Bhandara district of Nagpur division in Vidarbha region of Maharashtra, India. The method utilized was an exploratory social research design. Using the purposive population sampling technique method, a total of 72 sample paddy-growing beneficiary farmers from KVK, Sakoli Dist. Bhandara were chosen, and they were interrogated using a structured interview schedule. As a result, this study was limited to a sample of 72 paddy growers who were cultivating their paddy crops using both the transplanted and drill paddy methods.Findings of present study revealed that majority of the paddy growers were young with high education level,possessed small and marginal type of land holding with annul income in the range of Rs.75001/- to 1,50,000/-, medium level of scientific orientation,economic motivation,innovativeness respectively and favourable attitude towards to drill paddy technology. Further the findings of the study revealed that the highest gross returns received to farmers adopting were Rs. 85807.50/- and 81000.80/- per ha for transplanted and drill paddy cultivation methods respectively. The highest net returns at Cost A realized by the paddy farmers adopting drill paddy method of cultivation i.e. Rs.54738.28 per hectare.The highest benefit cost ratio (BC ratio)was released by the farmers adopting drill method of paddy cultivation at Cost A,Cost B and Cost C respectively.

Keywords:Traditional Puddle Transplanted Rice, Drilled Paddy, Transplanted Paddy, Economic Comparison, Benefit Cost Ratio

1.0.INTRODUCTION

In comparison to CT-TPR (traditional puddle transplanted rice), direct seeded rice is a technology that is labour, water, and energy efficient as well as environmentally beneficial (Kumar and Ladha, 2011). In the rice-wheat growing regions of the Indo-Gangetic plains (IGP), transplanting is the main technique for establishing rice. However, the cost of transplanting in the area has increased because to rising labour expenditures for creating nurseries, puddling fields, and transplanting. Farmers no longer find transplanting to be as enticing because to worries about the disappearance of subsurface water and rising irrigation expenditures. An alternate technique that could lower the labour and irrigation water needs for crop establishment is direct rice sowing (Kumar and Ladha, 2011). In places of eastern India, direct seeding would also help farmers to establish rice early, allowing them to harvest early and begin sowing wheat, which would increase crop yield (Singh *et al*., 2008).

Rice transplantation requires more water, is more difficult, takes longer, and costs a lot more to raise the nursery, remove the plants, and then transplant them. A substitute for the traditional puddle transplantation of rice must be found due to labour shortages during the

busiest transplanting season, an uncertain supply of irrigation water, groundwater depletion, and rising production costs.

In Asia, increasing rice production while using less water is crucial for environmental sustainability and food security (Tuong and Bouman, 2003).A farmer can save money by switching to transplanted rice instead than drill rice, and modest adjustments to the cultivation process can increase the cropping system's efficiency. When compared to transplanted paddy, the equipment utilized to drill paddy might also affect prices. Under proper weed management and water management techniques, drill paddy is a more affordable alternative that produces comparable yields. Additionally, the farmers' mindset needs to shift because even when a resource is abundant, like water, it shouldn't be exploited carelessly. Drill paddy required substantially less time to prepare the land than transplanted paddy. Because of this, the total water input (rainfall plus irrigation) before crop establishment was significantly reduced. With the aforementioned factors in mind, the current study was carried out in the Vidarbha Region of Maharashtra State's Bhandara district to examine the socioeconomic, psychological, and personal traits of paddy growers, determine the cost per hectare of cultivating Kharif paddy using the transplanted and drill cultivation methods, and calculate the relative economics of the transplanted and drill paddy cultivation methods.

3.0. MATERIAL AND METHODS

The current inquiry was conducted in Maharashtra's Vidarbha region's Bhandara district. Three Tahsils viz., Lakhani, Sakoli and Lakhandur were chosen from the Bhandara district, and within each Tahsil, onevillage was chosen on purpose. These villages contained beneficiaries of the KVK who grew paddy using both drill and transplanted paddy cultivation methods. Therefore, the scope of this study was limited to a sample of 72 paddy growers who used both types of paddy growing techniques. A social research design that was exploratory was adopted. To gather data, a structured interview schedule was created. With the use of a scheduled interview schedule, data were gathered using the personal interview approach. The schedule's questions were created with the study's goals in mind. Both the respondent's home and their farm were visited during the interview.After the respondents' interviews and schedule editing were finished, the results were tabulated. The raw data from the revised schedule was first serially entered in a main table that was appropriate, and then it was added to a secondary table based on the classification. All of the chosen variables were categorized using the scores that each variable had received. (Please re-write the elaboration)

4.0. RESULTS AND DISCUSSION

4.1. Respondent's Profile

Table 1 show the respondent's profile in the study. It was discovered that 43.05 percent of respondents were under the age of 35, followed by 33.34 and 23.61 percent of respondents who fell into the categories of middle age (between 36 and 50 years) and old age (beyond 50 years), respectively.

In terms of education, over one-fourth (26.38%) of paddy farmers were found to have completed at least higher secondary school, followed by nearly one-fifth (18.05%) who had completed at least fourth grade, and a pitiful 12.50% who had completed at least high school.

It was found that 36.12% of respondents had small (1.00 to 2.00 acres) land holdings, followed by 26.38% of respondents who had marginal land holdings, 25.00% of respondents who had semi-medium land holdings, 11.12% of respondents who had medium land holdings, and very few, or 01.38 percent of respondents, who had large land holdings.

It is noted that 40.27% of respondents reported annual incomes between Rs. 75,000 and Rs. 15,00,000, followed by 29.16% who reported incomes between Rs. 75,000 and Rs. 1,500, and nearly one-fourth (23.62%) who reported incomes between Rs. 1,50,001 and Rs. 2,25,000, respectively. Only 06.95% reported annual incomes above Rs. 2, 25,000.

Regarding their level of scientific orientation, it was found that more than half (59.72%) of respondents fell into the medium category, followed by 20.84% of respondents in the high category, and 19.44% of respondents in the low category. (please rewrite the discussion)

Table 1. Respondent's Profile According to their Selected Characteristics

Sr. No	Characteristics and levels	Score range	Respondents (N=72)	
			Frequency	Percent (%)
1	**Age:**			
i	Young	Up to 35 years	31	43.05
ii	Middle	36 to 50 years	24	33.34
iii	Old	Above 50 years	17	23.61
	Total		**72**	**100.00**
2	**Education:**			
ii	Primary	Up to 4^{th} standard	13	18.05
iii	Middle school	5^{th} to 7^{th} standard	09	12.50
iv	High school	8^{th} to 10^{th} standard	10	13.88
v	Higher Secondary School	11^{th} and 12^{th} standard	19	26.38
vi	College	Above 12^{th} standard	21	29.16
	Total		**72**	**100.00**
3	**Land holdings:**			
i	Marginal	Up to 1.00 Ha.	19	26.38

ii	Small	1.01 to 2.00 Ha.	26	36.12
iii	Semi-medium	2.01 to 4.00 Ha.	18	25.00
iv	Medium	4.01 to 10.00 Ha.	08	11.12
v	Large	Above 10.00 Ha.	01	01.38
	Total		**72**	**100.00**
4	**Annual income:**			
i	Marginal	Upto Rs. 75,000/-	21	29.16
ii	Small	Rs. 75,001/- to Rs. 1,50,000/-	29	40.27
iii	Medium	Rs. 1,50,001/- to Rs. 2,25,000/-	17	23.62
iv	High	Above Rs. 2,25,000/-	05	06.95
	Total		**72**	**100.00**
5	**Scientific orientation**			
i	Low	Upto 20	14	19.44
ii	Medium	21 to 27	43	59.72
iii	High	Above 27	15	20.84
	Total		**72**	**100.00**
6	**Economic motivation**			
i	Low	Upto 20	15	20.83
ii	Medium	21 to 29	44	61.11
iii	High	Above 30	13	18.06
	Total		**72**	**100.00**
7	**Innovativeness**			
i	Low	Upto 13	15	20.83
ii	Medium	14 to 22	38	52.78
iii	High	Above 22	19	26.39
	Total		**72**	**100.00**
8	**Attitude towards drill paddy method**			
i	Unfavourable	Upto 16	13	18.05
ii	Favourable	17 to 31	50	69.45
iii	Highly Favourable	Above 31	09	12.50
	Total		**72**	**100.00**

Source : Result Output (2023)

Note :According to the information of Innovativeness aspect, more than 38 of respondents (52.78%) fell into the medium category of innovativeness, followed by more than 19 of respondents (26.39%), and more than 15 of respondents (20.83%) fell into the low category.

According to the Economic Motivation , the majority of respondents (61.11%) fall into the medium group of economic motivation, while 20.83 percent go into the high category and 18.06 percent fall into the low category.

According to theinnovativeness, more than 50% of respondents (52.78%) fell into the medium category of innovativeness, followed by more than one-fourth of respondents (26.963%), and more than one-fifth of respondents (20.83%) fell into the low category.

With regards attitude towards drill paddy method, it was observed that above two third of respondents (69.45%) had favourable attitude towards drill paddy method, followed

by nearly one fifth respondents (18.05%) had unfavourable category of attitude whereas 12.50 per cent of respondents had shown highly favourable attitude towards drill paddy method.

4.2. Paddy Production Costs for Various Farming Techniques

4.2.1. Conventional Transplanting Method

In the Bhandara district, this kind of paddy cultivation is fairly common. The vast majority of farmers cultivate their paddy using this technique. Table 2 details the economics of paddy cultivation costs using the traditional transplanting method. From Table 2, it is clear that farmers had to spend Rs. 37,272.52 (Cost A) per hectare to grow paddy using the traditional transplanting method. B and C had per-hectare costs of 52,273.06 and 54,473.06 rupees, respectively. The biggest direct expense was labor, which accounted for 25.0% of the total cost. Machine costs came in at 18.63% and fertilizer costs at 7.60%. Cost A's percentage of the overall cost was (68.42%). Land rental value made up the largest portion of cost B's total cost (26.10%), followed by interest on fixed capital (1.44%). Over 95.67% of the total cost is attributable to cost B. Family labour made up 4.04 percent of the overall cost. The price of primary produce is Rs. 1,411.92 per quintal.

Table 2: Per-Hectare Cost of Cultivation of Paddy by Transplanting Method

Sl. No.	Particular	Unit		Input/ha.	Cost per unit of input	Total cost per ha. (Rs)	% to total cost
1	Hired human labour	Male	Days	33.00	240.00	7,920.00	14.54
		Female	Days	57.00	100.00	5,700.00	10.46
		Total	Days	**90.00**	340.00	**13,620.00**	25.00
2	Bullock labour		(Pair days)	0.00	0.00	0.00	0.00
3	Machine charges		Hours	14.50	700.00	**10,150.00**	18.63
4	Seed		Kgs	70.00	50.00	3,500.00	6.43
5	Manures		Qtls	26.38	60.01	1,583.00	2.91
6	Fertilizer	N	Kgs	99.82	11.63	1,161.00	2.13
		P	Kgs	50.08	43.69	2,188.00	4.02
		K	Kgs	25.20	31.39	791.00	1.45
		Total				**4,140.00**	7.60
7	Irrigation	Cost	Rs.			465.00	0.85
8	Insecticide	Cost	Rs.			1,984.00	3.64
9	Incidental charges	Cost	Rs.			145.00	0.27
10	Repairing charges	Cost	Rs.			110.00	0.20
11	Working capital	Cost	Rs			**35,697.00**	65.53

12	Interest on working capital	Cost	Rs.			924.81	1.70
13	Depreciation	Cost	Rs.			565.00	1.04
14	Land revenue	Cost	Rs.			85.71	0.16
15	**Cost (A)**		Rs.			**37,272.52**	68.42
16	Rental value of land	Cost	Rs.			14,215.54	26.10
17	Interest on fixed capital	Cost	Rs.			785.00	1.44
18	**Cost (B)**					**52,273.06**	95.96
19	Family human labour	Male	Days	5.00	240.00	1,200.00	2.20
		Female	Days	10.00	100.00	1,000.00	1.84
		Total	Days	**15.00**	340.00	**2,200.00**	4.04
20	**Cost (C)**	Cost	Rs.			**54,473.06**	100.00
21	Yield per hectare	Main	Qtls	32.50	2,515.00	81,737.50	
	Value of by-produce	Bye	Qtls	37.00	110.00	4,070.00	
22	Value of total produce					85,807.50	
23	Per quintal cost of production					**1,411.92**	

Source: Research Output (2023)

4.2. Drilling Method

Table 3 provides the economics of the cost of paddy cultivation using the drilling method. As can be observed from Table 3, farmers had to spend Rs. 26262.52 (Cost A) per hectare to grow paddy using the drilling method. Costs B and C were respectively Rs. 40461.94 and Rs. 41881.94 per hectare. The biggest percentage of the overall cost's direct expenses was labor. Cost A made up 62.71% of the total cost. Land rental value made up the largest portion of cost B's total cost (32.03%), followed by interest on fixed capital (1.87%). A total of 96.61 percent of the cost is attributable to cost B. 3.39 percent of the total cost was accounted for by labor from families. The price of the primary produce is Rs. 1241.60 per quintal.

Table 3: Per-Hectare Cost of Cultivation of Paddy by Drilling Method

Sl. No.	**Particular**	**Unit**		**Input/ha.**	**Cost per unit of input**	**Total cost per ha. (Rs)**	**% to total cost**
1	Hired human labour	Male	Days	17.00	240.00	4,080.00	9.74
		Female	Days	33.00	100.00	3,300.00	7.88
		Total	Days	**50.00**	340.00	**7,380.00**	17.62
2	Bullock labour		(Pair days)	0.00	0.00	0.00	0.00
3	Machine charges		Hours	9.00	700.00	6,300.00	15.04
4	Seed		Kgs	45.00	50.00	2,250.00	5.37
5	Manures		Qtls	26.38	60.01	1,583.00	3.78
6	Fertilizer	N	Kgs	99.82	11.63	1,161.00	2.77
		P	Kgs	50.08	43.69	2,188.00	5.22
		K	Kgs	25.20	31.39	791.00	1.89
		Total				**4,140.00**	9.88
7	Irrigation	Cost	Rs.			465.00	1.11

8	Insecticide	Cost	Rs.			1,064.00	2.54
9	Incidental charges	Cost	Rs.			145.00	0.35
10	Repairing charges	Cost	Rs.			110.00	0.26
11	Working capital	Cost	Rs			**23,437.00**	55.96
12	Interest on working capital	Cost	Rs.			924.81	2.21
13	Depreciation	Cost	Rs.			565.00	1.35
14	Land revenue	Cost	Rs.			85.71	0.20
15	**Cost (A)**		Rs.			**26,262.52**	62.71
16	Rental value of land	Cost	Rs.			13,414.42	32.03
17	Interest on fixed capital	Cost	Rs.			785.00	1.87
18	Cost B					**40,461.94**	96.61
19	Family human labour	Male	Days	3.00	240.00	720.00	1.72
		Female	Days	7.00	100.00	700.00	1.67
		Total	Days	**10.00**	340.00	**1,420.00**	3.39
20	Cost C	Cost	Rs.			**41,881.94**	100.00
21	Yield per hectare	Main	Qtls	30.72	2515.00	77,260.80	
	Value of by-produce	Bye	Qtls	34.00	110.00	3,740.00	
22	Value of total produce					81,000.80	
23	Per quintal cost of production					**1,241.60**	

Source : Research Output (2023)

4.3. Various Paddy Cultivation Techniques' Comparative Economics:

Table 4 presents the comparative economics of several techniques. Table 4 shows that farmers using the traditional transplanting and drilling methods received the maximum yields of paddy per hectare of 32.50 quintal and 30.72 quintal, respectively. Farmers who used the traditional transplanting approach paid Rs. 85807.50 and the drilling method Rs. 81000.80 the highest gross profits. The farmers using the drill method of agriculture realized the highest net returns at cost A, or Rs. 54738.28 per hectare. The farmers who adopted the drilling method of paddy cultivation at Costs A, B, and C, respectively, realized the highest BC ratio.

Table 4: Comparative Economics of Different Methods of Paddy Cultivation

Sr. No.	**Particulars**	**Methods of paddy cultivation**	
		Transplanting	**Drilling**
1	Yield per q/hect.	32.50	30.72
2	Value of main produce	81,737.50	77,260.80
3	Value of by-produce	4,070.00	3,740
4	Gross returns	85,807.50	81,000.80
5	Total Cost		
	i) Cost A	37,272.52	26,262.52
	ii) Cost B	52,273.06	40,461.94
	iii) Cost C	54,473.06	41,881.94
6	Net return over		
	i) Cost A	48,534.98	54,738.28
	ii)Cost B	33,534.44	40,538.86

	iii)Cost C	31,334.44	39,118.86
7	Input-Output ratio (B:C ratio)		
	i) Cost A	2.30	3.08
	ii)Cost B	1.64	2.00
	iii)Cost C	1.58	1.93

Source : Research Output (2023)

5.0. CONCLUSION

The majority of paddy farmers were young, highly educated, and in possession of small or marginal land holdings with annual incomes ranging from Rs. 75001 to Rs. 1,50,000. They also displayed moderate levels of scientific orientation, economic motivation, and inventiveness, as well as a favorable attitude toward the technology used to drill paddy. The greatest gross yields earned by farmers using the transplanted and drill paddy farming methods, respectively, were Rs. 85807.50 and 81000.80 per hectare.The paddy farmers using the drill paddy mode of cultivation saw the best net returns at Cost A or Rs. 54738.28 per hectare. Farmers using the drill method of paddy cultivation released the highest benefit-cost ratio (BC ratio) at Costs A, B, and C, respectively.

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