International Journal of Agricultural Sciences
Volume 8 |Issue 1| January, 2012 | 228-231

RESEARCH PAPER

Comparison of conventional practice and SRI method of hybrid rice cultivation on farmer's fields in central plain zone of Uttar Pradesh

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Abstract **:** A study was conducted on farmer's field in Fatehpur district (U.P.) during *Kharif,* 2008 to compare conventional and SRI methods of hybrid rice cultivation. The SRI involved transplanting of 10 days old single seedling/hill at 25x 25 cm spacing and 20 t/ha FYM application. Conventional method involved transplanting of 25 days old 2 seedlings/hill at 20 x 10 cm spacing and 150 kg N + 60 kg P + 40 kg K fertilizers/ ha. SRI method improved growth and yield attributes of hybrid rice 'PHB - 71' by the large margins over conventional method. It produced 83.20 q/ha grain yield and earned Rs. 64620/ha with 3.48 B:C ratio against 61.80 q/ha grain yield and Rs. 41240/ha return with 2.00 B:C ratio under conventional method of hybrid rice cultivation. In SRI method, NPK + FYM @ 10 t/ha or FYM alone @ 20 t/ha gave higher grain yield (83.80 and 83.10 q/ha) and net return (Rs. 64151 and 64520/ha) than inorganic NPK with 75.30 q/ha grain yield and Rs. 57651/ha net return.

Key Words **:** Hybrid rice, SRI, Productivity, Economics, Soil fertility

View Point Article **:** Rajiv and Dabbas, M.R. (2012). Comparison of conventional practice and SRI method of hybrid rice cultivation on farmer's fields in central plain zone of Uttar Pradesh. *Internat. J. agric. Sci.*, **8**(1): 228-231.

Article History **: Received :** *03.09.2011;* **Revised :** *15.10.2011;* **Accepted :** *06.12.2011*

INTRODUCTION

System of rice intensification (SRI) is particularly well suited for cultivation of hybrid rice, since it not only saves the seed cost (75 % saving) but also helps in saving water (30-40%). Research conducted so far in multilocational trials has clearly indicated that hybrids perform better under SRI method of cultivation as compared to high yielding varieties (Subbaiah *et al*., 2005). So it is recommended that where ever feasible, SRI method of cultivation can be adopted for rice hybrids. Therefore, keeping it's importance in view, this new method of hybrid rice technology (SRI) was tested by the scientists of KVK, Fatehpur on farmer's fields during *Kharif,* 2008.

MATERIALS AND METHODS

The study was carried out with rice hybrid PHB-71. It was tested under conventional method *vis-à-vis* SRI method of cultivation. In conventional method, 20 kg seed was sown in nursery for one hectare transplanting. Seedlings of 25 day age were transplanted at 20 cm x 10 cm spacing keeping 2 seedlings per hill. Fertilizers were applied @ 150 kg N + 75 kg P + 60 kg K + 25 kg $ZnSO_4$/ha along with 10 t/ha FYM. Weeds were controlled by the application of Butachlor herbicide @ 3 kg/ha in standing water. Submergence of water was maintained throughout crop season.

In SRI method, only 5 kg seed was sown in nursery for transplanting in one hectare area. Seedlings of 10 day age were transplanted at 25 cm x 25 cm spacing keeping single seedling per hill. No inorganic fertilizer was applied, but 20 t/ ha FYM was applied a fortnight before transplanting. Weeds were control by mechanical weeder. Alternate wetting and drying of soil was maintained till flowering then flooding of water was done. Other operations were done uniform in both methods of cultivation. Transplanting and harvesting were

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done on first week of July and last week of October, respectively.

The Study was carried out in two different trials. In trial no. 1, comparison of both methods was done, while in trial no. 2, three levels of nutrient management were compared in SRI method. The soil of both trials was slightly alkaline in nature and poor in organic carbon. Observations were recorded on growth, yield attributes, yield, gross return, net return, benefit : cost ratio and post-harvest soil fertility.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Trial No. - 1 :

Growth and yield attributes :

Plant height of rice was recorded almost similar in both methods of cultivation (Table 1). Root growth was found much more in SRI method where root spread was found 75.95 per cent more and root depth 124.53 per cent more in SRI than conventional method. Root spread might be attributed to more space available per plant and root depth to limited soil moisture during vegetative phase in SRI method of cultivation. Number of tillers and spikes/hill were produced much more in SRI method, which might be attributed to lesser competition between hills for space and nutrients. However, number of spikes/m^2 were lesser in SRI method. It might be due to increased competition between tillers of a hill, where most of the tillers could not bear spikes and because of much lesser number of hills/m^2, spikes/m^2 reduced in SRI method as compared to conventional method. Number of grains/spike and test weight both were recorded higher in SRI method by 52.48 and 7.66 per cent, respectively than conventional method, which might be due to better nutrition as there was least competition between plants for space and nutrients because of much wider plant spacing. SRI method induced earliness in flowering by about a week than conventional method perhaps due to better and early vegetative growth. These results corroborate with the findings of Shekhar *et al*. (2009) and Vijay Kumar *et al.* (2006).

Yield and economics

Grain yield was produced higher by the large margin of 34.63 per cent in SRI method over conventional (Table 1). It

Table 1 : Comparative performance of hybrid rice under conventional and SRI method of cultivation on farmer's field

Sr. No.	Crop/soil parameters	Conventional method	SRI method	Increase over conventional method in	
				Units	Percentage
Crop parameters					
1.	Plant height (cm)	102.20	103.40	1.20	1.17
2.	Root spread (cm)	7.90	13.90	6.00	75.95
3.	Root depth (cm)	10.60	23.80	13.20	124.53
4.	No. of tillers/hill	16.00	52.00	36.00	225.00
5.	No. of tillers/m^2	800.00	832.00	32.00	4.00
6.	No. of spikes/hill	10.00	26.00	16.00	160.00
7.	No. of spikes/m^2	500.00	416.00	(-) 84.00	(-) 16.80
8.	Spike length (cm)	26.00	30.00	4.00	15.38
9.	No. of grains/spike	202.00	308.00	106.00	52.48
10.	Test weight (g)	23.50	25.30	1.80	7.66
11.	Days to 50% flowering	82.00	74.00	(-) 8.00	(-) 9.76
12.	Grain yield (q/ha)	61.80	83.20	21.40	34.63
13.	Cultivation cost (Rs./ha)	20560	18580	(-) 1980	(-) 9.63
14.	Gross return (Rs./ha)	618.00	83200	21400	34.63
15.	Net return (Rs./ha)	41240	64620	23380	56.69
16.	B:C ratio	2.00	3.48	1.48	74.00
Post harvest soil parameters					
17.	Organic carbon (0.32%)	0.31	0.34	0.03	-
18.	Soil pH (7.6)	7.60	7.50	(-) 0.10	-
19.	Available N (170.6kg/ha)	169.30	172.20	2.90	-
20.	Available P (26.8 kg/ha)	26.40	27.00	0.60	-
21.	Available K (216.2 kg/ha)	216.00	216.60	0.60	-

Note:- Figures given in parenthesis are initial values

was attributed to more number of grains/spike and test weight of grain. The better performance of crop under SRI method was the out come of enhanced growth measured in terms of root development and number of tillers/hill and also per unit area. Improved root development might have increased the uptake of nutrients even from deeper layer of soil. In SRI method, crop plants may utilize solar radiation in better way which might has increased the photosynthesis rate and finally the accumulation and translocation of more photosynthates from source to sink. Hastening in flowering by about a week in SRI method may improve yield attributes and finally the grain yield. The productivity enhancement in SRI method corroborate well with the findings of Shekhar *et al.* (2009) and Sinha and Talati (2007).

Cost of hybrid rice cultivation was lower in SRI method than conventional by 9.63 per cent. It was due to lesser costs of seed, seedlings growing, weed control, transplanting and irrigation. Gross return was higher by 34.63 per cent in SRI method and it was directly attributed to grain yield. Net return obtained in SRI method was Rs. 23380/ha or 56.69 per cent higher than conventional method. It might be attributed to higher gross return and lesser cost of cultivation in SRI method as also indicated from B :C ratio which was worked out 74.0 per cent more in SRI than conventional method. These results are in agreement with the findings of Reddy *et al*. (2006).

Post- harvest soil:

Different soil parameters *viz*., organic carbon, available N, P and K marginally increased in SRI method but reduced in conventional method as compared to their initial levels. It might be associated with application of FYM in sufficient quantity in SRI method which left residues of nutrients after crop harvest, besides, increased microbial activity in soil with FYM application may improve the soil condition at crop harvest. These results confirm the findings of Husain *et al*. (2009).

Trial No. - 2:

Growth and yield attributes :

Plant height was not much influenced by nutrients management practices, but root spread and root depth were found considerably higher with NPK + FYM and FYM than NPK alone (Table 2). In NPK fertilizers alone, root spread and depth reduced by 20.27 and 13.12 per cent as compared to

Table 2 : Effect of nutrient management practices on hybrid rice under SRI method

Sr. No	Crop/soil parameters	Nutrients applied			Per cent decrease from FYM in	
		N:P:K@ 150:75:60	NPK @ 150:75:60+ 10 t FYM	FYM @ 20 t/ha	NPK	NPK +FYM
	Crop parameters					
1.	Plant height (cm)	105.30	104.20	103.60	+5.91	+0.56
2.	Root spread (cm)	11.80	24.10	14.80	20.27	4.73
3.	Root length (cm)	21.20	24.30	24.40	13.12	0.41
4.	No. of Tillers/hill	46.00	53.00	54.00	14.82	1.85
5.	No. of tillers/m^2	736.00	848.00	864.00	14.82	1.85
6.	No. of Spikes/hill	22.00	27.00	26.00	15.38	+3.85
7.	No. of Spikes/m^2	352.00	432.00	416.00	15.38	+3.85
8.	Spike length (cm)	26.20	29.60	30.20	13.25	1.99
9.	No. of grains/spike	286.00	306.00	302.00	5.30	+1.32
10.	Test weight (g)	23.60	26.10	24.80	4.84	+5.24
11.	No. of days to 50% flowering	77.00	73.00	75.00	+2.67	2.67
12.	Grain yield (q/ha)	75.30	83.80	83.10	9.39	+0.84
13.	Cultivation cost (Rs./ha)	17649	19649	18580	5.01	+5.75
14.	Gross return (Rs./ha)	75300	83800	83100	9.39	+0.84
15.	Net return (Rs./ha)	57651	64151	64520	10.65	0.57
16.	Benefit : Cost ratio	3.27	3.26	3.47	5.76	6.05
	Post harvest soil parameters					
17.	Organic carbon (0.30%)	0.30	0.31	0.33	-	-
18.	Soil pH (7.7)	7.70	7.70	7.60	-	-
19.	Available N (165.2 kg/ha)	164.60	165.80	166.40	-	-
20.	Available P (24.3 kg/ha)	24.10	24.60	24.90	-	-
21.	Available K (215.4 kg/ha)	215.10	216.00	216.30	-	-

Note:- Figures given in parenthesis are initial values

FYM alone, respectively. Similarly, number of tillers/hill and per m^2 reduced in NPK treatment by 14.82 per cent as compared to FYM treatment. Number of spikes/hill or m^2 were maximum with NPK + FYM closely followed by FYM alone. NPK alone reduced spike number by 15.38 and 18.52 per cent than FYM alone and NPK + FYM, respectively. Spike length was considerable higher with FYM or NPK + FYM and reduced by 13.25 per cent with NPK alone. Number of grains per spike and test weight of grain were also higher under FYM or NPK + FYM, but increased 5.30 and 4.84 per cent under NPK alone treatment, respectively. The better performance of NPK + FYM or FYM alone in respect to growth and yield attributes might be due to improved soil condition because of FYM application which may increase the availability of macro and micro nutrients in soil for crop plants. The best performance of NPK + FYM treatment in respect to yield attributes might be due to readily available NPK through fertilizer and improved soil condition along with increased availability of micronutrients through FYM application. Better performance of rice under integrated use of inorganic fertilizers and organic manures was also reported by Chettri and Mondal (2005).

Yield and economics:

Grain yield was produced considerably higher with NPK + FYM or FYM alone over NPK alone. Application of NPK alone reduced grain yield by 9.4 and 10.2 per cent as compared to FYM alone and NPK + FYM, respectively. It might be attributed to number of spikes per unit area, spike length, number of grains/spike and test weight as all these reduced with NPK alone application. These results confirm the findings of Chettri and Mondal (2005).

Cost of cultivation was highest in NPK+FYM treatment and lowest in NPK alone. It was attributed to additional cost of FYM. The treatment of FYM alone required higher cost than NPK fertilizers because of its transportation and cost of application. Gross return was highest under NPK + FYM treatment very closely followed by FYM alone, while NPK alone reduced gross return by 9.4 and 10.2 per cent as compared to FYM alone and NPK + FYM treatments, respectively. It was directly attributed to grain yield. Net return was obtained highest of Rs. 64520/ha from FYM alone followed by Rs. 64151/ha with NPK + FYM and lowest of Rs. 57651/ha with NPK alone. Thus, NPK alone reduced net return by 10.13 and 10.65 per cent than NPK + FYM and FYM alone, respectively. These are attributed to combined effect of gross return and cost of cultivation. However, B : C ratio was highest under FYM alone, while other two practices maintained similar ratio with each other.

Post- harvest soil:

Soil fertility in terms of organic carbon and available NPK increased marginally with FYM treatments, while decreased with NPK fertilizers alone as compared to their initial soil status. The treatment of 20 t FYM/ha showed more increase in soil fertility than the treatment of 10 t FYM/ha at crop harves (Husain *et al*., 2009).

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