RESEARCH ARTICLE Indian Journal of Agricultural Research, Volume 59 Special Issue: 176-180 (November 2025)

Impact Study on Front Line Demonstration of Rice Variety Shalimar Rice-4 (SR-4) in District Kupwara

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10.18805/IJARe.A-6312

ABSTRACT

Background: Paddy constitutes a prominent cereal crop in district Kupwara of Jammu and Kashmir. The low productivity in the respective area might be accredited to the non-implementation of the amended cultivation practices and non-availability of high yielding rice varieties. Consequently, efforts have been focused on showcasing high-yielding rice varieties released by SKUAST-Kashmir, along with advanced production technologies to boost rice productivity.

Methods: The current investigation was executed by Krishi Vigyan Kendra, Kupwara, SKUAST-Kashmir J and K to appraise the imprints of frontline demonstration aimed at promoting the adoption of popular rice variety, Shalimar rice -4(SR-4).180 demonstrations were conducted in different villages of district Kupwara .90 farmers were involved in FLD programme encasing an expanse of 36.0 hectare in three consecutive years-2021-22, 2022-23, 2023-24.

Result: Results showed that the rice variety Shalimar rice-4 (SR-4)has highest grain yield (81.00-86.00 q/ha) under irrigated conditions during kharif seasons of 2021-22,2022-23 and 2023-24). In frontline demonstrations, a mean output of 83.33 q/ha was achieved, while farmer practices yielded only 51.66 q/ha. This resulted in an observed technology gap of 1.00, an extension gap of 32.33 and a technology index of 1.19 per cent between the two methods. Consequently, the average yield of paddy improved by 63.33 percent compared to traditional farming practices.

Key words: FLD, Impact, Rice, Yield and economics.

INTRODUCTION

Rice (*Oryza sativa* L.) remains the primary food that sustains half population of the world daily. Approximately 70 million of the most impoverished individuals rely on it (Khandey, 2017). Nearly 640 million tonns of rice is produced in Asia, representing 90% of global production. India is the second-largest producer of rice after China and has allocated the most extensive area for rice cultivation (43.1 Mha) paying for 29.4 per cent of the global rice expanse and producing 110.15 million tons, with an average yield of 2,550 kg per hectare (Economic Survey, 2017-2018). After West Bengal, UP stays the second largest rice - growing state in the country, where rice is grown over an extent of 5.86 Mhaencircling a production of 14.41 million tonnes and the productivity is 2.46 tonnes per hectare.

In UT of J and K , rice is primarily cultivated as a single-crop activity across both divisions, yielding an average of 41 quintals per hectare. Rice production rose from 4,327 quintals in 1965 to 5,001 quintals in 2010-11, while the cultivated area expanded from 212.00 hectares to 261.35 hectares during the same period (Economic Survey, 2017-2018). The rice is cultivated on 0.26 million hectares exhibiting output and productivity of 0.55 million tonnes and 2.1 tonnes per hectare respectively.

In district Kupwara rice being the major crop is cultivated over an expanse of 22000 hectares, possessing a mean productivity of 45 qtls per hectare (Statistics CAO Kupwara, 2022). The rice productivity in the concerned district is stumpy on account of the low seed replacement rate and non availability of improvedrice varieties and non-adoption of scientific cultivation methods recommended by SKUAST-Kashmir. Front line demonstration serves as an effective mechanism for technology transfer, showcasing the potential of new techniques to enhance yield and profitability. Keeping in view the afore mentioned reasons

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How to cite this article: Bhat, R.A., Malik, K.M., Bhat, F.N., Gani, G., Raina, F.A., Rashid, Z. and Altaf, M. (2025). Impact Study on Front Line Demonstration of Rice Variety Shalimar Rice-4 (SR-4) in District Kupwara. *Indian Journal of Agricultural Research*. **59 (Special issue):** 176-180. doi: 10.18805/IJARe.A-6312.

Submitted: 17-09-2024 **Accepted:** 15-03-2025 **Online:** 26-04-2025

KVK,Kupwara conducted frontline demonstrations in different villages of the district on high yielding ,disease resistant rice variety *viz.* Shalimar rice-4 (SR-4) released by SKUAST-Kashmir in order to boost the rice production of the respective district.

MATERIALS AND METHODS

The current investigation was accomplished at farmers field in District Kupwara through front line demonstration by Krishi Vigyan Kendra Kupwara SKUAST-Kashmir for during the Kharif seasons of three successive years from 2021-22, 2022-23 and 2023-24.

Hundered eighty (180) demonstrations were conducted in various villages of Kupwara district. Ninety (90) farmers were involved in FLD programme encasing an expanse of 36 .0 hectare in *kharif* seasons of the three consecutive years of 2021-22, 2022-23, 2023-24. Each frontline demonstration was established on a 0.2-hectare plot, with an adjacent 0.2-hectare area designated as a control to compare against traditional farming practices. Farmers were selected based on a survey conducted by KVK and specialized training was provided during the implementation of the demonstration. Table 1 outlines the differences between the demonstration and the current farming practices. The crop was harvested at maturity. The extension gap, technology gap and technology index were evaluated using the formulas proposed by Samuil *et al.* (2000) and Dayanand *et al.* (2012), as detailed below:

- Per cent increase over farmers practices =

$$\text{Improved practices - Farmers } \frac{\text{Practices}}{\text{Farmers}} \text{ practices } 100$$

- Technology gap = Potential yield - Demonstration yield
- Extension gap = Demonstration yield - Farmers yield
- Technology index =

$$\frac{\text{Potential yield - Demonstration yield}}{\text{Potential yield}} \times 100$$

Data on the adoption and horizontal spread of technologies were gathered through interactions with farmers. The information was analyzed using appropriate statistical methods. The following formulas were employed to evaluate the impact on various parameters of the rice crop.

- Impact of yield =

$$\frac{\text{Yield of demonstration plot - Yield of control plot}}{\text{Yield of control plot}} \times 100$$

- Impact on adoption (% change) =

$$\frac{\text{Number of adopters after demonstration - Number of adopters before demonstration}}{\text{Number of adopters before demonstration}}$$

- Impact on horizontal spread (% change) =

$$\text{After area (ha) - Before area (ha)}$$

RESULTS AND DISCUSSION

Plant height

The average plant height from the demo plots was recorded as 140.05 cm as compared to average plant height of 115 cm from farmers field (Table 2) , this might be in debt of the element that the variety in demonstration plot has high biomass alongwith high grain yielding capacity *i.e.* genetic potentiality and balanced use of fertilizers and by following other recommended package of practices, these results resemble with Samant (2015).

No. of panicles /m^2

From the (Table 2) it can inferred that number of panicle/ m^2 was found highest from the demo plots with average panicle/m^2 as 384.06 as compared to 306.33 from farmers practice plots this may be due to high yielding potential of variety with higher yield attributes as a result of implementing the recommended practices in the demo plots where as the control plots lack such practices. Same results have also been reported by Tripathi *et al*., 2013 and Samant (2015).

Yield

Analysis of the data (Table 2) shows that the average yield from demonstration plots was 83.33 q/ha, while traditional farming practices yielded 51.60 q/ha. This represents an increase of 63.33 per cent in rice yield. The yield under demonstration practices significantly surpasses that of conventional methods due to high yield potential of the demo variety of rice balanced and proper use of fertilizers and other recommended practices of rice cultivation.

Table 1: Level of use and gap in adoption of rice technologies in Kupwara.

Crop operation	Recommended technologies	Existing technologies	Gap
Variety	SR-4	K-39	Partial
Land preparation	Ploughing/Harrowing	Ploughing/Harrowing	Nil
Seed rate	3 kgs/500 m^2	10 kg/500 m^2	Huge
Seed treatment	Thiram	No seed treatment	Huge
Transpalnting method	Line	Random	Partial
Fertilizer application/dose	120N+ 60P +40K+20Zn	Either excess or less	Huge gap
Herbicide application	Pyrazosulfuran Ethyl+ alachlor	Butachlor	Partial

Table 2: Yield and gap analysis of FLD on rice at farmers field.

Year	No. of FLDs covered	Area	Plant height (cm)		Panicle/ m^2 (No)		Potential yield (q/ha)	Grain yield (q/ha)		Increase in yield over FP (%)	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
			Demo	FP	Demo	FP		Demo	FP				
2021	70	14	127.02	103.50	377.90	289	85	81	47	76.59	36.00	2.00	2.35
2022	60	12	136.03	107.50	385.00	310	85	83	51	60.78	31.00	3.00	3.52
2023	50	10	140.05	115.00	389.03	320	85	86	57	52.63	30.00	-2.00	-2.29
Mean			134.36	108.6	384.06	306.33	85	83.33	51.66	63.33	32.33	1.00	1.19

These results align with the findings of Singh (2018). However, fluctuations in rice yield across different years may be attributed to variations in soil moisture and rainfall.

Extension gap

Extension gap of 36.00, 31.00 and 30.00 q/ha was perceived in 2021, 2022 and 2023 respectively. A usual extension gap of 32.33 q/ha was noted, highlighting the necessity to educate farmers through various outreach methods, such as frontline demonstrations and training sessions. This approach is essential for encouraging the adoption of improved paddy varieties and protective technologies to narrow the extension gap. Increasing the use of modern production techniques alongside high-yield varieties will help address this concerning trend, (Meena and Singh, 2016).

Technology gap

The disparities amid the potential yield and the yield from demonstration plots were 2, 3 and -2 for the years 2021, 2022 and 2023, respectively. Over the three-year FLD program, the average technology gap was 2.33 q/ha. This observed gap can be attributed to variations in soil fertility, farming practices and local climatic conditions (Meena and Singh 2016).

Technology index

The technology index reflects practicality of the demonstrated technology in a farmer's field. The observed value of technology index was 2.35,3.52 and -2.29 per cent during 2021, 2022 and 2023 respectively (Table 2). Technology index was recorded as 1.19% during kharif seasons of demonstrations, showing the efficiency of interventions. With these results the adoption of the interventions will enhance which in turn will improve the productivity of rice. These results are in close conformity with the results of Bhartiya *et al.* (2017).

Economics

Rice variety SR-4 demonstrated higher net returns of Rs 88,607, Rs 92,659 and Rs 97,421 per hectare in 2021, 2022 and 2023, respectively, compared to traditional farming practices, which yielded Rs 48,329, Rs. 49,421 and Rs 54,020 during the same years (Table 3). Additionally, the BCR for rice raising using best practices were 1.50, 1.53 and 1.54, while the ratios for traditional methods were 0.99, 0.96 and 1.01 (Saikia and Saikia, 2022). These differences are likely due to the higher yields achieved with improved technologies, which corroborates Mokidue *et al.* (2011). The results from the front line demonstration (FLD) showcased a significant positive impact, allowing researchers to effectively illustrate the benefits of the new agricultural technologies in farming contexts, ultimately facilitating long-term technology transfer.

Impact of technology

The technology significantly influenced the adoption of the high-yielding paddy variety SR-4, covering 830 hectares

Table 3: Economics.

Year	Yield (q/ha)		Cost of cultivation (Rs./ha)		Gross return (Rs./ha)		Net return (Rs./ha)		BCR (Rs./ha)	
	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP
2021	81	47	58713	48341	147320	96670	88607	48329	1.50	0.99
2022	83	51	60551	51123	153210	100554	92659	49421	1.53	0.96
2023	86	57	62919	53320	160340	107340	97421	54020	1.54	1.01
Mean	83.33	51.66	60727.66	50928	153623	101521.33	92895.66	50590	1.52	0.98

Table 4: Impact of (FLDs) on adoption of rice production technology.

Crop operation	No.of adapters		Change in no. of adapters	% Change after demonstration
	Before demonstration	After demonstration		
Variety	50	150	100	200
Land preparation	150	165	15	10
Seed rate	50	170	120	240
Fertilizer dose	100	180	80	800
Proper herbicide application	30	180	150	400
Mean	76	169	93	330

Table 5: Impact of (FLDs) on horizontal spread of rice.

Variety	Area (ha)		Change in area (ha)	Impact % change
	Before demonstration	After demonstration		
SR-4	150	550	400	266.66

over the past three years. This variety boasts quality traits such as blast resistance, early maturity and a yield potential of up to 85 quintals per hectare. The demonstration also facilitated the promotion of scientific cultivation which increased the average paddy yield upto 83.33 q/ha compared to farmers practice with 51.66 q/ha. The demonstrations also recorded average higher gross returns of 153623.00 compared to farmers practice with average gross returns of 101521.33 which had an average benefit cost (B:C) ratio of 1.52 and 0.98, respectively. The technology made a notable impact on the farming community, leading to a broader adoption across the region. The results are in agreement with Singh *et al.* (2020).

Horizontal spread of rice, variety SR-4

The Front Line Demonstrations (FLDs) yielded positive outcomes, showcasing the benefits of the new technologies in actual farming conditions. FLDs organized by KVK, Kupwara, significantly contributed to a 48.57% horizontal spread of this technology (Table 4). The results are in agreement with Singh *et al.* (2020).

Adoption of rice technologies

During the course of study it was observed that prior to demonstration, the adoption of the recommended new rice variety among farmers was low, but it surged by 200% afterward. Overall, the adoption level of rice cultivation improved by approximately 330% (Table 5). The results are in agreement with Singh *et al.* (2020).

CONCLUSION

Farmers have experienced a significant increase in income due to the cultivation and adoption of the new rice variety SR-4 with other recommended scientific techniques of production. This statement is backed by the income generated by the farmers over past three years in contrast to the local variety and farmers practice. Consequently, this demonstration was widely accepted with the variety and other recommended package of practices by realizing higher profitability. The FLDs posed a affirmative influence on Horizontal spread and adoption rate of SR-4. The FLDs recorded lower technology gap as well as technology index showing the more feasibility of the variety and other technological interventions in the area, however higher value of extension gap indicates that more demonstrations on the supra technologies needs to be conducted.

ACKNOWLEDGEMENT

The present study was supported by, Directorate of Extension, SKUAST-Kashmir and ICAR, ATARI, Ludhiana and FLD farmers.

Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Informed consent

All animal procedures for experiments were approved by the Committee of Experimental Animal care and handling techniques were approved by the University of Animal Care Committee.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or sponsorship influenced the design of the study, data collection, analysis, decision to publish, or preparation of the manuscript.

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