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Performance of timely sown irrigated wheat varieties under irrigated conditions in Faridabad district of Haryana

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Abstract

A field study covering two consecutive rabi seasons (2021–22 to 2022–23) was undertaken on farmers' fields in Faridabad district, Haryana, under irrigated conditions. The objective was to evaluate the yield performance and economic benefits of recently released wheat varieties when sown timely. Frontline demonstrations (FLDs) compared WH 1105 with the widely grown local check variety HD 2967. Results consistently showed that improved practices with WH 1105 produced higher grain yields than farmer practices using HD 2967. Yields of the improved varieties ranged between 52.5 and 53.8 q/ha, reflecting an advantage of 13.74–16.66% over local practice across the study period. On average, the extension gap was 7.0 q/ha, the technology gap 2.85 q/ha, and the technology index 5.0%. In addition to yield, the improved varieties also recorded higher gross and net returns with a superior benefit–cost ratio. The findings suggest that WH 1105 is well-suited, high-returning options for timely sown irrigated wheat cultivation.

Keywords: Timely sowing, wheat, irrigated conditions, frontline demonstration, varietal performance

Introduction

India consistently ranks among the world's leading wheat-producing nations, contributing significantly to global food security. The crop occupies nearly 30 million hectares in the country, with annual production exceeding 100 million tonnes in recent years. Despite being the second-largest wheat producer globally, yields vary considerably across states and agro-climatic zones. Northern states such as Punjab, Haryana, and Uttar Pradesh remain the primary wheat belts. Frontline demonstrations (FLDs) serve as an important extension approach to bridge yield gaps and promote the adoption of improved agricultural technologies (Desai *et al.*, 2021) ^[2]. Conducted under farmers' field conditions and supervised by experts, FLDs allow real-time evaluation of varieties and production practices while highlighting extension and technology gaps. In Faridabad district of Haryana, wheat is the dominant rabi crop, yet productivity is often constrained by varietal choice. Selecting varieties suited to local growing conditions is critical for optimizing yield potential (Singh, 2017) ^[11]. High-yielding, timely sown varieties can ensure better productivity during the optimum growing season (Reager *et al.*, 2018) ^[8]. To address these challenges, Krishi Vigyan Kendra (KVK), Faridabad introduced improved wheat varieties and recommended agronomic practices through FLDs. These demonstrations aimed to encourage adoption of superior varieties, increase yield, and generate farmer feedback regarding adoption constraints. Against this background, the present two-year study was undertaken to evaluate the productivity and profitability of promising wheat variety under timely sown irrigated conditions through FLDs on farmers' fields.

Materials and Methods

The study was conducted during three consecutive rabi seasons (2021-22 to 2022–23) on farmers' fields in Faridabad district, Haryana, through FLDs organized by KVK, Faridabad. A total of 60 demonstrations were laid out, covering 24 ha under the paddy–wheat cropping system with active farmer participation. Selected farmers were trained in scientific wheat production practices before implementation. The soils of the demonstration sites were

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generally sandy loam, low in nitrogen and phosphorus, and medium to high in potassium. The mean annual rainfall during the study period was about 515 mm. Training programs emphasized seed treatment, line sowing, balanced fertilization, weed control, and irrigation scheduling at critical crop growth stages. Data were collected from demonstration plots (Improved Practices – IP) and adjoining farmer-managed plots (Farmer Practices – FP). Parameters assessed included grain yield, cost of cultivation, gross and net returns, and benefit–cost ratio. Gaps in technology adoption were quantified following Samui *et al.* (2000) [9].

Formulas used:

- Technology gap = Potential yield – Demonstration yield
- Extension gap = Demonstration yield – Farmers' yield
- Technology index (%) = (Technology gap ÷ Potential yield) × 100

Results and Discussion

Productivity

Table 3 compares the performance of timely sown wheat under Frontline Demonstrations (FLDs) using Improved Practices (IP) and Farmers' Practices (FP) from Rabi 2021–22 to 2022–23. In 2021–22, 30 demonstrations (12 ha) using WH1105 recorded 53.8 q/ha (IP) against 47.3 q/ha (FP), showing a 13.74% gain, an extension gap of 6.5 q/ha, and a reduced technology index of 3.92%. In 2022–23, WH1105 again outperformed FP (52.5 vs. 45.0 q/ha), with a 16.66% yield increase, a 7.5 q/ha extension gap, and a 6.25% technology index. Overall, across 60 demonstrations (24 ha), IP averaged 53.15 q/ha against 46.15 q/ha in FP, reflecting a 15.2% yield advantage. The mean extension gap (7.0 q/ha) and technology index (5.0%) confirm that improved practices are practical and profitable, significantly boosting wheat productivity under timely sowing.

Gap Analysis: Extension Gap: Averaged 7.0 q/ha (range: 5.1 to 7.5 q/ha), indicating substantial yield potential if improved practices are widely adopted (Ali & Singh, 2021; Kumar *et al.*, 2024) [1, 5].

Technology Gap: Varied between 2.2 and 3.5 q/ha, with a mean of 2.8 q/ha affected by soil fertility and weather variability (also observed by Morwal, 2018) [7].

Technology Index: Mean of 5.0%, demonstrating high feasibility of adoption. The lowest index was 3.92% (2021–22), and the highest was 6.25% (2022–23). These findings are consistent with earlier results in pulses (Mokidue *et al.*, 2011; Kumar *et al.*, 2020; Kumar *et al.*, 2024) [6, 4, 5].

Economics

Economic analysis (Table 4) shows that the **cost of cultivation** under improved practices (IP) and farmers' practices (FP) was nearly the same (₹ 37,900/ha vs. ₹ 37,650/ha), implying that adoption of IP did not impose a considerable extra financial burden. Yet, gross returns under IP averaged ₹ 1,10,613/ha compared to ₹ 1,05,638/ha under FP, translating into net returns of ₹ 72,713/ha under IP versus ₹ 67,988/ha under FP. The benefit–cost (B:C) ratio further underscores the economic advantage: on average, IP achieved 2.91, while FP managed 2.80.

These results strongly suggest that improved practices not only raise productivity but also strengthen profitability without significantly raising input costs. Given that the cost of cultivation remains nearly constant, the additional returns come from better yields, efficient use of inputs, and reduced losses. These findings confirm that improved technologies enhance economic viability without additional cost (Hooda & Rani, 2024; Kumar *et al.*, 2024) [3, 5].

Table 1: Comparisons between Improved Practices (IP) and Farmer's Practices (FP) under timely sown Wheat frontline demonstrations

Sr. No.	Particular	Improve Practices (FLDs)	Farmers Practice (Existing practices)
1.	Farming situation	Irrigated	Irrigated
2.	Previous crops	Paddy	Paddy
3.	Seed treatments	Seed treatment with fungicide Tebuconazole 2 DS at 1 g/kg seed followed by biofertilizers <i>Azotobacter</i> and PSB culture	Nil
4.	Time of sowing	25th October to 15th November	15 th - 25 November November
5.	Seed rate	100 kg/ha	125-150 kg/ha
6.	Fertilizers dose	150:60:30:25 kg NPK Zn/ha	175-60: 0:0 kg NPKZn/ha
7.	Weeds management	Sulfosulfuron 75% + Metsulfuroun methyl 5% WG (ready mix) 32 g a.i./ha at 30-35 DAS	Sulfosulfuron 75% at 30-35 days after sowing (DAS).f.b 2,4-D at 0.50 kg a.i./ha after one week of 1st spray
8.	Plant protection measure	Need based application of insecticides as per university recommendation.	No timely plant protection measures

Table 2: Details of the experiment.

Season & year	No. of Demonstrations.	Area (ha)	Variety	
			Assessed	Control
Rabi 2021-22	30	12.0	WH1105	HD 2967
Rabi 2022-23	30	12.0	WH1105	HD 2967

Table 3: Details of acreage, yield, per cent increase in yield, extension gap, technology gap and technology index under timely sown Wheat frontline demonstrations

Season & year	No. of Demo.	Area (ha)	Variety		Yield (q/ha)		Per cent increase in yield over FP	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
			IP	FP	IP	FP				
Rabi 2021-22	30	12.0	WH1105	HD 2967	53.8	47.3	13.74	6.5	2.2	3.92
Rabi 2022-23	30	12.0	WH1105	HD 2967	52.5	45.0	16.66	7.5	3.5	6.25
Total/ Mean	110	44.0	-	-	53.15	46.15	15.2	7	2.85	5.085

IP: Improved Practices i.e. FLD; FP: Farmers' Practice

Table 4: Economics under timely sown Wheat under frontline demonstration

Year	Cost of cultivation Rs/ha		Gross Return Rs/ha		Net Return Rs/ha		B:C Ratio	
	IP	FP	IP	FP	IP	FP	IP	FP
Rabi 2021-22	37250	36750	108660	104025	71410	67275	2.91	2.83
Rabi 2022-23	38550	38550	112565	107250	74015	68700	2.92	2.78
Mean	37900	37650	110613	105638	72713	67988	2.91	2.80

Conclusion

Two-year study demonstrated that adoption of improved wheat variety WH 1105, along with recommended agronomic practices under FLDs, significantly enhanced yield and profitability compared to traditional farmer practices in Faridabad district. Improved practices increased grain yield, gross returns, and net returns with a superior benefit–cost ratio. The reduction in extension and technology gaps indicates that dissemination of appropriate production technologies can effectively bridge yield gaps under timely sown irrigated conditions. Overall, WH 1105 emerged as promising, profitable, and farmer-friendly options for irrigated wheat cultivation. Scaling up such demonstrations and promoting location-specific varieties and agronomic practices will be crucial for sustaining wheat productivity and enhancing farmers' income.

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