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EFFECT OF FRONTLINE DEMONSTRATIONS ON YIELD ENHANCEMENT AND PROFITABILITY IN FODDER OAT CULTIVATION

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SUMMARY

Frontline Demonstrations (FLDs) are systematic, long-term educational activities where agricultural scientists showcase new technologies on farmers' fields, fostering direct interaction and feedback between researchers and farmers. In this context, FLDs were conducted over four consecutive years (2020-21 to 2023-24) to assess the performance of the oat variety HJ 8. The study revealed that demonstrated plots resulted in oat average fodder yield of 543 q per ha, marking a significant increase (34.07%) over the local variety (405 q/ha). The average technological and extension gap were recorded at 138 and 107 q per ha with technological index of 16.46 per cent. Consequently, the average gross returns (Rs. 111275 per ha) and net returns was higher in demonstrated plots than in plots using farmers' practice recording Rs. 83030 and Rs. 40011 per ha, respectively. Additionally, average B:C ratio was also notably higher (2.45:1) in demonstrated plots than farmers' practice (1.93:1). These findings underscore the importance of promoting such advanced varieties to enhance farmer income and agricultural productivity.

Key words: Oat, frontline demonstration, technology gap, extension gap, technological index

The Farmer FIRST (Farm, Innovations, Resources, Science and Technology) Programme (FFP) is an initiative launched by the Indian Council of Agricultural Research (ICAR) to enhance farmer-scientist interaction and involve farmers as active participants in agricultural research and technology dissemination. The Farmer FIRST program is a significant initiative aimed at improving agricultural practices and livelihoods, especially for small and marginal farmers. It typically involves collaboration between agricultural universities, research institutions and farming communities to address local agricultural challenges effectively. These programs often focus on disseminating innovative farming techniques, enhancing farm productivity, improving market access, and providing valuable training and extension services to farmers. The program bridges the gap between research institutions and farming communities, ensuring sustainable agricultural development. The program emphasizes the integration of technologies for holistic farming development and aims to increase farmers' income and improve their livelihoods. This programme is being implemented by ICAR through State Agricultural Universities (SAUs), ICAR Institutes, and Krishi Vigyan Kendras (KVKs). FFP consists of four major components *i.e.*, Farmer-Scientist Interaction, Technology Demonstration, Integrated Farming System (IFS) and Market Linkages & Value Addition.

Under this programme, front line demonstrations (FLD) are conducted on various technologies developed by the agricultural institutes. The main objective of FLD is to demonstrate newly released crop production and protection technologies and its management practices in the farmers' field under different agro-climatic regions and farming situations. Extension agencies utilize frontline demonstrations effectively to promote and expand

[2]PI, Farmer First Programme.
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the adoption of scientific technologies. These demonstrations aim to bridge yield gaps caused by limited awareness among farmers about improved cultivation practices. (Singha and Baruah, 2011). FLDs are meant not only to educate farmers on the efficacy of new technologies but also help the field extension functionaries to gain confidence in suggested technologies (Darshan *et al*., 2021). These demonstrations cover a wide array of crops, including fodder crops such as oat (*Avena sativa* L.). Oat is a fast-growing, short-duration fodder crop that produces a substantial yield of forage (Phogat *et al*., 2021) and ranks around sixth in world cereal production after wheat, maize, rice, barley and sorghum (Bhukar *et al*. 2024). The quality of fodder used in livestock feeding is crucial, as it directly affects productivity as well as the quality of milk and dairy products. (Jindal *et al*., 2024). Oat forage is highly palatable, nutrient-rich, and easily digestible, making it an excellent feed for ruminants (Satpal *et al*., 2024). Despite the release of several high-yielding oat varieties by various research institutes, many farmers continue to cultivate traditional and outdated varieties, leading to a significant gap in fodder yield. This gap is largely due to a lack of awareness regarding newly developed technologies, which highlights the need for effective dissemination. Frontline demonstrations (FLDs) serve as a vital tool in this regard by showcasing the advantages of scientifically proven cultivation practices, thereby narrowing the gap between research and field-level adoption. With this objective, FLDs were conducted to evaluate the performance of the oat variety HJ 8 and to promote its adoption among farmers in the Hisar district of Haryana.

MATERIALS AND METHODS

Frontline demonstrations (FLDs) on oat variety HJ 8 were conducted over four consecutive years *i.e.*, 2020-21, 2021-22, 2022-23 and 2023-24 in three villages of district Hisar *viz.*, Chirod, Payal and Lohari Ragho. A total of 200, 400, 92, and 100 FLDs were conducted covering area of 8.00, 20.00, 4.60 and 5.00 acres during the respective year (Table 1). The crop was raised following the package of practices recommended by CCS Haryana Agricultural University, Hisar (Anonymous, 2023).

The performance of the demonstrated variety was compared with the local oat varieties traditionally used by farmers, considering it as farmers' practice (check). Training programs were also conducted in each of the demonstration villages to enhance the technical skills of participating farmers and ensure the effective adoption of improved cultivation practices.

At harvest, data were collected on the fodder yield of both the demonstrated and check plots. Key economic indicators including fodder yield, cost of cultivation, net returns, and benefit-cost ratio were calculated for both sets of the plots. Yield gaps and other relevant parameters were analyzed using formulas proposed by Singh and Singh (2020).

$$\text{Per cent increase in yield (\%)} = \frac{\text{Yield in demonstration plot (q/ha)} - \text{Yield in check plot (q/ha)}}{\text{Yield in check plot (q/ha)}} \times 100$$

$$\text{Technological gap (q ha}^{-1}\text{)} = \text{Potential yield of the crop (q/ha)} - \text{Yield in demonstration plot (q/ha)}$$

$$\text{Extension gap (q ha}^{-1}\text{)} = \text{Yield in demonstration plot (q/ha)} - \text{Yield in farmers' practice plot (q/ha)}$$

$$\text{Technological index (\%)} = \frac{\text{Potential yield of the crop (q/ha)} - \text{Yield in demonstration plot (q/ha)}}{\text{Potential yield of the crop (q/ha)}} \times 100$$

RESULTS AND DISCUSSION

Fodder Yield

The oat fodder yield in demonstration plots ranged from 528 to 557 quintals per hectare, compared to 366 to 442 quintals per hectare in plots using farmers' practice (Table 2). The mean fodder yield recorded under demonstration plots was higher (543

TABLE 1
Details of Frontline Demonstrations laid out on oat fodder crop

Technology demonstrated	Year	No. of FLDs	No. of farmer	Area covered (ha)
Fodder production of oat (HJ 8)	2020-21	200	200	8.00
	2021-22	400	400	20.00
	2022-23	92	92	4.60
	2023-24	100	100	5.00

TABLE 2
Overall yield gap analysis in oat variety HJ 8

Year	Variety demonstrated	Farmers' variety	Green fodder yield (q/ha)			Increase in yield (%)	Technology gap (q/ha)	Extension gap (q/ha)	Technological index (%)
			Potential yield	Yield under FLD	Yield of local check				
2020-21	HJ 8	Local	650	541	395	36.96	109	146	16.77
2021-22	HJ 8	Local	650	528	366	44.26	122	162	18.77
2022-23	HJ 8	Local	650	545	416	31.00	105	129	16.15
2023-24	HJ 8	Local	650	557	442	26.02	93	115	14.31
	Mean		650	543	405	34.07	107	138	16.46

q/ha) than in plots using farmers' practice (405 q/ha) resulting into mean increase in yield of 34.07 per cent. The findings of the present study are in align with Charak *et al.* (2017) and Paul *et al.* (2018) who also reported the same observations.

Technology gap

Technology gap measures the difference between potential yield of a variety and yield in demonstration plots. In the present study, average fodder yield of the oat variety HJ 8 in demonstration plots was 543 q per ha, against its potential yield of 650 q per ha leading to an average technology gap of 107 quintals per ha. This could be attributed the differences in agro-ecosystems, soil fertility, local climatic conditions and adaptability of the demonstrated interventions under the field conditions. These results are in similarity with the findings of Tetarwal and Singh (2022), and Singh *et al*. (2024). Furthermore, the technology gap decreased from 122 to 93 quintals per ha over successive years of demonstration, indicating improved adoption of fodder production technology by the participating farmers. Therefore, to harness the full potential of improved production and protection technologies, efforts through frontline demonstrations should be intensified to enhance awareness and generate greater interest among the farming community.

Extension gap

The extension gap measures the yield difference between demonstration plots and existing farmers' practices (Table 2). Extension gap in green fodder yield of oat was 146, 162, 129 and 115 q per ha during the years 2020–21, 2021–22, 2022–23 and 2023–24, respectively, with an average of 138 q per ha. These figures highlight the pressing need to educate farmers on modern and improved agricultural practices. Promoting the adoption of advanced production technologies and high-yielding varieties is essential for bridging this gap. Encouraging farmers to shift from traditional methods to the updated and science-based techniques will play a key role in enhancing productivity. this could be achieved by adopting various extension approaches such as conducting front line demonstration and organizing training programmes. Similar findings have been observed by Singh *et al*. (2024) in oat, and Bharti *et al*. (2024) in green gram.

TABLE 3
Economic analysis of FLD's vs Farmers' practice on oat fodder crop

Village	Gross cost (Rs/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		B:C Ratio	
	FLD	Farmers' practice	FLD	Farmers' practice	FLD	Farmers' practice	FLD	Farmers' practice
2020-21	39900	38308	108200	79000	68300	40692	2.71	2.06
2021-22	42540	40167	105600	73200	63060	33033	2.48	1.82
2022-23	46788	43290	119900	91520	73112	48230	2.56	2.11
2023-24	52250	50312	111400	88400	59150	38088	2.13	1.75
Mean	45369.5	43019.25	111275	83030	65905	40011	2.45	1.93

Technology index

The technology index shows the percentage ratio of the technological gap to potential yield, and reflects the feasibility of the introduced technology under farmers' field conditions. Lower the value of technology index, greater will be the feasibility of technology. Finding of the present study revealed that the technology index decreased from 18.77 per cent in 2021–22 to 14.31 per cent in 2023–24 (Table 2), demonstrating the increasing acceptance and effectiveness of the demonstrated technologies in the areas of study. This downward trend highlights the potential for further improvement in fodder oat productivity across the district. The findings also confirm that the Frontline Demonstration (FLD) programme was highly effective in disseminating knowledge on various aspects of fodder oat cultivation and promoting the adoption of improved agricultural practices among farmers.These findings align with the results of previous studies conducted by Tiwari *et al*. (2017), Rohit and Singh (2019), Singh *et al*. (2024), and Pujari *et al*. (2024), which also highlighted a significant technological index associated with technologies demonstrated through FLDs.

ECONOMICS

Although the gross cost of cultivation was slightly higher in the demonstration plots, averaging Rs. 45370 per ha compared to Rs. 43019 per ha under farmers' practices, the trend reversed in terms of returns. The demonstration plots resulted in significantly higher average gross returns of Rs. 111275 per ha compared to Rs. 83030 per ha from farmers' practices (Table 3). As a result, per ha net return was also higher in the demonstration plots, ranging from Rs. 33033 to Rs. 48230, with an average of Rs. 65905, compared to Rs. 40011 under farmers' practices. Similarly, the benefit-cost (B:C) ratio was higher in the demonstration plots, ranging from 2.13:1 to 2.71:1 with an average of 2.45:1, as against 1.93:1 in the plot using farmers' practice. This outcome can be attributed to the higher yields achieved through the adoption of improved technologies compared to traditional farmer practices. Moreover, the enhanced returns highlight the economic viability of the technological interventions, which can serve as a strong incentive for encouraging farmers to adopt these practices. These findings are in line with the results reported by Gogoi *et al*. (2020), Singh *et al*. (2024) and Pujari *et al*. (2024).

CONCLUSION

The findings of this study indicate that the adoption of improved production technologies can lead to a substantial increase in both yield and economic returns in fodder oat cultivation. The reduction in technology and extension gaps reflects improved adoption of advanced fodder production practices, highlighting the critical role of farmer education through approaches like frontline demonstrations (FLDs). The strategy of varietal replacement through FLDs has the potential to significantly enhance fodder productivity at both local and broader scales. Therefore, to ensure wider dissemination and adoption of these improved technologies, it is essential that policymakers allocate sufficient financial resources to strengthen the frontline extension system, facilitating the effective implementation of FLDs under the close supervision of agricultural scientists and extension personnel.

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