Annals of Arid Zone 62(2): 181-184, 2023

Impact of Front Line Demonstration on Productivity of Pearl Millet in Dryland Areas of Rajasthan

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Received: April 2023

Abstract: One hundred twenty five front line demonstrations were carried out during *kharif* 2018 - 2022 in Maulasar block of Nagaur district to demonstrate the performance of MPMH-17/HHB-299 variety with improved package and practices. The grain yield of pearl millet in demonstrations was 16.42 to 23.40% higher over farmer's practice. The extension gap, technology gap and technology index were calculated as 0.20 to 0.50 t ha^{-1}, 0.15 to 1.62 t ha^{-1} and 5.25 to 57.86%, respectively. Results suggested that farmers should apply recommended dose of fertilizers, use improved hybrid seeds, integrated weed practice, water and insect-pest management.

Key words: Front line demonstration, productivity, profitability, pearl millet.

Pearl millet [(*Pennisetum glaucum* (L) R. Emend Stuntz] is one of the most important nutritious coarse-grain cereal crops. It contributes significantly to the food and nutritional security of the rural and urban poor people in the dry tracts of the country. Its grain has a very high nutritional value for human consumption. Livestock relishes its straw, both in fresh and dried forms and it is the most drought and heat-tolerant short-duration rainfed crop, grown in the arid and semi-arid regions of the world (Bhagavatula *et al*., 2013). It displays high water use efficiency and can be cultivated in sandy, low fertility acid or salt affected soils in drought prone environments. Rajasthan is the leading state in terms of area (4.31 mha) and production (5.77 mt) of pearl millet with 1337 kg ha^{-1} productivity (Anonymous, 2021). It is often cultivated with either conventional production technology with limited weed/pest management or using improved production technology at suboptimal levels. Adopting advised scientific and sustainable management production practises would boost pearl millet productivity because varieties and INM have an impact on it. Front line demonstration (FLD), aims to boost productivity by offering necessary inputs as well as enhanced production and good agricultural techniques that have been tested by the researchers of ICAR Institutes and State Agricultural Universities (SAUs). The promotion of the cultivation of better varieties, gathering feedback from farmers regarding obstacles to the adoption of suggested enhanced technologies for additional study, and maximising the process of technological diffusion among farmers are other important

OPEN ACCESS

Edited by

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Citation

Bamboriya, S.D., Jat, A.S., Choudhary, M.D. and Choudhary, L.R. 2023. Impact of front line demonstration on productivity of pearl millet in dryland areas of Rajasthan. Annals of Arid Zone 62(2): 181-184

doi: 10.59512/aaz.2023.62.2.13

https://epubs.icar.org.in/index.php/AAZ/article/view/135576

Table 1. Detail of package and practices for pearl millet cultivation

Technological intervention	Farmer's practice	Recommended Practice (FLD's)
Variety	Proagro, Nirmal	MPMH-17, HHB-299
Seed rate (kg ha^{-1})	5-6	4-5
Seed treatment	Carbendazim 50 WP @ 2g kg^{-1}	Carbendazim 50 WP @ 2g kg^{-1} seed, Imidacloprid 70 WS @ 5g kg^{-1} seed &NPK liquid consortia 5-10 ml kg^{-1} seed
Soil treatment	No Application	Quinalphos 25 kg ha^{-1}
Spacing	Un uniform plant population	45-60 x 15 cm
Time of Sowing	1-30 July	15 June- 15 July
Nutrient management	60 kg DAP at sowing time & 30 kg urea at 1 month DAS	60 kg N & 30-40 kg P_2O_5. Full dose of P & half dose of N at sowing time and half dose of N at 1 month DAS.
Weed management	Hand weeding at 25-30 DAS	Atrazine 500g a.i. ha^{-1} at 1-2 DAS and hand weeding 30 DAS
Plant protection measures	Use of Monocrotophos 1 litre ha^{-1}	Spray of Imidacloprid @ 0.5 ml L^{-1} of water for white grub and one spray of Mancozeb 2 g L^{-1} of water for green ear & ergot disease control

components of this program (Nagarajan *et al*., 2001). Pearl millet is often cultivated with either conventional production technology with limited weed/pest management or using improved production technology at suboptimal levels. Thus, there is ample scope of further improving the production and productivity of pearl millet and raise the income level of farmers.

Materials and Methods

The present study was carried out in the Nagaur district, which is located on the North-western part of Rajasthan state and lies at 27°20′ N latitude and 73°74′ E longitude with an altitude of 302 m above msl. Front line demonstrations were conducted during *kharif*, 2018 to 2022 in the Maulasar block of the district in the fields of 125 farmers. Soils in the demonstrated area were sandy loam in texture with pH ranging from 7.3 to 8.7 and EC values of 0.33 to 0.64 dS m^{-1}. Total rainfall during *kharif* 2018, 2019, 2020, 2021 and 2022 was 421, 743, 492, 475, and 518 mm, respectively. However during 2018, the distribution was not good as most of the rainfall occurred in July and during the later part of the crop growth the rainfall was insufficient. During 2021 the onset of the monsoon was late (in August) and continuous rainfall occurred during the crop maturity stage, affecting crop yield and quality. All the technological interventions were taken as per the prescribed package and practices for the improved varieties of pearl millet crop (Table 1). The grain yield was recorded and yield gap analysis, cost of cultivation, net returns and additional return parameters were calculated (Table 2 and 3). The knowledge of farmers' cultivation practice was gathered through personal discussion with selected farmers. The selected farmers were trained on different aspects of improved package and practices. Scientists visited regularly FLD fields and farmer's fields. The feedback information from the farmers was also recorded for further improvement in research and extension programs. The extension activities *i.e*., training, scientist visits, and field days, were organized at all FLD sites. All of the required information was recorded at the farmer's field and analyzed for comparative evaluation between front line demonstrations and farmers practice. Different parameters were calculated to find out technology gaps (Yadav *et al.,* 2004).

Extension gap	=	Demonstrated yield- farmer's practice yield
Technology gap	=	Potential yield - Demonstration yield
Additional return	=	Demonstration return - farmer's practice return
Technology index	=	[(Potential yield-Demonstration yield)/(Potential yield)] x 100

Results and Discussion

Grain yield

Crop yield under FLDs was higher than the yield with the farmer's practices (local check) (Table 2). The average yield with improved

Table 2. Yield performance, technology gap, extension gap and technology Index of pearl millet under Farmers' Practice and Front Line Demonstration

CFLD year	Crop	Variety	No. of Demons-trations	CFLD Area (ha)	Yield (t ha^{-1})			% increased yield over local check	Technology gap (t ha^{-1})	Extension gap (t ha^{-1})	Technology Index (%)
					Potential of variety	Demons-trated plot	Local Check plot				
2018	Pearl millet	MPMH-17	25	10	2.8	1.55	1.33	16.42	1.25	0.22	44.70
2019	Pearl millet	MPMH-17	25	10	2.8	2.65	2.15	23.40	0.15	0.50	5.25
2020	Pearl millet	MPMH-17	25	10	2.8	1.81	1.53	18.46	0.99	0.27	35.27
2021	Pearl millet	MPMH-17	25	10	2.8	1.18	0.98	20.41	1.62	0.20	57.86
2022	Pearl millet	HHB-299	25	10	2.8	2.65	2.23	18.93	0.15	0.42	5.28
Average			125	50		1.97	1.64	19.52	8.31	0.33	29.67

Table 3. Economics of pearl millet under frontline demonstrations

Year	Cost of cultivation (Rs. ha^{-1})		Gross return (Rs. ha^{-1})		Net Return (Rs. ha^{-1})		Additio-nal return (Rs. ha^{-1})	BC Ratio	
	Demons-trated plot	Local check plot	Demons-trated plot	Local check plot	Demons-trated plot	Local check plot		Demons-trated plot	Local check plot
2018	23496	22296	59143	52658	35647	30362	5285	2.52	2.37
2019	24764	23700	89758	75560	64994	51860	13134	3.62	3.19
2020	25560	24000	74229	68495	48669	44495	4174	2.91	2.85
2021	25348	24200	53418	49700	28070	25500	2570	2.11	2.05
2022	29624	27716	97588	88812	67964	61096	6868	3.29	3.20
Average	25758	24382	74827	67045	49069	42663	6406	2.89	2.73

technologies under FLDs were 1.55, 2.65, 1.81, 1.18, and 2.65 t ha^{-1} as against 1.33, 2.15, 1.53, 0.98, and 2.23 t ha^{-1} under farmers' practice during 2018, 2019, 2020, 2021 and 2022, respectively. These results are in accordance with the findings of Kumar *et al*. (2010), Parmar *et al.* (2016) and Ram *et al*. (2018). The yield was reduced during succeeding years because of the late onset of the monsoons and erratic rains in this region.

Technology & extension gap and technology index

Minimum technology index (5.25%) was observed in *kharif* 2019 whereas the maximum (57.86%) was in 2021. This vast difference in values may be due to uneven weather conditions in the area during 2021. Lower values of the technology index showed greater feasibility of the improved technology at the farmer's fields. These findings are in line with the findings of Jat and Gupta (2014), Jat and Gupta (2015) and Ramniwas *et al*. (2022).

Economics

The net returns under FLDs were Rs. 35647, 64994, 48669, 28070 and 67964 ha^{-1} with B: C ratios of 2.52, 3.62, 2.91, 2.11 and 3.29 during 2018, 2019, 2020, 2021 and 2022, respectively. In contrast the farmers received net returns of Rs. 30362, 51860, 44495, 25500 and 61096 ha^{-1} with B: C ratios of 2.37, 3.19, 2.85, 2.05 and 3.20 in these years, respectively. These values clearly bring out the advantages of following proper package of practices for pearl millet cultivation. Such a trend was also observed by Parmar *et al.,* (2016).

Conclusions

It is evident that the farmers' production can be increased from 16.42 to 23.40% and their income can be enhanced from Rs. 2570 to Rs. 13134 ha^{-1} if technologies demonstrated in FLDs are fully implemented. This can also be very helpful in improving their standard of living. These FLDs also encourage other farmers to adopt more effective production techniques not

only for pearl millet but also for other crops for higher returns.

Acknowledgment

The authors sincerely thank all farmers involved in FLDs for sincere participation and Zonal Project Directorate (ICAR) - Zone IV, Jodhpur for financial assistance.

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Printed in June 2023