

Yield gap analysis of pearl millet through frontline demonstrations in Dausa district of Rajasthan

Dausa district comes under Agroclimatic Zone IIIa, namely “Semi Arid Eastern Plains”. The technologies were demonstrated and disseminated through frontline demonstrations to farmers of Dausa district. Pearl millet is the most important cereal crop grown in kharif season in Dausa district of Rajasthan. Pearl millet occupies first rank among cereal crops grown in Dausa district. It account for 1.25 lakh hectares area and 2.13 lakh tonne production with 1700 kg/ha productivity (Anon, 2013). The increase in production in recent years has been possible due to improvement in productivity and strategies adopted by the Government by launching various schemes. In view of this, a project on frontline demonstration was started in order to demonstrate the production potential and latest advancement in package of practices among the farmers with the view to reduce the time gap between technology generated and its adoption. This also enables field functionaries to elucidate the production constraints and limitation in the adoption of technology for onward transmission to scientists to reorient their research accordingly. In order to improve the productivity the unfolded technologies could be included in frontline demonstrations plots under the direct supervision of the scientists by supplying the critical inputs. Keeping in view the importance of frontline demonstration in Dausa district of Rajasthan in productivity enhancement and increase the monetary returns, the present study was carried out.

The present study was conducted in the farmer's fields of Dausa district, Rajasthan during the *kharif* season for consecutive seven years from 2006 to 2012. A total of 124 demonstrations covering an area of 60 ha having similar number of traditional practices or local check were carried out in sandy

loam soil under rainfed conditions. The pearl millet crop was sown around June to mid July and harvested in mid September across the years. The variety RHB 121 was used for demonstration in all the villages and years except in 2006 and 2009 at Nadi Malwas and Bhojpura, Peechupada villages, the variety ICMH 356 was demonstrated. Frontline demonstrations were conducted in Kota Patti, Digaria, Singwara, Udala Aluda and Malwas villages in Dusa block and Nadi Malwas in Lalsot block and Peechupada, Bhojpura and Reta villages of Sikarai block of Dausa district. In frontline demonstrations special emphasis was given to proper seed rate (4 kg/ha), balanced use of fertilizers (60 kg/ha N and 30 kg/ha P₂O₅), high yielding varieties (RHB 121 and ICMH 356), seed treatment with pesticides and proper and need based plant protection measures. In traditional or local check plots farmers used higher seed rate (6 kg/ha), imbalanced use of fertilizers, local or private company seeds for sowing, improper seed treatment and plant protection measures. The cross section data on output of pearl millet crop and input used per hectare have been collected from the frontline demonstration plots. In addition to this in traditional or control plot followed by farmers have also been collected and used for further calculation like cost of cultivation, gross returns, net returns, additional cost, additional returns and BC ratio. The benefit cost ratio was calculated by dividing the net monetary return by the total cost of cultivation. Yield gap, extension gap and technology indices were calculated as follows.

Technology gap = Potential yield- Demonstration yield

Extension gap = Demonstration yield- Farmers / Traditional yield

Technology index = $\frac{Pi-Di}{Pi} \times 100$

Table 1. Comparative statement of yield and other parameters of pearl millet in different villages of Dausa district in Rajasthan

Year	Village	Block	Variety	No. of Demo.	Area (ha)	Highest yield of Demo. (kg/ha)	Lowest yield of Demo. (kg/ha)	Average yield of Demo. (kg/ha)	Average yield of local check (kg/ha)	% increase	Technology gap (kg/ha)	Extension gap (kg/ha)	Technology index
2006	Nadi Malwas	Lalsot	ICMH-356	10	5	1650	1400	1526	1300	17.38	974	226	38.96
2007	Kota-patti	Dausa	RHB 121	10	5	1425	1050	1272	1070	18.88	1528	202	54.57
2007	Digaria	Dausa	RHB 121	10	5	1625	1075	1397	1125	24.17	1403	272	50.10
2008	Singwara	Dausa	RHB 121	19	10	1650	1175	1401	1157	21.08	1399	244	49.96
2009	Bhojpura & Peechupara	Sikarai	ICMH-356	20	10	2450	2150	2307	2066	11.67	193	241	7.72
2010	Udala	Dausa	RHB 121	20	10	2225	1875	2075	1837	12.92	963	238	34.39
2011	Aluda & Reta	Dausa & Sikarai	RHB 121	25	10	2500	1850	2114	1752	20.66	1048	362	37.42
2012	Malwas	Dausa	RHB 121	10	5	1650	1400	1470	1295	13.51	1505	175	53.75
Total	-	-	-	124	60	-	-	-	-	-	-	-	-
Average	-	-	-	-	-	1896	1496	1695	1450	17.53	1127	245	40.98

Demo.- Demonstration, Potential yield of ICMH 356=2500 kg/ha, Potential yield of RHB 121= 2800 kg/ha

Table 2. Economics of pearl millet in different villages of Dausa district in Rajasthan

Year	Village	Variety	No. of Demo.	Area (ha)	Cost of cultivation (₹/ha)		Gross returns (₹/ha)		Increase in Gross returns (%)	Net returns (₹/ha)		Increase in net returns (%)	Additional cost (₹/ha)	Additional returns (₹/ha)	BC ratio	
					Demo.	Local	Demo.	Local		Demo.	Local				Demo.	Local
2006	Nadi Malwas	ICMH -356	10	5	7629	7000	13956	12000	16.3	6327	5000	26.5	629	1956	1.82	1.71
2007	Kota-patti	RHB 121	10	5	6300	5800	10539	9077	16.1	4239	3277	29.3	500	1462	1.67	1.56
2007	Digaria	RHB 121	10	5	6700	6000	11587	9593	20.8	4887	3593	36.0	700	1994	1.73	1.60
2008	Singwara	RHB 121	19	10	7100	6500	12653	10512	20.4	5553	4012	38.4	600	2141	1.78	1.62
2009	Bhojpura & Peechupara	ICMH -356	20	10	7900	7630	34326	30973	10.8	26426	23343	13.2	270	3083	4.34	4.06
2010	Udala	RHB 121	20	10	9142	8680	26660	23946	11.3	17518	15266	14.7	462	2714	2.92	2.76
2011	Aluda & Reta	RHB 121	25	10	10524	9598	26766	22188	20.6	16242	12590	29.0	926	4578	2.54	2.31
2012	Malwas	RHB 121	10	5	11803	10920	20740	18610	11.4	8937	7690	16.2	883	2130	1.75	1.70
Total			124	60	-	-	19653	17112	15.98	11266	9346	25.44	-	2507	2.32	2.17
Average			-	-	8387.3	7766	-	-	-	-	-	-	621.3	-	-	-
Demo.- Demonstration			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Where, P_i = Potential yield of the crop

D_i = Demonstration yield of the crop

Yield of frontline demonstration trials and potential yield of the respective variety and year were compared to estimate the yield gap which was further categorized into technology and extension gaps. Technology gaps (1528 kg/ha) was the highest in case of RHB 121 at village Kota Patti in the year 2007 and the lowest (193 kg/ha) was in ICMH 356 at village Bhojpura, Peechupada in the year 2009. Average technology gap was 1127 kg/ha. This may be due to the variations in soil fertility and weather condition especially rainfall intensity, interval, etc. Hence, location specific recommendations are necessary to bridge the gap. Higher technology gap (647 kg/ha) was also recorded by Meena *et al.* (2012) and Katare Subhash *et al.* (2011).

The extension gaps for all the years in frontline demonstrations were lower as compared to technology gaps except in the year 2009. This emphasized the effort made by the scientist to educate the farmers in adoption of improved technology to narrow the extension gaps. Extension gap was highest in variety RHB 121 (362) at village Aluda, Reta in the year 2011 and lowest (175) at village Malwas in variety RHB 121 in the year 2012. The average extension gap was 245 kg/ha. These findings are in line with the findings of Kaushik (1993) and Meena *et al.* (2012). All demonstrations recorded lower extension gap as compared to technology gap except in the year 2009. Similar findings were also reported by Sharma and Sharma (2004) and Jat *et al.* (2013).

Technology index shows the feasibility of the evaluated technology on the farmer's fields. Lower the value of technology index more feasibility of technology. Technology index was the highest to the tune of 54.57 per cent at village Kota Patti in the year 2007 and lowest 7.72 per cent at villages Bhojpura, Peechupada in 2009. The average technology index was found to be 40.98 per cent. Similar technology index were also reported by Meena *et al.* (2012) (26.98%) and Katare Subhash *et al.* (2011) (24.21%).

The highest pearl millet yield of frontline demonstration were found to be 2500 kg/ha in 2011 at Aluda, Reta village followed by 2450 kg/ha and 2225 kg/ha, at villages Bhojpura, Peechupada in 2009 and Udala in 2010, respectively. Lowest yield of 1050 kg/ha followed by 1075 kg/ha and 1175 kg/ha at village Kota Patti in the year 2007, Digaria in the year 2007 and Singwara in the year 2008, respectively were recorded. Average yield of frontline demonstration were found maximum to the tune of 2307 kg/ha at village Bhojpura, Peechupada in year 2009 with the variety ICMH 356. The Maximum increase over control or traditional practice was 24.17 per cent at village Digaria in 2007 with the variety of RHB 121 followed by 21.08 per cent at village Singwara in the year 2008 with the same variety. Studies showed that average increase was 17.53 per cent which indicated that frontline demonstrations were better than farmer's practices or control (Table 1). Similar results were reported by several workers (Suryawansi and Prakash, 1993; Sagar and Ganesh Chandra, 2004; Jat *et al.*, 2013; Meena *et al.*, 2012) for increasing the productivity of the farm community.

Economics of various frontline demonstrations on pearl millet in different years is indicated in Table 2. The highest increase in gross returns were found to be 20.80 per cent at village Digaria in the year 2007 with variety of RHB 121 followed by 20.60 per cent and 20.4 per cent at village Aluda, Reta in the year 2011 and at village Singwara in the year 2008 with the same variety. Average increase in gross returns was found to be 15.98 per cent. The highest increase in net returns were found to be 38.4 per cent at village Singwara in the year 2008 with the variety of RHB 121 followed by 36.0 and 29.3 per cent in village Digaria in the year 2007 and village Kota Patti in the year 2007 with variety RHB 121. Average net returns was found to be 25.44 per cent increase which showed that frontline demonstrations could increase the living standard of farming community of Dausa district.

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Among all frontline demonstrations the highest BC ratio was found in village Bhojpra (4.34). Peechupada in the year 2009 with the variety ICMH 356 followed by 2.92 and 2.54 at village Udala in year 2010 with the variety RHB 121 and village Aluda, Reta in the year 2011 with the same variety, respectively. These findings are in line with the findings of Meena *et al.* 2012 and Jat *et al.* (2013a) in other crops.

Overall results showed that variety RHB 121 was found better in per cent increase, gross returns and net return but ICMH 356 was found better in respect of BC ratio. Across the years frontline demonstrations recorded higher productivity ranging from 11.67 to 24.17 per cent and higher BC ratio from 1.67 to 4.34. Presently, 17.53 per cent increase revealed that if farmers adopt the demonstrated technologies, it may fetch ₹ 1920/ha as net returns in addition to what they are getting now in traditional practices which may improve their livelihood.

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