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 accounts 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 Dausa 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 P<sub>2</sub>O<sub>5</sub>), 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 = Pi-Di/Pi X 100

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Village</th>
<th>Block</th>
<th>Variety</th>
<th>No. of Demo.</th>
<th>Area (ha)</th>
<th>Highest yield of Demo. (kg/ha)</th>
<th>Lowest yield of Demo. (kg/ha)</th>
<th>Average yield of Demo. (kg/ha)</th>
<th>Average yield of local check (kg/ha)</th>
<th>% increase</th>
<th>Technology gap (kg/ha)</th>
<th>Extension gap (kg/ha)</th>
<th>Technology index</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Nadi Malwas</td>
<td>Lalsot</td>
<td>ICMH-356</td>
<td>10</td>
<td>5</td>
<td>1650</td>
<td>1400</td>
<td>1526</td>
<td>1300</td>
<td>17.38</td>
<td>974</td>
<td>226</td>
<td>38.96</td>
</tr>
<tr>
<td>2007</td>
<td>Kota-patti</td>
<td>Dausa</td>
<td>RHB 121</td>
<td>10</td>
<td>5</td>
<td>1425</td>
<td>1050</td>
<td>1272</td>
<td>1070</td>
<td>18.88</td>
<td>1528</td>
<td>202</td>
<td>54.57</td>
</tr>
<tr>
<td>2007</td>
<td>Digaria</td>
<td>Dausa</td>
<td>RHB 121</td>
<td>10</td>
<td>5</td>
<td>1625</td>
<td>1075</td>
<td>1397</td>
<td>1125</td>
<td>24.17</td>
<td>1403</td>
<td>272</td>
<td>50.10</td>
</tr>
<tr>
<td>2008</td>
<td>Singwara</td>
<td>Dausa</td>
<td>RHB 121</td>
<td>19</td>
<td>10</td>
<td>1650</td>
<td>1175</td>
<td>1401</td>
<td>1157</td>
<td>21.08</td>
<td>1399</td>
<td>244</td>
<td>49.96</td>
</tr>
<tr>
<td>2009</td>
<td>Bhojpur &amp; Sikarai Peechupara</td>
<td>Dausa</td>
<td>ICMH-356</td>
<td>20</td>
<td>10</td>
<td>2450</td>
<td>2150</td>
<td>2307</td>
<td>2066</td>
<td>11.67</td>
<td>193</td>
<td>241</td>
<td>7.72</td>
</tr>
<tr>
<td>2010</td>
<td>Udala Aluda &amp; Reta</td>
<td>Dausa</td>
<td>RHB 121</td>
<td>20</td>
<td>10</td>
<td>2225</td>
<td>1875</td>
<td>2075</td>
<td>1837</td>
<td>12.92</td>
<td>963</td>
<td>238</td>
<td>34.39</td>
</tr>
<tr>
<td>2012</td>
<td>Malwas</td>
<td>RHB 121</td>
<td>RHB 121</td>
<td>25</td>
<td>10</td>
<td>2500</td>
<td>1850</td>
<td>2114</td>
<td>1752</td>
<td>20.66</td>
<td>1048</td>
<td>362</td>
<td>37.42</td>
</tr>
</tbody>
</table>

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

104
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 \((1528 \text{ kg/ha})\) was the highest in case of RHB 121 at village Kota Patti in the year 2007 and the lowest \((193 \text{ kg/ha})\) was in ICMH 356 at village Bhojpura, Pechupada in the year 2009. Average technology gap was \(1127 \text{ kg/ha}\). 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 \((647 \text{ kg/ha})\) 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 \(245 \text{ kg/ha}\). 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, Pechupada 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, Pechupada 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, Pechupada 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.

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 2007 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.

References
Anonymous, 2013, ZREAC Report of Deputy Director (Agriculture), Dausa, Rajasthan, India.