Biological Forum – An International Journal **16(6): 189-192(2024)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Yield Gap Analysis of Cluster Front Line Demonstrations on Chickpea in Dausa District of Rajasthan

B.L. Jat[1], Akshay Chittora[2*], R.L. Meena[3] and Sunita Kumari[4]

[1]Associate Professor (Agronomy), Krishi Vigyan Kendra, Dausa (Rajasthan), India.
[2]Subject Matter Specialist (Horticulture), Krishi Vigyan Kendra, Dausa (Rajasthan), India.
[3]Assistant Professor (Plant Pathology), College of Agriculture, Jhilai (Niwai), Tonk (Rajasthan), India.
[4]Subject Matter Specialist (Extension Education), Krishi Vigyan Kendra, Dausa (Rajasthan), India.
SKN Agriculture University, Jobner (Rajasthan), India.

(Corresponding author: Akshay Chittora)*
(Received: 08 April 2024; Revised: 26 April 2024; Accepted: 19 May 2024; Published: 15 June 2024)
(Published by Research Trend)

ABSTRACT: The present study was conducted at the farmers' fields of Dausa district of Rajasthan (India) to investigate the impact of cluster front line demonstrations on chickpea during rabi 2016-17 to rabi 2021-22. A total of 575 demonstrations of chickpea in 260 ha area having similar number of traditional practices or local check were carried out in sandy loam soil under irrigated conditions of Dausa district. Yield of front line demonstrations trials and potential yield of respective variety and year were compared to estimate the yield gap which were further categorized into technology gap and extension gap. The technology gap was recorded highest (5.70 q/ha) in case of GNG-1581 during 2017-18 and lowest technology gap (3.87 q/ha) was recorded in case of CSJ-515 during 2021-22. The extension gap was the highest during rabi 2020-21 (4.95 q/ha) and lowest during rabi 2021-22 (2.30 q/ha). The average technology gap was 4.83 q/ha and the average extension gap was 3.56 q/ha. The technology index was maximum during rabi 2017-18 (21.92%) while minimum during rabi 2021-22 (16.13%). Average technology index was recorded 18.63%. The highest yield (22.40 q/ha) of chickpea demonstrations was recorded during rabi 2020-21 with variety GNG-2144 while lowest yield (19.73 q/ha) was recorded during rabi 2017-18 with variety CSJ-515. Average yield of demonstrations was 21.05 q/ha whereas average yield of local check was 17.50 q/ha, representing 20.40% yield increase in demonstrations over local check. The average gross return was Rs 92623 which was 20.99 per cent higher over control. The average net return was Rs 53065 which was 58.74 per cent higher over local check. The average B:C ratio of the demonstrations was 2.31 while it was 1.82 in local check.

Keywords: Cluster front line demonstration, chickpea, yield, economics, B: C ratio.

INTRODUCTION

Pulses are a Smart Food as these are critical for food basket (dal-roti, dal-chawal), important source of plant protein and help address obesity, diabetes etc. In addition pulses are highly water efficient, can grow in drought prone areas and help improve soil fertility by fixing soil nitrogen (Kumar *et al.,* 2020). Pulses occupy a prominent place in human nutrition particularly among the lower income groups of people in developing countries like India. India is the largest producer and consumer of pulses with maximum area coverage in the world. However, productivity of pulses in India is well below the world's average productivity. There are several reasons responsible for lesser productivity of pulses *i.e.* more focus on cereal crops like wheat & rice, less investment on irrigation facilities (only 15% for pulses as against 80-90% for wheat/ rice), technological absence to minimize disease, insect and weed infestation that cause substantial damage in standing crops, lack of quality seed of improved varieties, cultivation on less fertile soil, rainfed and marginal lands, imbalance use of nutrients, lack of integration of nutrient supply sources and adverse impact of weather aberrations on crops.

Chickpea (*Cicer arietinum* L.) is one of the oldest pulse crops that have been grown for over 8,000 years (Dhuppar *et al*., 2012). It is the cheapest source of protein (18-22%), carbohydrate (52-70%), fat (4-10%) and minerals. By virtue of its ability to fix atmospheric nitrogen, it is traditionally indispensable component of cropping systems in India and is also climate resilient and can be sown in rainfed areas.

Dausa district falls in agroclimatic zone IIIa namely "Semi-Arid Eastern Plains" of Rajasthan which covers Dausa, Ajmer, Tonk and Jaipur districts. Chickpea is an important pulse crop grown in rabi season in Dausa district of Rajasthan. During 2021-22 chickpea was grown in 24012 hectare area with total production of 31744 metric tons having productivity of 1322 kg/ha (Anonymous, 2021).

Cluster front line demonstration (CFLD) is a novel approach to provide a direct interface between researcher and farmer for the transfer of technologies developed by them and to get direct feedback from farming community. Centrally Sponsored Scheme, 'National Food Security Mission' (NFSM), was launched in October 2007. The concept of Cluster front line demonstration was put forth under this mission. The scheme implemented in a mission mode through a farmer centric approach. The basic strategy of the mission is to promote and extend improved technologies, *i.e.,* seed, micronutrients, soil amendments, integrated pest management, farm machinery and implements, irrigation management along with capacity building of farmers. In view of this, a project on cluster front line 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 lag between technology generated and its adoption. In order to improve the productivity all the recommended technologies were carried out in front line demonstrations plots under the direct supervision of the scientists. The project was implemented by Krishi Vigyan Kendra, Dausa with main objective to boost the production and productivity of chickpea in the district.

MATERIALS AND METHODS

The present study was conducted at farmers' fields of Dausa district of Rajasthan during rabi season of consecutive five years from 2016-17 to 2021-22. A total of 575 demonstrations in 260 hectares area having similar number of traditional practices or local check were carried out in sandy loam soil under irrigated conditions. The chickpea crop was sown in last week of October to first week of November and harvested in second fortnight of March across the years. The variety CSJ 515 was used in demonstrations in Jaama village during 2017-18 and Mohchingpura village during 2021-22 while variety GNG-1581 was demonstrated in different villages of Lalsot and Bandikui blocks of Dausa district during 2017-18. Chickpea variety GNG 1958 was used for cluster front line demonstrations in different villages of Dausa, Lawan and Lalsot blocks of Dausa district during 2018-19 and Badoli and Mohanpura villages during 2020-21. Other variety GNG 2144 was used in demonstrations in Peechupada Kalan, Mund Ghisya and Chhareda villages during 2019-20 and Badoli village during the year 2020-21. The area falls under agroclimatic zone IIIa namely "Semi-Arid Eastern Plains" of Rajasthan. After preliminary survey and interactive meetings farmers were trained to follow the package and practices for chickpea cultivation as recommended for the region.

In cluster front line demonstrations special emphasis was given to proper seed rate (60-80 kg/ha), balanced use of fertilizers (40 kg/ha N and 20 kg/ha P_2O_5), seed treatment with pesticides (carbendazim 50 WP @ 1g/kg + fipronil 5 SC @ 10 ml/kg) and proper need based plant protection measures. In traditional or local check plots farmers were using higher seed rate, imbalance dose of fertilizers, local seed for sowing, improper seed treatment and plant protection measures. The basic information was recorded from the demonstration and control plots and analyzed for comparative performance of the cluster frontline demonstrations (CFLDs) and farmer's practice. The yield data were collected both from the demonstrations and farmers' practice by random crop cutting method and analyzed by using simple statistical tools. These were further used for calculation of cost of cultivation, gross returns, net returns, additional cost, additional returns and B:C ratio. The cost of cultivation included all the expenditures right from land preparation to harvest. Gross return was calculated by multiplying of produce to prevailing market price. The benefit cost ratio (B: C) was calculated dividing the net monetary return by the total cost of cultivation. Technology gap, extension gap and technology index were calculated as follows:-

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmer's/ Traditional yield

$$\text{Technology Index} = \frac{\text{Potential yield} - \text{Demonstrations yield}}{\text{Potential yield}} \times 100$$

RESULTS AND DISCUSSION

Yield of cluster front line demonstration trials and potential yield of the respective variety were compared to estimate the yield gap which was further categorized into technology and extension gaps. Technology gap was maximum (5.70 q/ha) in case of GNG-1581 during 2017-18 while minimum technology gap (3.87 q/ha) was recorded in case of CSJ-515 during the year 2021-22. Average technology gap was 4.83 q/ha throughout the study period (Table 1). Higher technology gap were also recorded by Bairwa *et al.* (2021) ; Ramesh *et al.* (2023). Though, the cluster front line demonstration trials were laid down under the supervision of KVK scientists at the farmers' fields but the yield obtained in demonstration plots over the years was still lower than potential yield which may be attributed to climatic conditions of the areas. Hence, variety wise location specific recommendation appears to be necessary to minimize the technology gap for yield level in different situations (Jat *et al.,* 2013).

The extension gap for all the years in cluster front line demonstrations on chickpea were lower as compared to technology gap except in the year 2020-21 for variety GNG 2144 (Table 1). This emphasized the efforts made by the scientists to educate the farmers in adoption of improved technology to narrow the extension gaps. These findings are in line with Ramesh *et al.* (2023). Among the cluster front line demonstrations on chickpea in different years, extension gap was the highest *i.e.* 4.95 q/ha in variety GNG 2144 at Badoli village during 2020-21 while extension gap was the lowest *i.e.* 2.30 q/ha in variety CSJ 515 at Mohchingpura village during 2021-22 (Table 1). Singh *et al.* (2014); Rachhoya *et al.* (2018) also reported similar findings in chickpea.

Technology index was the highest by the tune of 19.74 per cent in Dausa, Lawan and Lalsot blocks during 2018-19 and lowest technology index was 16.13 per cent at Mohchingpura village in 2021-22. The average

technology index was 18.63 per cent which indicates that wide gap exists between the technology evaluated at research station and farmers fields'. Lower value of the technology index indicates more feasibility of evaluated technology. Similarly, technology index were also reported by Rajpoot (2020) ; Bairwa *et al.* (2021). Variations in in the technology gap and index percentage were found due to differences in agro-climatic factors and management practices which can be reduced by farmer's participation in adopting new technologies (Kumari and Singh 2023).

The data (Table 1) showed that maximum yield of cluster front line demonstration was 26.0 q/ha during 2017-18 in variety GNG 1581 and 2018-19 in variety GNG 1958 while minimum yield of demonstration was 16.0 q/ha during 2017-18 in variety CSJ 515 and GNG 1581. Average yield of cluster front line demonstrations was reported maximum (22.40 q/ha) during 2020-21 in variety GNG 2144 while minimum average yield of cluster front line demonstrations (19.73 q/ha) was reported during 2017-18 in variety CSJ 515. The highest percentage increase over control or farmers practice was 28.37 per cent during 2020-21 with variety GNG 2144 followed by 28.28 per cent during 2020-21 with variety GNG 1958. Study showed that average percentage increase over control was 20.40 per cent which showed that cluster front line demonstrations found better than farmers practices or control. The results were in confirmity with the findings of Singh *et al.* (2018) ; Prasad *et al.* (2022).

Data pertaining to economic performance of various cluster front line demonstrations on chickpea are presented in Table 2. The economics of chickpea cultivation and its feasibility in demonstration was calculated considering the existing prices of inputs and production costs over farmers' practice. Maximum per cent increase in net return (97.91%) was reported during 2017-18 with variety CSJ 515 followed by GNG 1581 (79.94%) in 2017-18. Average per cent increase in gross return was 20.99% while average per cent increase in net return was 58.74% during the study period. Higher B:C ratio was observed in demonstrations over local check across the years. Average B:C ratio across the years was 2.31 while for farmer's practice average B:C ratio was 1.82. Similar findings were reported by Prasad *et al.* (2022) ; Kantwa *et al.* (2024).

Table 1: Comparative statement of yield and other parameters of cluster front line demonstrations on chickpea in different villages of Dausa district of Rajasthan.

Year	Village	Block	Variety	No of Demo	Area (ha)	Highest yield of Demo (q/ha)	Lowest yield of Demo (q/ha)	Average yield of Demo (q/ha)	Average yield of Local Check (q/ha)	% increase	Technology Gap (q/ha)	Extension Gap (q/ha)	Technology Index (%)
2017-18	Jaama	Dausa	CSJ-515	46	18.4	24.0	16.0	19.73	16.68	18.29	4.27	3.05	17.79
2017-18	Different villages	Lalsot, Bandikui,	GNG-1581	204	81.6	26.0	16.0	20.30	17.16	18.30	5.70	3.14	21.92
2018-19	Different villages	Dausa, Lawan and Lalsot	GNG-1958	160	80	26.0	18.0	21.51	18.16	18.49	5.29	3.35	19.74
2019-20	Peechupada Kalan, Mund Ghisya, Chhareda	Bandikui, Dausa, Nangal Rajawatan	GNG-2144	80	40	25.0	18.5	21.62	18.30	18.14	5.18	3.32	19.33
2020-21	Badoli,	Ramgrah Pachwara	GNG-2144	20	10	24.5	20.5	22.40	17.45	28.37	4.40	4.95	16.42
2020-21	Badoli, Mohanpura	Ramgrah Pachwara	GNG-1958	25	10	24.0	19.5	21.68	16.90	28.28	5.12	4.78	19.10
2021-22	Mohchingpura	Sikandara	CSJ-515	40	20	23.0	18.0	20.13	17.83	12.90	3.87	2.30	16.13
Total	-	-	-	575	260	-	-	-	-	-	-	-	-
Average	-	-	-	-	-	24.64	18.07	21.05	17.50	20.40	4.83	3.56	18.63

Table 2: Economics of the cluster front line demonstrations on chickpea in different villages of Dausa district of Rajasthan.

Year	Village	Variety	No of Demo	Area (ha)	Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		% increase in Gross return	Net return (Rs/ha)		% increase in net return	Additional cost (Rs/ha)	Additional return (Rs/ha)	B:C ratio	
					Demo	Local	Demo	Local		Demo	Local				Demo	Local
2017-18	Jaama	CSJ-515	46	18.4	31622	33510	56104	45880	22.28	24482	12370	97.91	-1888	10224	1.77	1.37
2017-18	Different villages	GNG-1581	204	81.6	31622	33510	60100	49336	21.82	28478	15826	79.94	-1888	10764	1.90	1.47
2018-19	Different villages	GNG-1958	160	80	34932	36230	92855	78755	17.90	57923	42525	36.21	-1298	14100	2.66	2.17
2019-20	Peechupada Kalan, Mund Ghisya	GNG-2144	80	40	44182	46246	107898	91713	17.65	63716	45467	40.14	-2064	16185	2.44	1.98
2020-21	Badoli	GNG-2144	20	10	44354	47106	116740	91495	27.59	72386	44389	63.07	-2752	25245	2.63	1.94
2020-21	Badoli, Mohanpura	GNG-1958	25	10	45709	47106	113068	88690	27.49	67359	41584	61.98	-1397	24378	2.47	1.88
2021-22	Mohchingpura	CSJ-515	40	20	44488	47262	101600	90560	12.19	57112	43298	31.90	-2774	11040	2.28	1.92
Total	-	-	575	260	-	-	-	-	-	-	-	-	-	-	-	-
Average	-	-	-	-	39558	41567	92623	76632	20.99	53065	35065	58.74	-2008.71	15990.86	2.31	1.82

CONCLUSIONS

The study was undertaken at Dausa district of Rajasthan (India) to investigate the impact of cluster front line demonstrations on chickpea during rabi 2016-17 to rabi 2021-22. The existing farmers' practices were compared against recommended practice for the production of chickpea. Cluster front line demonstration is one of the best ways to educate the conventional cultivators in terms of productivity potential and profitability. The results indicate that cluster front line demonstrations had higher productivity over farmers' practice ranging from 18.14 to 28.37 per cent. The benefit-cost ratio was consistently higher for the demonstrations over farmer's practice which suggests that recommended practices of chickpea cultivation may lead to increased profitability of chickpea in Dausa district (semi-arid region) of Rajasthan.

Acknowledgements. Authors are grateful to Indian Council of Agricultural Research, New Delhi and Agricultural Technology Application Research Institute, Jodhpur for providing funds to conduct the cluster frontline demonstrations on chickpea at Krishi Vigyan Kendra in Dausa district of Rajasthan.

REFERENCES

Anonymous. (2021). ZREAC report of Deputy Director (Agriculture), Dausa.

Bairwa, R. K., Meena, R. R., Singh, M., Rohilla, P. P., Singh, R., Sanadhya, G. and Meena, C. L. (2021). Impact of front line demonstration on chickpea yield improvement in Kota district of Rajasthan. *Extended Summaries : 5th International Agronomy Congress, November 23-27, 2021, India*, 1472-1473.

Dhuppar, P., Biyan, S., Chintapalli, B., Rao, S. (2012). Chickpea crop production in the context of climate change: An Appraisal. *Indian Research Journal of Extension Education, 2*, 33-35.

Jat, B. L., Gupta, J. K., Dhakar, M. R. and Sharma, R. N. (2013). Impact of frontline demonstration trials on sustainability of chickpea (*Cicer arietinum*) production in Dausa district of Rajasthan. *Environment & Ecology, 31*(4A), 1906-1910.

Kantwa, C. R., Tripathy, S., Bhadauria, R. S., Sharma, B., Jakhar, S. R., Kumar, S. and Singh, S. R. K. (2024). Front line demonstration on performance of chickpea in malwa region of Madhya Pradesh. *Legume Research*, *47*(1), 74-77.

Kumar, S., Dev, J., Singh, R. and Kumar, S. (2020). Comparison for yield potential of chickpea in Cluster Front Line Demonstrations and Farmer's Practices in rainfed areas of Bilaspur district of Himachal Pradesh. *Himachal Journal of Agricultural Research, 46*(2), 145-150.

Kumari, S. and Singh, H. (2023). Impact of frontline demonstrations on productivity of chickpea (*Cicer arietinum* L.) under Central Punjab conditions. *Indian Journal of Extension Education, 59*(3), 113-117.

Prasad, D., Prakash, V., Meena, R. S. And Bairwa, S. K. (2022). Performance of chickpea (*Cicer arietinum*) frontline demonstrations in Rajasthan. *Indian Journal of Agricultural Sciences 92* (2), 254–257.

Rachhoya, H. K., Sharma, M. and Saini, V. K. (2018). Evaluation of yield performance of chickpea (*Cicer arietinum*) through cluster front line demonstration. *International Journal of Current Microbiology and Applied Sciences, 7*(5), 2465–2471.

Rajpoot, S. K. S. (2020). Evaluation of Front Line Demonstration on Chick Pea (*Cicer arietinum* L.) in Sonbhadra District of U.P. *International Journal of Current Microbiology and Applied Sciences, Special Issue*, 206- 212.

Ramesh, G., Durgaprasad, N. V. V. S., Jahnavi, M. and Rajesh Chowdary, L. (2023). Impact of cluster frontline demonstrations on yield of chickpea (*Cicer arietinum* L.) in Prakasam district of Andhara Pradesh, India. *International Journal of Plant & Soil Science, 35* (9), 65-70.

Singh, D., Patel, A. K., Baghel, S. K., Singh, M. S., Singh, A. and Singh, A. K. (2014). Impact of front line demonstration on the yield and economics of chickpea (*Cicer arietinum* L.) in Sidhi district of Madhya Pradesh. *Journal of Agri Search, 1*(1), 22–25.

Singh, R., Dogra, A., Sarkar, A., Saxena, A. and Singh, B. (2018). Technology gap, constraint analysis and improved production technologies for yield enhancement of barley (*Hordeum vulgare*) and chickpea (*Cicer arietinum*) under arid conditions of Rajasthan. *Indian Journal of Agricultural Sciences, 88*(2), 93–100.

How to cite this article: B.L. Jat, Akshay Chittora, R.L. Meena and Sunita Kumari (2024). Yield Gap Analysis of Cluster Front Line Demonstrations on Chickpea in Dausa District of Rajasthan. *Biological Forum – An International Journal, 16*(6): 189-192.