Yield gap analysis of chickpea production through cluster frontline demonstrations in Samba district, Jammu and Kashmir

NEERJA SHARMA[1*], ABHAY KUMAR SINHA[1], SAURAV GUPTA[1] and SUNIL KUMAR MISHRA[2]

[1]ICAR – Krishi Vigyan Kendra, SKUAST – Jammu, Samba 184121 Jammu and Kashmir, India
[2]Division of Agronomy
Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu
Jammu 180009 Jammu and Kashmir, India
*Email for correspondence: neerja1975@gmail.com

Received: 11.08.2023/Accepted: 13.09.2023

ABSTRACT

Krishi Vigyan Kendra, Samba, Jammu and Kashmir conducted frontline demonstrations during 2020-21 and 2021-22 in four blocks of Jammu and Kashmir namely Samba, Ghagwal, Sumb and Vijaypur. The demonstrated technology included improved variety PBG-7, seed treatment with fungicides and *Rhizobium*, water management at critical stages and application of IPM module for the management of insect pests and diseases of chickpea especially gram pod borer, wilt and dry root rot. There was an increase of 49.07 and 50.00 per cent in yield in demonstrations over farmers' practice during 2021-22 and 2022-23 respectively. The technology gap in the demonstration yield was 7.2 and 7.8 q per ha in 2021-22 and 2022-23 respectively over the potential yield of chickpea. The extension gap of 5.0 and 6.1 q per ha was recorded during 2021-22 and 2022-2023 respectively. The technology index was 40.0 and 39.0 per cent during 2021-22 and 2022-23 respectively. With the adoption of improved technology under FLDs, higher gross return (Rs 81,000 and 85,400/ha), net return (Rs 62,500 and 65,900/ha) and B-C ratio (1:3.3 and 1:3.4) were recorded as compared to farmers' practice having the gross return of Rs 40,600 and Rs 42,700 per ha, net return of Rs 23,600 and Rs 25,000 per ha and B-C ratio of 1:1.3 and 1:1.4 during 2021-22 and 2022-23 respectively.

Keywords: Chickpea; frontline demonstrations; yield; technology gap; extension gap; technology index

INTRODUCTION

Chickpea (*Cicer arietinum* L) is a popular legume that belongs to family Fabaceae. It is one of the important pulse crops of India. Pulses are good source of protein and commonly called the poor man's meat (Reddy et al 2007). Among pulses, chickpea is preferred as most important food in sustainable agriculture system due to its low production cost, wider adaptation, ability to fix atmospheric nitrogen and to be fit in various crop rotations (Singh 1997).

India is the largest chickpea producer as well as consumer in the world. During 2021-22 (fourth estimate), chickpea production of India was 13.75 million tonnes from an acreage of 10.91 million ha with a productivity of 12.6 q per ha (Anon 2023).

According to Unani and Ayurvedic system of medicine, this plant holds a good repute and is used to improve taste and appetite. Its high nutritional value makes it important food particularly in rainfed areas. The low productivity of chickpea poses a threat to economic security of the small and marginal farmers.

Frontline demonstration on improved practices in high yielding varieties is an effective way to impart knowledge, develop skill and change attitude of the farmers. Keeping these points in view, efforts were made by the scientists of Krishi Vigyan Kendra, Samba, Jammu and Kashmir by laying out frontline demonstrations on chickpea with improved production technologies under real farm situation against locally cultivated chickpea crop during rabi season of 2021-22 and 2022-23.

MATERIAL and METHODS

The present study was carried out by Krishi Vigyan Kendra, Samba, Jammu and Kashmir during 2021-22 to 2022-23 in the farmers' fields. Samba is situated at an elevation of 384 meters amsl with longitude of 75.12° E and latitude of 32.57° N and located in the Shivalik hills range alongside the National Highway on the bank of river Basantar.

A total of 150 farmers were included in the frontline demonstrations on chickpea production technology. For this, five Tehsils were selected purposively. Randomly twelve farmers from each Tehsil were selected making a total sample size of sixty. The demonstrations were laid on an area of 4.0 ha.

The impact of frontline demonstrations was studied on the increase in yield, net return, gross return and benefit-cost ratio in comparison to local practice. Satisfaction of beneficiaries was taken as to react positively or negatively towards the services rendered during frontline demonstrations through various dimensions like technology demonstrated, training of participants, timeliness of services, provision of inputs, field visits, diagnosis and advisory services to field problems, organization of extension activities, performance of variety demonstrated and overall impact of frontline demonstrations.

The selected respondents were interviewed personally with the help of structured-interview schedule on different dimensions. The information on demonstrated package of practices and farmers' practice followed are mentioned in Table 1. Technology gap, extension gap and technology index were also studied. The yield data were collected from both the demonstrations and farmers' practice using random crop cutting method and analysed accordingly. The technology gap, extension gap and technological index were calculated by using following formulas as per Samui et al (2000):

Technology gap = Potential yield – Demonstration yield

Extension gap = Demonstration yield – Farmers' practice yield

$$\text{Technology index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

RESULTS and DISCUSSION

Yield: A comparison of yield between improved practices and farmers' practice is shown in Table 2. On an average, 10.8 and 12.2 q per ha yield was recorded in demonstration plots as compared to farmers' practice (5.8 and 6.1 q/ha) with an increase of 49.07 and 50.0 per cent during 2021-22 and 2022-23 respectively.

Singh et al (2011) reported the increase in yield of solanaceous vegetables in Rajasthan condition through FLDs on improved production technology. Similarly, yield enhancement in potato in frontline demonstrations has been documented by Mishra et al (2009) and in bajra by Kumar et al (2010). The frontline demonstrations had a good impact on the farming community of Samba district as they were motivated by the new agricultural technologies applied. Similar observation was made by Singh et al (2014)

Technology gap: Data given in Table 2 reveal that the technology gap in the demonstration yield was 7.2 and 7.8 q per ha in 2021-22 and 2022-23 respectively over the potential yield of chickpea. The technology gap may be attributed to the dissimilarity in the soil fertility status and weather conditions (Meena et al 2021). Hence, variety-wise location specific recommendation appears to be necessary to minimize the technology gap for yield levels in different situations.

Extension gap: The extension gap of 5.0 and 6.1 q per ha was recorded during 2021-22 and 2022-2023 respectively (Table 2). This emphasized the need to educate the farmers through various means of improved agricultural production technologies to reverse this wide extension gap. More and more use of latest production technologies with high yielding varieties would subsequently change this alarming trend of galloping extension gap. The new technologies would eventually lead the farmers to discontinue the old technologies and to adopt new technologies. This finding is similar to the observation of Hiremath and Nagaraju (2010).

Technology index: The technology index was 40.0 and 39.0 per cent during 2021-22 and 2022-23 respectively (Table 2). The technology index shows the feasibility of the evolved technology at the farmers' fields. The lower the value of technology index more is the feasibility of the technology adoption (Jingar et al 2006).

Table 1. Details of chickpea cultivation under frontline demonstrations and existing farmers' practice

Component	Technological intervention	Farmers' practice	Gap
Land preparation	Three ploughings	Three ploughings	Nil
Variety	GNG-2144 and PBG-7	Local variety	Full
Seed rate	60 kg/ha	80 kg/ha	Full
Seed treatment	*Trichoderma viride* @ 5 g/kg seed	No seed treatment	Full
Seed inoculation	*Rhizobium* culture @ 20 g/kg seed	No seed inoculation	Full
Sowing method	Line sowing	Broadcasting	Full
Fertilizer dose	RDF	Only FYM and small amount of DAP	Full
Weed management	Pre-emergence herbicides application + two mechanical weedings	No weeding	Full
Irrigation	Two irrigations at pre-flowering and one irrigation at partial pod development stage	Rainfed	Full
Plant protection	Pheromone trap @ 4/plot + bird perchers (T-shaped pegs) @ 10/plot + spray of 250 LE, HaNPV after 10 days of second spray, spraying of neem seed kernel extract (NSKE) @ 5% at 15 days interval from pod formation stage	Partial application of insecticides without knowledge; use of incorrect dose	Partial

Table 2. Yield, technology gap, extension gap and technology index of frontline demonstrations on chickpea

Year	Area (ha)	Number of FLDs	Yield (q/ha)		Per cent increase over farmers' practice	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			FLD	Farmers' practice				
2021-22	10.4	53	10.8	5.8	49.07	7.2	5.0	40.0
2022-23	10.0	50	12.2	6.1	50.00	7.8	6.1	39.0

Economics: The input and output prices of the commodities prevailed during the demonstrations were taken for calculating cost of cultivation, gross return, net return and benefit-cost ratio (Table 3). With the adoption of improved technology under FLDs, higher gross return (Rs 81,000 and 85,400/ha), net return (Rs 62,500 and 65,900/ha) and B-C ratio (1:3.3 and 1:3.4) were recorded as compared to farmers' practice having the gross return of Rs 40,600 and Rs 42,700 per ha, net return of Rs 23,600 and Rs 25,000 per ha and B-C ratio of 1:1.3 and 1:1.4 during 2021-22 and 2022-23 respectively. It may be due to higher yield in improved technology. These results are in close conformity with the findings of Meena and Dudi (2012)

Reasons for low yield of chickpea under farmers' practice

Farmers did not follow the optimum sowing time due to non-availability of quality seed. Moreover, farmers raised the crop in traditional way by broadcasting without any seed treatment and inoculation.

Use of inadequate and imbalanced doses of fertilizers by the farmers could not result into potential yield. Lack of knowledge regarding weedicides, plant protection measures, other cultural operations and post-harvest management techniques could also be the factors responsible for lower yield.

Specific constraints with marginal/small farmers

Traditional implements and tools were still in practice due to small holdings which had poor working efficiency. The lack of simple modern tools for small holdings also hindered the adoption of improved technology. Small and marginal farmers had less capability and did not dare to invest in the costly inputs due to high risk and poor purchasing capacity.

Table 3. Cost of cultivation, gross return, net return and B-C ratio as effected by improved and local practices

Year	Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		Net return (Rs/ha)		B-C ratio	
	FLD	Farmers' practice	FLD	Farmers' practice	FLD	Farmers' practice	FLD	Farmers' practice
2021-22	18,500	17,000	81,000	40,600	62,500	23,600	3.3	1.3
2022-23	19,500	17,700	85,400	42,700	65,900	25,000	3.4	1.4

CONCLUSION

Frontline demonstration is the most suitable method for assessing the performance of the improved technology as it directly involves the scientists in conducting the demonstration at the farmers' fields. Technological and extension gap can be bridged by emphasis on improved production technology including all cultural operations. Replacement of local variety with the improved variety of chickpea would increase the production and net income of the farmers. Hence the concept of FLD may be applied at a greater number of farmers' fields for speedy and wider dissemination of the recommended practices which would subsequently improve the livelihood of the farming community.

REFERENCES

Anonymous 2023. Agricultural statistics at a glance 2022. Directorate of Economics and Statistics, Department of Agriculture and Farmers' Welfare, Ministry of Agriculture and Farmers' Welfare, Government of India, New Delhi, India.

Hiremath SM and Nagaraju MV 2010. Evaluation of on-farm frontline demonstrations on the yield of chilli. Karnataka Journal of Agricultural Sciences **23(2):** 341-342.

Jingar KL, Panwar P and Pareek OP 2006. Frontline demonstrations on maize in Bhilwara district of Rajasthan. Current Agriculture **30(1-2):** 115-116.

Kumar A, Kumar R, Yadav VPS and Kumar R 2010. Impact assessment of frontline demonstrations of bajra in Haryana state. Indian Research Journal of Extension Education **10(1):** 105-108.

Meena ML and Dudi A 2012. On-farm testing of chickpea (*Cicer arietinum* L) cultivars for site-specific assessment under rainfed condition of western Rajasthan. Indian Journal of Extension Education **48(3-4):** 93-97.

Meena MS, Singh SK, Meena HN, Meena RK and Choudhary A 2021. An assessment of extension, technological gaps and income augmentation through participatory cluster frontline demonstrations on chickpea (*Cicer arietinum*) in Rajasthan. Journal of Food Legumes **34(3):** 205-209.

Mishra DK, Paliwal DK, Tailor RS and Deshwal AK 2009. Impact of frontline demonstrations on yield enhancement of potato. Indian Research Journal of Extension Education **9(3):** 26-28

Reddy AA, Mathur VC, Yadav M and Yadav SS 2007. Commercial cultivation and profitability. In: Chickpea breeding and management (SS Yadav, R Redden, W Chen and B Sharma, Eds), CAB International, Wallingford, UK, pp 291-320.

Samui SK, Maitra S, Roy DK, Mondal AK and Saha D 2000. Evaluation on frontline demonstration on groundnut (*Arachis hypogaea* L) in Sundarbans. Journal of the Indian Society of Coastal Agricultural Research **18(2):** 180-183.

Singh D, Patel AK, Baghel SK, Singh MS, Singh A and Singh AK 2014. Impact of frontline demonstration on the yield and economics of chickpea (*Cicer arietinum* L) in Sidhi district of Madhya Pradesh. Journal of AgriSearch **1(1):** 22-25.

Singh KB 1997. Chickpea (*Cicer arietinum* L). Field Crops Research **53(1-3):** 161-170.

Singh R, Soni RL, Singh V and Bugalia HL 2011. Dissemination of improved production technologies of solanaceous vegetables in Banswara district of Rajasthan through frontline demonstrations. Rajasthan Journal of Extension Education **19:** 97-100.