E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; 7(8): 201-204
Received: 12-06-2024
Accepted: 19-07-2024

KN Rana
Scientist, Department of Crop Production, Krishi Vigyan Kendra, NAU, Vyara, Gujarat, India

AJ Dhodia
Scientist, Department of Agricultural Extension, Krishi Vigyan Kendra, NAU, Vyara, Gujarat, India

HR Jadav
Scientist, Department of Crop Protection, Krishi Vigyan Kendra, NAU, Vyara, Gujarat, India

CD Pandya
Senior Scientist & Head, Krishi Vigyan Kendra, NAU, Vyara, Gujarat, India

Corresponding Author:
KN Rana
Scientist, Department of Crop Production, Krishi Vigyan Kendra, NAU, Vyara, Gujarat, India

Impact of cluster frontline demonstrations of pigeonpea in Tapi district of South Gujarat

KN Rana, AJ Dhodia, HR Jadav and CD Pandya

DOI: https://doi.org/10.33545/2618060X.2024.v7.i8c.1221

Abstract
Frontline Demonstration is the main tool and unique approach to provide a direct interface between researcher and farmers. Frontline demonstration is conducted under direct supervision of scientists and provide guidance throughout the utilization of technology. To create better and visible impact of technology the demonstration conducted in cluster approach of at least 10.00 ha. The cluster frontline demonstrations (CFLDs) on pigeonpea was conducted by Krishi Vigyan Kendra, Tapi, Gujarat during the year 2020 to 2022 in four blocks of Tapi district *i.e.*, Valod, Vyara, Kukarmunda and Songadh. Total 100 demonstrations covering 40 ha land on pigeonpea (GT-104) was carried out with the objective to demonstrate integrated crop management in pigeonpea (GT-104) to increase productivity, profitability and adoption of recommended practices. The average yield of CFLDs plot of pigeonpea (GT-104) in 2020-21, 2021-22 and 2022-23 were 12.5, 12.3 and 12.8 q/ha, whereas, control plots recorded 10.0, 9.1 and 9.2 q/ha, respectively. The increase in the yield under CFLDs of pigeonpea were obtained 25.4, 35.2 and 39.1 percent higher over farmer's practices in the year 2020-21, 2021-22 and 2022-23, respectively. The maximum net return of 54950, 59942 and 64985 Rs./ha in demonstration plot compared to 39860, 39249 and 41609 Rs./ha in control plot and the benefit cost ratio (BCR) also recorded higher in recommended practice *i.e.*, 3.67, 3.80 and 3.80 as compared to 3.0, 2.9 and 2.92 in farmer's practice in the year 2020-21, 2021-22 and 2022-23, respectively. CFLDs made a positive impact on adoption of pigeonpea production technologies.

Keywords: Impact of cluster frontline demonstrations, pigeonpea, yield of pigeonpea, economic of pigeonpea, adoption of pigeonpea

Introduction
Tapi district comes under South Gujarat Heavy Rainfall Zone–I & II. South Gujarat Heavy Rainfall Zone–I consist of four talukas of Tapi district *i.e.*, Songadh, Vyara, Dolvan and Valod taluka. It has an intensive rainfall over 1500 to 2200 mm per annum. Rain mostly received during the month of July-August. The zone has clay soil with normal pH and EC, medium organic carbon and phosphorous and high in potash. South Gujarat Heavy Rainfall Zone–II consists of three talukas *i.e.*, Uchchhal and Nizar and Kukurmunda. Rainfall of the area varying between 1000 to 1500 mm per annum. This zone has black soil with medium to heavy texture and 75 percent of the area is rainfed.

The district is remote forest area and characterized mainly by tribal. Major field crops grown are paddy, pigeonpea, sorghum, gram, green gram, groundnut, soybean, *Rabi* okra as main vegetable crop. Krishi Vigyan Kendra (KVK), Tapi imparted the training programmes in the village and created awareness among the farmers about the scientific cultivation of pigeonpea with minimal use of agrochemicals.

KVK is an agricultural extension centre established by the Indian Council of Agricultural Research (ICAR) to provide technological support and knowledge dissemination to farmers and rural communities. KVK serve as a link between research institutions and farmers, facilitating the transfer of advanced agricultural technologies to the grassroot level. KVK-Tapi is established by the ICAR and associated with Navsari Agricultural University (NAU), Navsari.

Pulses form the most important source of proteins. Malnutrition among the poor, especially the tribal women can be reduced by increasing production of pulses.

Pulses are the major source of protein compared to cereals, oilseeds and other crops. Government of India introduced National Food Security Mission (NFSM) on pulses which has helped Indian farmers to increase the production by Cluster Front Line Demonstrations (CFLDs), trainings and various extension activities of pulses. Mission was launched to bridge the yield gap in pulses through dissemination of improved technologies and farm management practices with focus on districts which have high potential but low level of productivity performance, at present. KVK-Tapi played important role to increase pulses production in Tapi district with help of NFSM-pulses project.

Tapi district consists of 43.7 percent plain area with heavy black soils and 26.0 percent hilly area with light soil (lateritic and eroded shallow and clay loam moderately deep shallow soil). Due to heavy rainfall plain area is restricted to limited crops *viz.*, paddy and sugarcane in *kharif* season. In fact, pigeonpea is generally sown in hilly area or with proper drainage in plain area. Farmers used to cultivate pigeonpea with ridge method of planting to provide proper drainage. Lack of proper knowledge about good quality seeds and high-yielding varieties of pigeonpea is a major problem in tribal area. It is observed that lack of awareness about Seed rate and spacing of crop, use of biofertilizers for seed treatment, integrated pest and disease management, integrated nutrient management is also a cause for low productivity here. Besides that, poor economic status of the tribal farmers inhibits them to purchase major input like fertilizers, pesticides as well as to perform important operation timely. Hence, KVK-Tapi has conducted CFLDs on pigeonpea var. GT-104 in adopted villages from the year 2020-21 to 2022-23 in the area of 40 ha covering 100 no. of farmers in Tapi district.

Objective

1. To study the impact of cluster frontline demonstrations on yield of pigeonpea
2. To study the impact of cluster frontline demonstrations on Economics of pigeonpea
3. To study the impact of cluster frontline demonstrations on adoption of pigeonpea production technologies

Materials and Methods

The technologies demonstrated for pigeonpea was identified based on need analysis of farmers obtained through field visits, farmers meeting and group discussion with farmers in adopted villages of KVK. The study was carried by KVK, Tapi during *Kharif* season from 2020 to 2022 (3 consecutive years) in the farmer's field. In *Kharif*-2020 total 50 demonstrations were arranged in Beldha and Titva villages of Valod Block and Uchamada and Jesingpura villages of Vyara block in 20 ha area. In *Kharif*-2021 total 25 demonstrations were arranged in Balambha and Maulipada villages of Kukarmunda block in 10 ha area. In *Kharif*-2022 total 25 demonstrations were arranged in Ganchikuva village of Songadh block in 10 ha area.

KVK organised trainings and various extension activities for the selected farmers of CFLDs to provide complete knowledge regarding package of practices of pigeonpea including integrated nutrient management, integrated pest management, integrated disease management, moisture conservation practices, weed management, *etc.* as recommended by the Navsari Agricultural University, Navsari. Information regarding varietal characteristics of GT-104 pigeonpea was also provided. Farmers were trained for the demonstration conducted in irrigated condition having good drainage facility. Certified seeds of major pigeopea (GT-104) was provided to selected farmers. Crop was sown between 15th June to 15th July with the spacing of 60 cm x 20 cm and seed rate of 15 kg/ha. Farmers followed seed treatment of *Rhizobium* @ 10 ml/kg + PSB @ 10 ml/kg seed + *Trichoderma viridae* @ 10 g/kg seed, integrated nutrient management with application of 10 t/ha FYM + N:P:K (25:50:00) kg/ha, weed management-Pendimethalin @ 0.75-1.0 kg *a.i.*/ha followed by interculturing, integrated pest management by deep ploughing + Use of Emamectin Benzoate @ 250 ml/ha for pod-borer at 50% flowering and Neem oil 1500 ppm @ 5ml/lit for sucking pest. *vs.* farmers practice. In case of local check, the traditional practices were followed by using existing varieties.

Frequent monitoring, periodical visits and need based guideline were provided to farmers. During important stages of crop field days were also organised to spread the technology horizontally. Crop yield was recorded from the demonstration and control plots for the crops at the time of harvest. Economics were worked out to infer the superiority of the demonstration over the local practice. The following formulas were used to assess the impact of FLDs on the different parameters of oilseed crops.

$$\text{Impact on yield (\% Change)} = \frac{\text{Yield of demonstration plot (ha}-1\text{)}-\text{Yield of control plot(ha}-1\text{)}}{\text{Yield of control plot(ha}-1\text{)}} \text{ x } 100$$

$$\text{Impact on adoption (\% Change)} = \frac{\text{No.of adopters after demonstration}-\text{No.of adopter before demonstration}}{\text{No.of adopter before demonstration}} \text{ x } 100$$

Result and Discussion

Table 1: Impact of Frontline Demonstrations on Yield of Pigeonpea

Crop & Year	Technology interventions	Number of farmers	Area (ha)	Yield (q/ha)				% Increase in yield
				Demo			Control	
				High	Low	Average		
Pigeonpea (2020-21)	ICM	50	20	14.0	10.0	12.5	10.0	25.4
Pigeonpea (2021-22)	ICM	25	10	14.4	9.8	12.3	9.1	35.2
Pigeonpea (2022-23)	ICM	25	10	15.1	11.7	12.8	9.2	39.1

The perusal data (Table-1) clearly indicated that yield of pigeonpea (GT-104) was found higher in CFLDs plots as compared to farmer practices (control plot). The maximum yield of 14.0, 14.4 and 15.1 q/ha were recorded in cluster front line demonstration of pigeonpea in the year 2020-21, 2021-22 and 2022-23, respectively. The average yield of CFLDs plots of pigeonpea in the year 2020-21, 2021-22 and 2022-23 were 12.5, 12.3 and 12.8 q/ha, whereas, control plots recorded 10.0, 9.1 and

9.2 q/ha, respectively. The increase in the yield under CFLDs of pigeonpea in the year 2020-21, 2021-22 and 2022-23 were obtained 25.4, 35.2 and 39.1 percent higher over farmer's practices, respectively.

The results clearly indicate the positive effects of CFLDs over the existing practices toward enhancing the yield of pigeonpea (GT-104) in different clusters of Tapi district. Farmers were motivated by results of improved practices applied in CFLDs trial. The higher yield of pigeonpea could be attributed due to adoption of improved variety of pigeonpea, use of recommended practices in demonstration plots *viz.*, seed treatments with bio-fertilizer and bio-agent, integrated nutrient management, integrated pest and disease management, weed management, *etc*. These results were also supported by Shah *et al*. (2019) [7], Singh *et al*. (2020) [8], Ganga Devi *et al*. (2020) [1], Raghav *et al*. (2020) [6], Kolhar *et al*. (2020) [3], Lakra *et al*. (2021) [4] and Kachhawa *et al*. (2021) [2].

Table 2: Impact of Frontline Demonstrations on Economics of Pigeonpea

Crop & Year	Technology interventions	Economics of demonstration (Rs./ha)				Economics of control (Rs./ha)			
		Gross Cost	Gross Return	Net Return	BCR	Gross Cost	Gross Return	Net Return	BCR
Pigeonpea (2020-21)	ICM	20553	75503	54950	3.67	19840	59700	39860	3.0
Pigeonpea (2021-22)	ICM	21393	81335	59942	3.8	20979	60228	39249	2.9
Pigeonpea (2022-23)	ICM	23164	88149	64985	3.8	21912	63521	41609	2.92

The data show in Table-2 clearly indicated that gross cost, gross and net return as well as benefit cost ratio were observed higher in cluster front line demonstration plots. The cost of cultivation was observed higher in demonstration plot because of whole recommended package of practices were adopted including the integrate nutrient and weed management practices, which was generally farmers were not followed in pigeonpea. The maximum gross return of 75503, 81335 and 88149 Rs./ha in demonstration plot compared to 59700, 60228 and 63521 Rs./ha in control plot were found in the year 2020-21, 2021-22 and 2022-23, respectively. The maximum net return of 54950, 59942 and 64985 Rs./ha in demonstration plot compared to 39860, 39249 and 41609 Rs./ha in control plot were found in the year 2020-21, 2021-22 and 2022-23, respectively. The benefit cost ratio (BCR) also recorded higher in recommended practice *i.e.* 3.67, 3.80 and 3.80 as compared to 3.00, 2.90 and 2.92 in farmer's practice in the year 2020-21, 2021-22 and 2022-23, respectively. This might be due to adoption of improved variety of pigeonpea (GT-104) and scientific cultivation practices increase the growth and yield attributing characters. Similar findings were also reported in frontline demonstrations on pigeonpea by Shah *et al*. (2019) [7], Singh *et al*. (2020) [8], Ganga Devi *et al*. (2020) [1], Raghav *et al*. (2020) [6], Kolhar *et al*. (2020) [3], Lakra *et al*. (2021) [4] and Kachhawa *et al*. (2021) [2].

Table 3: Impact of Cluster Frontline Demonstrations on Adoption of Pigeonpea Production Technologies

Sr. No.	Technology	Number of adopters (n=100)		Change in no. of Adopters	Impact (% Change)
		Before Demonstration	After Demonstration		
1	Land preparation and application of 10 T FYM	77.15	92.00	14.85	19.25
2	Improved variety (GT-104)	10.80	77.45	66.65	617.13
3	Seed rate (15 kg/ha)	28.00	85.10	57.10	203.93
4	Seed treatment (*Rhizobium* and PSB @ 10 ml/kg seed + *Trichoderma* @ 10 g/kg seed)	13.20	68.55	55.35	419.32
5	Drainage practices (Ridge planting)	78.00	90.15	12.15	15.58
6	Sowing time and spacing (Between 15 June to 15july and 60 cm x 20 cm)	70.41	91.28	20.87	29.64
7	Integrated pest & disease management (Pheromone trap, Bird perchies, Botanical pesticides)	23.05	41.52	18.47	80.13
8	Weed management (Pendimethalin @ 0.75-1.0 kg *a.i.*/ha followed by Interculturing)	60.21	81.47	21.26	35.31
9	Fertilizer management (N:P:K-25:50:00)	52.10	84.00	31.90	61.23
10	Recommended yield	32.76	87.24	54.48	166.30

The FLDs made a significant impact on the adoption of recommended variety 'GT-104' of pigeonpea crop. Before the frontline demonstrations, 10.80% farmers in adopted villages had used improved variety of pigeonpea (GT-104), however, they shifted to 77.45% after exposure to the demonstrations. The number of adopters for land preparation and application of FYM were raised from 77.15 to 92.00%, use of recommended seed rate from 28.00 to 85.10%, sowing with seed treatment increased from 13.20 to 68.55%, use of ridge planting for effective drainage from 78.00 to 90.15%, proper sowing time and spacing from 70.41 to 91.28%, integrated pest & disease management from 23.05 to 41.52%, weed management from 60.21 to 81.47%, fertilizer management from 52.10 to 84.00% and recommended yield increased from 32.76 to 87.24% in demonstration cluster.

In other words, CFLDs made a positive impact on the adoption of improved variety (617.13%), land preparation and application of FYM (19.25%), use of recommended seed rate (203.93%), seed treatment with bio-fertilizers and bio-agent (419.32%), Effective drainage system (15.58%), sowing time between 15th June to 15th July and maintaining 60 cm x 20 cm spacing (29.64%), integrated pest & disease management (80.13%), weed management (35.31%), fertilizer management (61.23%), and recommended yield (166.30%). Similar findings were also reported in oilseed crops by Patil *et al*. (2018) [5].

Farmers were unaware about improved technologies as all demonstration conducted in tribal area. But after exposure to frontline demonstrations, they were motivated to use improved variety and complete package of practices. The higher average grain yield in demonstration plots of pigeonpea over the local

check was found due to adoption of improved variety GT-104 along with proper land preparation, use of FYM, Use of recommended seed rate, seed treatment for nutrient availability as well as protection against wilt disease, seed sowing on ridge to overcome drainage problem with optimum spacing, integrated pest and disease management, timely weed management with minimal use of agrochemical and balanced nutrition by fertilizer management.

Conclusion

It is inferred from the above results that Cluster Front Line Demonstrations along with proper training and extension activities shows significant improvements on yield levels, Net income and adoption of recommended practices against the farmers' practices thus leads to productivity and profitability of farmers in the Tapi district of Gujarat. It is also concluded that the cluster frontline demonstrations (CFLDs) organized by the KVK is an effective tool for increasing the production and productivity of pigeonpea.

Acknowledgement

The authors express gratitude to the National food security mission, ICAR, New Delhi and Director, ICAR-ATARI, Zone-VII, Pune for providing funds to conduct the CFLDs. Also thankful to host institute Krishi Vigyan Kendra, Navsari Agricultural University, Tapi, Gujarat, and farmers of Tapi district who always make trust in the KVK, Tapi.

References

1. Ganga Devi M, Kumar AC, Yugandhar Kumar M. Transfer of ICM technologies in enhancement of redgram production through frontline demonstrations in Guntur district of Andhra Pradesh. J Entomol. Zool. Stud. 2020;8(5):620-622.
2. Kachhawa D, Singh N, Meena S, Singh M, Balai L, Berwal L, *et al*. Impact of cluster frontline demonstrations in productivity enhancement and dissemination of pigeon pea production technology in Dholpur, Rajasthan. Pharm Innov J. 2021;10(6):1305-1308.
3. Kolhar BC, Biradar SA, Devarnavadagi VS, Shivalingappa H. Impact of large scale demonstration of pigeonpea variety TS-3R CFLD programme in Vijayapur district. J Pharmacogn Phytochem. 2020;9(4):1336-1338.
4. Lakra PK, Rahangdale CP, Sharma S, Rathiya PS. Comparative performance of cluster frontline demonstration for increasing productivity of pulses in Surguja district of Chhattisgarh. Int J Chem Stud. 2021;9(1):2586-2589.
5. Patil SS, Mahale MM, Chavan SS. Impact of Frontline Demonstrations (FLDs) on oilseed crops in South Konkan coastal zone of Maharashtra. Curr Agric Res J. 2018;6(3):355-364.
6. Raghav DK, Kumar U, Kumar A, Singh AK. Impact of cluster frontline demonstration on pigeonpea for increasing production in rainfed area of district Ramgarh (Jharkhand) towards self-sufficiency of pulses. Indian Res J Ext Educ. 2020;20(4):34-39.
7. Shah KA, Nayaka P, Lad AN. Impact of cluster frontline demonstration of scientific cultivation practices of major pulses in Navsari district of Gujarat. Gujarat J Ext Educ. 2019;30(1):38-41.
8. Singh N, Singh AK, Pathak S, Chauriha S. Impact of cluster frontline demonstration on yield performance, extension gap and economics of pigeonpea (*Cajanus cajan*) under rainfed condition of Chitrakoot district in Uttar Pradesh. Int J Agric Sci. 2020;12(14):10077-10079.