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Cluster Front Line Demonstration Evaluation Programme on Bengal Gram (*Cicer arietinum* L.) Variety (NBeG-3) in Nizamabad District of Telangana

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Authors' contributions

This work was carried out in collaboration among all authors. Authors MS, RVTBN, BKK, DV and CP designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors PV and BVR managed the analyses of the study. Authors MBM and MS managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The present study was conducted under Krishi Vigyan Kendra (KVK), Rudrur operational area during 2017-18 to 2019-20 in the rabi seasons with 150 frontline demonstrations across twenty three villages, seven mandals of Nizamabad district of Telangana. The results of demonstrations showed that farmers could increase the Bengal gram productivity notably by switching over to improved variety and adoption of improved production technology. In front line demonstrations, it was observed that the improved Bengal gram variety NBeG-3 recorded the higher yield (2078 kg/ha) compared to the farmers' practices variety (1775 kg/ha). The demonstration yield was increased over farmer's practices was 12.11%. Technology gap and the technology index values were 422 kg/ha and 1689, respectively. The yields were noticeably low in local practices with old variety. Adoption of improved technology including new variety, timely supply of critical inputs with

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proper guidance by the scientist, frequent monitoring visits to diagnose the problems and take applicable corrective measures, field days etc., might be the causative factors for high yield with good quality in all demonstration plots.

Keywords: Bengal gram; chickpea; FLD; impact; adoption gap; B; C ratio.

1. INTRODUCTION

Chickpea (*Cicer arietinum* L.) is the predominant pulse crop in India, which is widely consumed. It is a leading *rabi* season legume food crop having extensive geographical distribution and contributing 39 per cent to the total pulse production of the country [1].

India is the large producer, importer and consumer of pulses. Pulses are chief source of protein for a majority of the Indian population. Pulses contribute 11% of the entire intake of proteins in India [2]. In India, frequency of pulses consumption is far above the other source of protein, which indicates the importance of pulses in their daily food habits. In India nearly about 10.72 million ha (26.49 lakh acres) area was reported under bengalgram during rabi 2019-20. In Telangana state, area covered under bengalgram during rabi 2019-20 was about 0.134 million ha (0.331 million acres) [3].

The pulses production was around 18.1 million tonnes from the last three years. In India Pulses production was not maintained growth so demand calling for import to the tune of 2.0 to 4.0 million tones [4]. During the last decade pulses production increased expressively but to get the native demand continuing the fast growth is a challenge for researchers, extension agencies and policymakers. Compared to most of pulse producing countries average productivity of our nation is low (694 kg/ha).

In India the concept of FLDs was initiated under a "Technology Mission on Pulses" in 1991-92. Important objective of demonstrations is to show released crop production technologies and its management practices within the farmers' field under different farming situations and at different agro climatic regions. These FLD's are worked out under the monitoring of agricultural scientists. The recent and innovative technology having higher production potential under the precise cropping system are often popularized through FLD programme. The present study has been handled to judge the difference between demonstrated technologies vis-a-vis practices followed by the local farmers in bengal gram crop.

2. RESEARCH METHODOLOGY

The study was carried out in operational area of Krishi Vigyan Kendra (KVK), Nizamabad located in Northen Telangana Zone, Telangana. Fifty front line demonstrations were conducted on Bengalgram (chickpea) crop in 22 villages over the period three years. The data on output of high yield variety of chickpea crop and inputs used per hectare have been collected from the front line demonstration trials conducted by KVK, Rudrur. All the participating farmers were trained on various aspects of Bengal gram production technologies. Recommended agronomic practices and genuine seeds of Bengal gram were used for FLDs in 0.4 ha area/demonstration. A one fifth area was also dedicated to grow local standard check (farmer's practices). In addition to the present data, data on traditional practices followed by farmers have also been collected. The premilinary data were collected from the chosen farmers and interpreted and presented in terms of percentage increased yield. Thus, a complete sample size comprised of 150 respondents from 7 mandals, 23 villages across Nizamabad district (Table.1).

The FLD in chickpea was consist of improved variety NBeG-3, proper tillage, seed rate and sowing method, balance dose of fertilizer (8kg Nitrogen + 20kg P_2O_5 + 8kg K_2O/acre), use of Trichoderma 5 g/ kg of seed as a seed treatment, proper irrigation, weed management and protection measure (Table 2). The results are in correspondingly with the findings of [5]. A total of 60 ha area was covered in three consecutive years. In the demonstration, one control plot was also kept where farmer's practices were implemented. The potential yield and demonstrated yield, extension gap between demonstrated yield, and yield under farmers practice and technology index. The yield data were collected from both the demonstration and existing practice by random crop cutting method and analyzed by using simple statistical tools.

To estimate the technology gap, extension gap and technology index following formulae used by [6] have been used: (Eq. 1 to 4) as given below-

$$Percent\ increased\ yield = \frac{Demonstration\ yield - Farmers\ yield}{Potential\ yield} \times 100 \quad (1)$$

$$Technology\ gap = Pi - Di \quad (2)$$

where: Pi – Potential yield; Di – demonstration yield

$$Extension\ gap = Di - Fi \quad (3)$$

where: Di – Demonstration yield; Fi – Farmers yield

$$Technology\ index = \frac{Techology\ gap}{Potential\ yield} \times 100 \quad (4)$$

3. RESULTS AND DISCUSSION

3.1 Difference in Farmers' Practices and Demonstration Package in Bengal Gram Crop

The differences between demonstration package and existing practices were observed regarding recommended variety, seed treatment, time of sowing, fertilizer dose, method of fertilizer application and plant protection measures. Under the demonstrated plot only the recommended variety was given to farmers by the KVK and all the other packages and practices were timely performed by the farmer itself under the guidance of KVK scientist (Table 2) in case of farmers' practice, they generally sow local seed of chickpea at higher seed rate without treatment. As a result, the farmers selected under FLD program on Bengal gram were provided with the seed Bengal gram var. (NBeG-3) from the year 2017-18 onwards.

It case of farmer situation, normally sowing of bengal gram is earlier to escape from water shortage for irrigation, thus leading to reduction in yield. Regarding the technique of fertilization, under demonstration, all fertilizers were drilled at the time of sowing, whereas, under farmers' practice, the broadcast method of fertilization was adopted. Similar observations have also been identified by [7] and [4].

3.2 The performance of FLD Programme on Production and economics of Bengal Gram

3.2.1 Performance of FLD

A evaluation of yield performance between demonstrated practices and native checks is shown in Table 3. It had been observed that in FLD's, the improved high yielding variety NBeG-3 documented the more grain yield (2078 kg/ha) in comparision to farmers practices (1775 kg/ha). The rise within the yield over local check was 12.11% [8,9,4] have documented similar yield enhancement in various crops in front line demonstration. It is evident from the results that the yield of improved variety was found better than the local check under same environment conditions. Farmers were motivated by the results of revealed agro technologies applied within the Demonstrations and it's expected that they might adopt these technologies in future. The yield of the front line demonstration and potential yield of the crop was compared to evaluate the yield gaps, which were further categorized into technology index.

3.2.2 Technology gap

The technology gap is the dissimilarity or gap between the demonstration yield and potential yield and it was 4.22 q/ha. This gap may due to variation in the soil fertility and climatic conditions. Hence, location specific recommendations are necessary to fulfill the gap. These findings are comparable to the findings of [9].

3.2.3 Technology index

Technology index shows the achievability of the technology at the farmer's field. The lower the worth of technology index more is that the feasibility. Result of present study depicted in Table- 3, revealed that the technology index values were 16.89. The results of this study are in recurrence with the findings of [10]. These results are in conformity with the findings of [11].

3.2.4 Economics of frontline demonstrations

The economics of chick pea production under FLD's have been presented in Table 4. The Results of economic analysis of bengal gram production shown that the gross expenditure in farmer's practices was greater than the recommended practices by about 0.53%. In FLD's recorded greater gross returns (Rs. 54,208/ha) and net return (Rs. 32,2811/ha). The benefit cost ratio of demonstration plots (2.48) was also more than the local practice (2.21). Further, additional cost of Rs.117 per hectare in farmer's practices has increased additional net returns Rs.5,959 per hectare with

increase in benefit cost ratio 0.27 suggesting its higher profitability and economic viability of the demonstration. More and less indistinguishable results were also reported by [4,12]. These results are conformity with [13].

3.2.5 Exploitable yield pool in Bengal gram

The results obtained from FLDs during the three years (2017-18 to 2019-20) have convincingly showed the positive impact of the production technology over the farmers' practices. The estimates resulted from the FLD's showed that there exists a commercially consumable yield reservoir, which can be attained through adoption of supported improved crop production technology for Bengal gram.

3.2.6 Roe of FLD programme in expanding Bengal gram cultivation in the district

The decline in overall yield and area under cultivation of Bengal gram in district was reported due to low yielding variety. There were significant areas under bengal gram cultivation in Nizamabad district before the introduction of improved high yielding NBeG-3. Farmers started summer Safflower cultivation in replacement of bengal gram to escape losses. Safflower on differing as around four months crop experiences more problems in intercultural operations and harvesting than bengal gram. The FLD programme on NBeG-3 variety with successive extension programme leads to renewal of bengal gram cultivation in the district. The area under bengal gram indicated an increasing trend over the period of last few years (2017-18 to 2019-20).

Table 1. Frontline Demonstration conducted locations mandals and village wise details of Nizamabad district

S. No	Year	Name of the mandal	Name of the village
1	2017-18	Kotagiri	Takli, Sunkini, Hangarga, Sompur, Suddulam
		Bodhan	Amdapur, Salampad, Hunsa
		Varni	Jalalpur
		Madnoor	Sirpur
2	2018-19	Kotagiri	Takli, Sunkini, Hegdoli, kallur, Suddulam
		Bodhan	Kopparga hangarga, Hungarga, Hunsa, Achanpally
		Rudrur	Rudrur
		Banswada	Banswada
3	2019-20	Renjal	Neela, Kandakurthi
		Kotagiri	Takli, Sompur, Kotagiri, Suddulam, Kollur, Sunkini, Rythunagar
		Madnoor	Madnoor

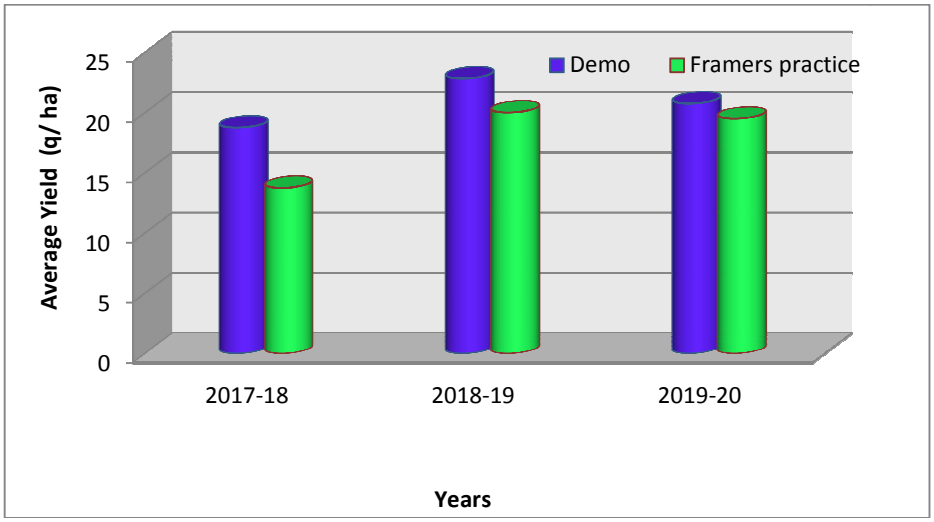

Fig. 1. Average Yields in three years data of Bengal gram in demo and farmers practice

Table 2. Differences between farmers' practices and technological intervention under FLD on chickpea

Particulars	Technological intervention	Existing practices	Gap
Variety	NBeG-3	JG-11 and Old and degenerated	Full gap
Land preparation	Three ploughing	Three ploughing	Nil
Seed rate	62.5-75kg/ ha on the basis of seed size	75-100kg/ ha	Higher seed rate
Sowing method	Line sowing (R x R 30 cm) (P x P 10 cm) and 5-8 cm deep	Line sowing (R x R 20 cm) (P x P 5 cm) and8 cm deep	Partial gap
Seed treatment	Trichoderma viridae powder 5g/ kg of seed	No seed treatment	Full gap
Fertilizer dose	45 kg Urea & 312 kg SSP per hac.	No use of fertilizer	Full gap
Weed management	Pendimithalin 2.5 L/ha and one hand weeding 30-45 DAS	Pendimithalin 2.5 L/ha	Partial gap
Irrigation	One at pre flowering and one at pod development stage	One irrigation	Partial gap
Plant protection	Need based plant protection measure	Improper measures & bios spraying	Full gap

Table 3. Yield Performance of Bengal gram under Farmers' Practice and Front Line Demonstration

Year	No. of Trials	Area (ha)	Average Yield (q/ ha)		Per cent increase	Technology gap (q/ ha)	Extension gap (q/ ha)	Technological index (%)	Net Return		B.C.Ratio	
			Demo	Check					Demo	Check	Demo	Check
2017-18	50	20	18.75	13.75	20.00	6.25	5.0	25	40000	31086	2.45:1	2.21:1
2018-19	50	20	22.83	20.0	11.32	2.17	2.83	8.68	32620	26480	2.45:1	2.24:1
2019-20	50	20	20.75	19.5	5.0	4.25	1.25	17.00	24222	21400	2.54:1	2.06:1
Total/ Average	150	60	20.78	17.75	12.11	4.22	3.03	16.89	32281	26322	2.48:1	2.21:1

Table 4. Economics of frontline demonstrations (Average values from 2017-18 to 2019-20)

Variables	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	Benefit: Cost ratio
Farmer's Practices (Local check)	22044	48366	26322	2.21
Demonstration	21927	54208	32281	2.48
Additional in demonstration	-117	5842	5959	0.27

4. CONCLUSION

The conclusions of the study revealed that wide gap occur in demonstration yield and local practices in bengal gram variety due to technology and extension gap in Nizamabad District of Telangana. The yield increment percent in of bengal gram to the extent of 12.11% in FLDs over the farmers practice made greater awareness and encouraged the other farmers to adopt the improved package of practices of bengal gram. These demonstration trails also magnify the relationship and confidence between farmers and KVK scientists. The recipient farmers of FLDs also play an essential role as source of information and quality seeds for wider dissemination of the improved varieties of bengal gram for other nearby farmers. It is concluded that the FLD programme is a effective tool in enhancing the production and productivity of chick pea crop through changing the knowledge, attitude and skill of farmers.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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