Original Research Article

Effect of Cluster Front Line Demonstrations on Productivity and Profitability of Redgram in Karimnagar District, Telangana

Abstract

Between 2017-18 and 2019-20, Krishi Vigyan Kendra, Jammikunta conducted frontline demonstrations on Redgram during the Kharif season across 90 hectares, encompassing 225 demonstrations in six villages within six clusters in Karimnagar district, Telangana. The improved technologies included the use of high-yielding varieties, seed treatment with bio-fertilizers, integrated nutrient and weed management, as well as pest and disease management.

The results indicated that the demonstrated plots achieved the highest average grain yield of 1350 kg/ha, compared to 1115 kg/ha from traditional farmer practices. Demonstration plots also yielded higher average net returns of Rs. 49,731/ha, in contrast to Rs. 34,815/ha from the farmers' practices.

Overall, the demonstrations showed a 23.79% increase in yield and a 42.81% increase in net returns compared to conventional methods. The average technology gap was 216 kg/ha, the average extension gap was 235 kg/ha, and the average technology index was 13.54%.

Key Words: Front line demonstrations, Biofertilizer, Redgram, Productivity, Profitability.

Introduction

Pulses are a key source of protein for vegetarians in India, providing essential amino acids, vitamins and minerals that complement staple cereals in their diets. Pigeon pea [*Cajanus cajan* (L.) Mill sp.] ranks as the fifth most significant grain legume globally and the second in India, following chickpea. This crop is crucial in tropical and subtropical regions and boasts several unique features. Pigeon pea is utilized in a variety of ways, more so than other pulses. With a protein content of 22-25%, it offers nearly double the protein of wheat and triple that of rice.

India has the largest area dedicated to pigeon pea cultivation, covering 4.42 million hectares, with a total production of 3.88 million tonnes and a productivity of 804 kg/ha in 2020-21 (agricoop.nic.in).

In Telangana, pigeon pea is grown across various soil types and under unpredictable rainfall conditions, occupying an area of 3.24 lakh hectares with a production of 4.14 lakh million tonnes and a productivity of 744 kg/ha (AMIC, 2021). This crop is particularly favored in rainfed areas due to its well developed tap root and lateral root systems, which enable it to access moisture from deeper soil layers. The short duration varieties of pigeon pea are especially suited for moisture-stressed conditions, likely contributing to the increased cultivation in these regions.

However, the productivity of pigeon pea in Telangana remains low at 744 kg/ha, compared to the national average of 909 kg/ha and 1858 kg/ha in the Philippines. The low productivity of pulse crops is largely due to their cultivation on marginal and sub marginal lands with poor management practices. There is a pressing need to adopt effective production technologies to maximize the yield potential of pigeon pea, which is hindered by factors such as high elasticity, indeterminate growth habits, weak source-sink relationships, low translocation efficiency, shedding of floral parts and a low harvest index.

The primary goal of frontline demonstrations is to showcase the production potential of various technologies in farmers' fields across different farming situations and agro-climatic regions. This study aims to assess the differences between the demonstrated technologies and the practices currently employed by local farmers in Redgram cultivation.

Table 1. Differences between farmers' practices and technological intervention for Redgram crop.

Sl.No	Particulars	Demonstrated Plot	Farmers Plot	Critical inputs
1	Farming situation	Rainfed	Rainfed	-
2	Field preparation	2 Ploughings	2 Ploughings	-
3	Method of Sowing	Square Planting (Dibbling)	Square Planting (Dibbling)	-
4	Time of sowing	June last week	July 1st week	-
5	Variety	WRG-65	LRG-41	Seeds of Variety WRG-65
6	Seed treatment	Seed treatment with Rhizobium and PSB	No seed treatment	PSB, Rhizobium
7	Seed rate & Spacing	2.5 kg/ac and 150 x 20 cm	2.5 kg/ac	2.5 kg Seed

8	Manures and Fertilizers	FYM 2tonn/acre, DAP – 50 Kg, Urea – 20 Kg, MOP - 15 Kg, and Acu spray (N:P: K:S) – 1kg	Injudicious use of nitrogenous fertilizers and less use of phosphate fertilizers.	Acu spray (N:P:K:S) – 1kg
9	Weed Management	Pre-emergence herbicide – Pendimethalin and one intercultural operation	No weeding/Interculture operation	Pendimethalin
10	Plant Protection	Neem oil @ 1 lit/ac Pheromone traps @6/ac	Injudicious use of insecticides and fungicides.	Neem oil and Pheromone traps

Materials and Methods

The present study was conducted by Krishi Vigyan Kendra during the Kharif season from 2017-18 to 2019-20 in six villages of Karimnagar district, Telangana. A total of 225 cluster frontline demonstrations were implemented across 90 hectares. Cooperative farmers were selected based on their participation and feedback gathered during preliminary surveys and interactive meetings. The aim was to actively engage farmers in demonstrating improved technologies for pulse production in these villages.

To assess the gaps in the adoption of recommended technologies prior to establishing the cluster frontline demonstrations (CFLDs), discussions were held with selected farmers. An awareness program was organized to educate farmers on the selection process and to provide skill development related to technological interventions for successful cultivation. Critical inputs, such as high-yielding varieties and recommended chemicals, were demonstrated after training, along with regular monitoring and pest and disease management advice from KVK scientists. The satisfaction levels of participating and neighbouring farmers regarding the performance of the demonstrated improved variety were also evaluated.

Economic parameters, including gross return, net return, and benefit-cost ratio were calculated based on current market prices for inputs and minimum support prices for outputs. Data were collected from both the frontline demonstration and control plots, allowing for the calculation of extension gap, technological gap and technological index as well as the benefit-cost ratio (Samui *et al.*, 2000). Data collection involved personal interactions with farmers on their fields, and statistical analysis was performed using percentages. The extension gap, technology gap and technology index were determined using the formulas provided by Samui *et al.* (2000).

Results and Discussion

The improved package of practices, along with technological interventions, significantly enhanced the productivity and profitability of pulses. It was also noted that farmers often used inappropriate and unrecommended insecticides, a finding supported by Singh *et al.* (2011). The seed yields in the demonstration plots were higher than those of traditional practices, largely due to the adoption of high-yielding, wilt-resistant varieties and integrated crop management practices.

The technologies promoted by KVK, Karimnagar, clearly impacted the productivity levels of red gram crops. These productivity levels surpassed those of conventional farming methods because KVK scientists carefully assessed and refined these technologies before introducing them to farmers, demonstrating the skills required through well-organized method and result demonstrations. A comparison of yield performance between the demonstrated practices and farmers' practices is presented in Table 2.

Table 2. Grain yield and gap analysis of cluster frontline demonstrations on Redgram.

Year	Number of Demonstrations	Average yield Kg/ ha		% Increase in Recommended Practice (RP)	Extension gap (kg/ ha)	Technology gap (kg/ ha)	Technology Index
		Demonstrated Practice	Farmers Practice				
2018	100	1425	1150	23.91	275	175	10.94
2019	75	1450	1125	28.88	325	150	9.38
2020	50	1175	1075	18.60	200	325	20.31
Average		1350	1116	23.79	266	216	13.54

The data showed that the average grain yield in the demonstration plots was consistently higher than that of farmers' practices over the three years. Specifically, the average yields of Redgram under the cluster frontline demonstrations were 1425 kg/ha, 1450 kg/ha and 1175 kg/ha compared to 1150 kg/ha, 1125 kg/ha and 1075 kg/ha in traditional practices. This resulted in average yield increases of 23.91%, 28.88%, and 18.60%, respectively. Similar improvements in yield for various crops through frontline demonstrations have been reported by Poonia and Pithia (2011), Patel et al. (2013), and Raj et al. (2013). The yields from the frontline demonstration trials were compared to the potential yields of the crop to estimate yield gaps, which were further classified into technology and extension gaps (Hiremath and Nagaraju, 2009).

Extension gap

The extension gap refers to the difference between the yields of demonstration plots and those of farmers' practices (control). Over the three years, the extension gaps were 275 kg/ha, 325 kg/ha, and 200 kg/ha, respectively. The average extension gap between the demonstration practices and farmers' practices was found to be 266 kg/ha (Table 2). This extension gap can be attributed to the adoption of improved transfer technology in the demonstration practices, which led to higher seed yields compared to traditional farming methods.

Technology gap

The technology gap refers to the difference between the yields from demonstration plots and the potential yield of the crop.Over the three years, the technological gaps were 175 kg/ha, 150 kg/ha, and 325 kg/ha, respectively.The average technology gap between the demonstration practices and farmers' practices was found to be 216 kg/ha (Table 2). This technology gap can be attributed to variations in soil fertility and weather conditions. Therefore, location-specific recommendations are essential to narrow the yield gap. These findings align with those reported by Patel *et al.* (2013).

Technology index

The technology index reflects the feasibility of adopting technology in farmers' fields. Over the three years, the technology indexwas10.94 %, 9.38% and 20.34% respectively.From this the results showed that the average technology index value was 13.54%, indicating a gap between the developed technology and its adoption by farmers. Similar findings have been reported by Gangadevi *et al.* (2017), Kumar *et al.* (2014), Thakral and Bhatnagar (2002), Bairwa *et al.* (2013), Hiremath and Nagaraju (2010) and Dhaka *et al.* (2010).

The economic analysis of Redgram production indicated that the average cost of cultivation was lower in demonstration plots (Rs. 27,192/ha) compared to farmers' practice plots (Rs. 28,658/ha). Frontline demonstrations also recorded higher gross returns (Rs. 79,923/ha) and net returns (Rs. 49,731/ha). Additionally, the benefit-cost ratio for demonstration plots (2.16) surpassed that of farmers' practices (1.54), with the average net return increasing by Rs. 14,916/ha.

Table.3 Economics of front-line demonstration.

Year	Total Returns (Rs/ha)		Gross cost (Rs/ha)		Net returns (Rs/ha)		Additional returns (Rs/ha)	B:C ratio	
	DP	FP	DP	FP	DP	FP		DP	FP
2018	80868	65262	26250	27625	54618	37637	16981	3.08:1	2.36:1
2019	84100	64960	27675	29175	56425	35785	20640	2.03:1	1.22:1
2020	65800	60200	27650	29175	38150	31025	7125	1.38:1	1.06:1
Average	**76923**	**63474**	**27192**	**28658**	**49731**	**34815**	**14916**	**2.16:1**	**1.54:1**

It is stated that the average profitability of Demonstrated practice is 49,731Rs/ha and that of farmers' practice is 34,815 Rs/ha, the difference between profitability levels of Redgram demonstration adopted farmers and non-adopted farmers is 14,916 Rs/ha.The higher additional returns obtained under demonstrations could be due to higher yield with improved technology. Similar observations were reported by Chaitanya *et al.*, 2020 and Dinesh *et al.*, 2021.

The results on profitability accrued by the farmers give an impression that there was a significant difference between profitability levels of technology adopted and non-adopted farmers of Redgram crop, this could be due to continuation of the adoption of location-specific technologies recommended by the scientists of KVK, Karimnagar.

Conclusion

The cluster frontline demonstrations conducted on Redgram at farmers' fields showed that adopting improved technologies led to significant increases in both yield and gross/net returns for the farmers. The successful implementation of frontline demonstrations, along with various extension activities such as training programs, field days, and exposure visits organized under CFLD initiatives, can effectively promote these improved technologies. Farmers have expressed strong interest in cultivating these varieties over larger areas in the upcoming seasons.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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