Original Research Article

Advancing Redgram productivity: Impact of Cluster Front Line Demonstrations in Wanaparthy district, Telangana

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ABSTRACT

This study aimed to assess the productivity improvement of redgram under Cluster Front Line Demonstrations (CFLD) in Wanaparthy district in the operational area of YFA-KVK, Mahabuabnagar-I. A total of 261 demonstrations were conducted over a seven-year period (2016-17 to 2022-23), covering 104.4 hectares during the kharif season under rainfed situation with protected irrigation. Results showed that with the introduction of improved high yielding short duration varieties -PRG176 and WRGE 97 when combined with seed treatment, recommended fertilizer doses, weed management, and plant protection, achieved an increase in average yield of 10.20 quintals per hectare, compared to 6.23 quintals per hectare with traditional farmers practices. Net returns averaged ₹35000 from CFLD demonstrations, significantly higher than the ₹14,230 from conventional methods, though variations were influenced by the Minimum Support Price (MSP) set by the Government of India. The study identified an average extension gap of 3.98 quintals per hectare between the demonstrated technology and traditional practices, with an average technology gap of 14.80 quintals per hectare across years. This gap varied annually due to the performance of recommended varieties and interventions. The technology index correlated with these technology gaps. The findings suggest that redgram production can be significantly improved through the adoption of improved technologies via CFLD. Therefore, it is crucial to spread these improved technologies among farmers using effective extension methods such as awareness camps, farmer-scientist interactions, group discussions, trainings, demonstrations, field days, and exposure visits through CFLD.

Keywords: Red gram, Cluster Front Line Demonstration, yield, Technology index, Extension Gap, Technology Gap

1. INTRODUCTION

Legumes are recognized for providing essential food proteins and are typically grown in risk-prone, marginal lands with minimal inputs. Among these, pigeon pea also called Redgram (Cajanus cajan (L.) Millspaugh) holds a significant role in rainfed agriculture. This perennial legume, belonging to the Fabaceae family, is native to the Eastern Hemisphere (Upadhyaya et al., 2013). Pigeon pea is extensively cultivated in tropical and subtropical regions worldwide and is a staple food in South Asia, Southeast Asia, Africa, Latin America, and the Caribbean (Kingwell-Banham et al., 2014).

Pigeon pea, also known as Tur or Arhar in India, is the second most important pulse crop in the country after gram (chana). India leads global production with 43.4 lakh tonnes grown over 49.8 lakh hectares, yielding 871 kg/hectare in 2021-22 (agricoop.nic.in). Other major producers include Malawi (4.24 lakh tonnes), Myanmar (3.39 lakh tonnes), Tanzania (1.36 lakh tonnes), and Haiti (1.23 lakh tonnes) (Crop Outlook Reports of Andhra Pradesh,2022).

In India, the area under redgram reported during 2022-23 was 114.04 lakh acres as against 119.33 lakh acres during 2021-22. Major producing states in India are Karnataka (14.10 lakh hectares), Maharashtra (11.76 lakh hectares), Madhya Pradesh (4.37 lakh hectares), Uttar Pradesh (3.64 lakh hectares), and Telangana (2.27 lakh hectares). Key redgram-growing districts in Telangana include Vikarabad, Sangareddy, Narayanpet, Adilabad, Asifabad, Mahabubnagar, and Rangareddy(Redgram Outlook (February). 2023).

Pulses constitute about one-fifth of the food grains area and contribute 7-10% to total food grain production in India. However, productivity stands at 892 kg/ha, necessitating further improvement. The Government of India, under the National Food Security Mission, aims to achieve self-sufficiency in pulses by activating Cluster Front Line Demonstrations (CFLDs) with the Indian Council of Agricultural Research and Krishi Vigyan Kendras, which showcase quality seeds and technological packages (Gautam U.S. et al., 2023).

CFLDs aim to demonstrate and popularize improved agricultural technologies on farmers' fields, bridging gaps between recommended practices to boost production (Gautam U.S. et al., 2019). These demonstrations are crucial for transferring the latest technologies and practices to farmers (Tankodara et al., 2018; Hiremath and Hilli, 2012), and for introducing suitable agricultural practices in real farming conditions (Deka et al., 2021), supported by extension programs for widespread technology dissemination (Madhushekar et al., 2021 and Venkatarajkumar et al., 2020).

Over the last few years, the area and production of pulses in Telangana State increased tremendously due to inception of Cluster Front Line Demonstration concept at farmers' field (Chaitanya. T et al, 2020). In light of these objectives, a study was conducted by YFA-KVK focusing on Cluster Front line Demonstrations conducted of Redgram at farmer's field under irrigated/ rain fed situation in kharif 2016-17 to 2022-23.

2. METHODOLOGY

The Cluster Frontline Demonstrations (CFLDs) on redgram were conducted by YFA-Krishi Vigyan Kendra, Mahabubnagar-I, Madanapuram, in 07 mandals of Wanaparthy district, Telangana, from the kharif seasons of 2016-17 to 2022-23. Each year, from 10 to 20 hectares were allocated to these demonstrations under rainfed situation with protected irrigations during Kharif season, contrasting with local farming practices. A total of 261 demonstrations covering 104.4 hectares were implemented to showcase advanced redgram technologies with the view to promote improved cultivation practices and increase the area under redgram in the district.

The soils in the selected villages were sandy loam and chalka soils. Farmers received training on the recommended package of practices for redgram cultivation from the KVK (Table 1) and were also provided with necessary need based critical inputs (Table 2). Each year, a cluster with 10-20 hectares were allocated for demonstrating redgram improved recommended technologies alongside local practices as a control. Pre-sowing training sessions were conducted with selected farmers. The redgram variety PRG 176, also known as Ujjvala, was recommended and provided as input due to its high yield, wilt tolerance, short duration (125-130 days) and suitability for all seasons and other high yielding, wilt tolerance variety called WRGe 97 also called Warangal Kandi was selected for distribution under critical inputs and recommended improved technologies, including seed treatment, fertilizer application, weed management, and integrated pest and disease management, were demonstrated throughout the crop cycle with corresponding training.

Regular visits by scientists ensured the effective execution of demonstration and facilitated the collection of farmers' feedback on recommended variety and technologies. The performance of the variety, along with the recommended technology, was assessed both visually and quantitatively by the farmers. Field days were organized to highlight the advantages of the demonstrated technologies, drawing participation from local farmers, neighboring communities, and agriculture department officials.

Yields from the demonstration plots were carefully recorded and compared with those from traditional farmers practices at harvest, revealing significant performance gaps. Data analysis also covered cultivation costs, net income, and benefit-cost ratios, underscoring the benefits of the advanced redgram technologies (Samui et al., 2000).

The Technology Gap, Extension Gap and Technological Index were calculated by using following formula as given below:

- **Extension gap = Demonstration yield – farmers practice yield**
- **Technology gap = Potential yield – Demo yield**

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- **Technological Index = Potential Yield-Demo yield / Potential Yield X 100**

3. RESULTS AND DISCUSSION

The adoption of improved seed variety and recommended farming practices is crucial for boosting crop production and profitability. Detailed parameters and procedures of recommended practices was depicted in Table 1. However, it was noted that farmers deviating from recommendations in case of application of plant protection chemicals. This issue is consistent with observations reported by Singh G, et al. (2011).

Table 1 Particulars showing the details of redgram cultivated under CFLD and farmers' practice

Particulars	Recommended Practices	Farmers practice
Variety	PRG176 and WRGE 97	Pinky/local admixtures seed
Seed Treatment	Thiram@3g/kg & Rhizobium400g/acre	No seed treatment done
Sowing time	June 15th – August 15th	June 15th to 15th July
Sowing method	150 X 20 cm, using seed cum fertilizer drill	Line sowing with inappropriate spacing
Seed rate	10 kgs/ha.	12-15 kgs/ha
Fertilizer dose	Balanced fertilization using 312.5 kg of SSP as the basal dose and 44 kg of urea in split doses as per the results of the soil test. Rhizobium 400 g/acre.	Improper fertilizer usesage with a basal dose of 20 kg of urea and a top dressing of 80 kg of DAP.
Plant protection	Neem oil @ 5ml/lit and Chlorophyriphos @2.5 ml/lit for control of sucking pest. Need bsed Plant protection chemicals (Emmamectin benzoate 100 grams per acre Chlorontrinilprole 80 ml per acre. Spraying of Acephate@1.5 g, Dichlorvos 1ml, spraying of dicofol@5ml/lit. (Maruca pod borer, Pod fly))	Indiscriminate use of chemicals, without following any recommendations
Weed management	Pre emergence herbicides Pendimethalin 1.2 lit per acre and post emergence herbicide Imazethapyr 250 ml acre at 15-20 DAS	

Table 2 Details of technology demonstrated and critical inputs distributed under CFLD in Redgram

Year	Cluster/Mandal selected	Demonstrations conducted	Area (ha.)	Technology Demonstrated	Critical inputs
2016-17	Kothakota, Peddamandadi	36	14.4	High yielding varieties with	Seed- PRG176, WRGE 97, pheromone traps(3no./ac.),

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2017-18	Wanaparthy, Pangal, Madanapuram	50	20	recommended +INM+IPM practices	Helicoverpa Lures((3no./ac.), Neem (1500ppm), Bio fertilizers, Micro nutrients Acuspray (pluse special)
2018-19	Wanaparthy, Madanapuram, Maldakal	50	20		
2019-20	Wanaparthy, Madanapuram,	25	10		
2020-21	Kothakota, Madanapuram	25	10		
2021-22	Kothakota, Madanapuram& Wanaparthy	25	10		
2022-23	Revally&Madan apuram	50	20		

3.1 Yield increase

From the Table 3 the grain yield and gap analysis for redgram, was observed which obtained by comparison of farming practices with those of recommended practices under CFLDs. The data reveal that demonstrations under Cluster Frontline Demonstrations (CFLDs) achieved an average yield of 10.20 quintals per hectare, representing a significant increase of additional 3.97 q/ha yield over farmers practice over the 6.23 quintals per hectare obtained using farmer's practice. The average technology index recorded was 59.18, while the average Technology gap of 14.80 quintals per hectare between CFLD and farmer's practice. Additionally, the extension gap was 3.98 quintals per hectare, as shown in Table 3. The higher yields in the demonstrations obtained compared to farmers practice (Fig 1) were attributed to the adoption of recommended improved practices such as line sowing, seed treatment, nutrient management, and effective weed control. These results corroborate the findings of Chaitanya. T et al, 2020 and Meena and Dudi, 2018.

Table 3 Gap analysis of CFLD on Redgarm (PRG-176) when compared betweendemonstrations and existing farmer's practice.

Year	No. of demons	Potential yield of the selected variety (q/ha)	Yield obtained from CFLD demo (q/ha)	Yield obtained from farmers practice (q/ha)	Additional yield (q/ha) over farmers practice	Extension Gap	Technology Gap	Technological Index
2016-17	36	25	13.55	7.81	5.74	5.74	11.45	45.80

2017-18	50		8.20	6.65	1.55	1.55	16.80	67.20
2018-19	50		10.13	6.44	3.69	3.69	14.87	59.48
2019-20	25		8.66	6.25	2.41	2.41	16.34	65.36
2020-21	25		10.25	5.87	4.38	4.38	14.75	59.00
2021-22	25		9.79	5.29	4.5	4.50	15.21	60.84
2022-23	50		10.85	5.27	5.58	5.58	14.15	56.60
Avg.			**10.20**	**6.23**	**3.97**	**3.98**	**14.80**	**59.18**

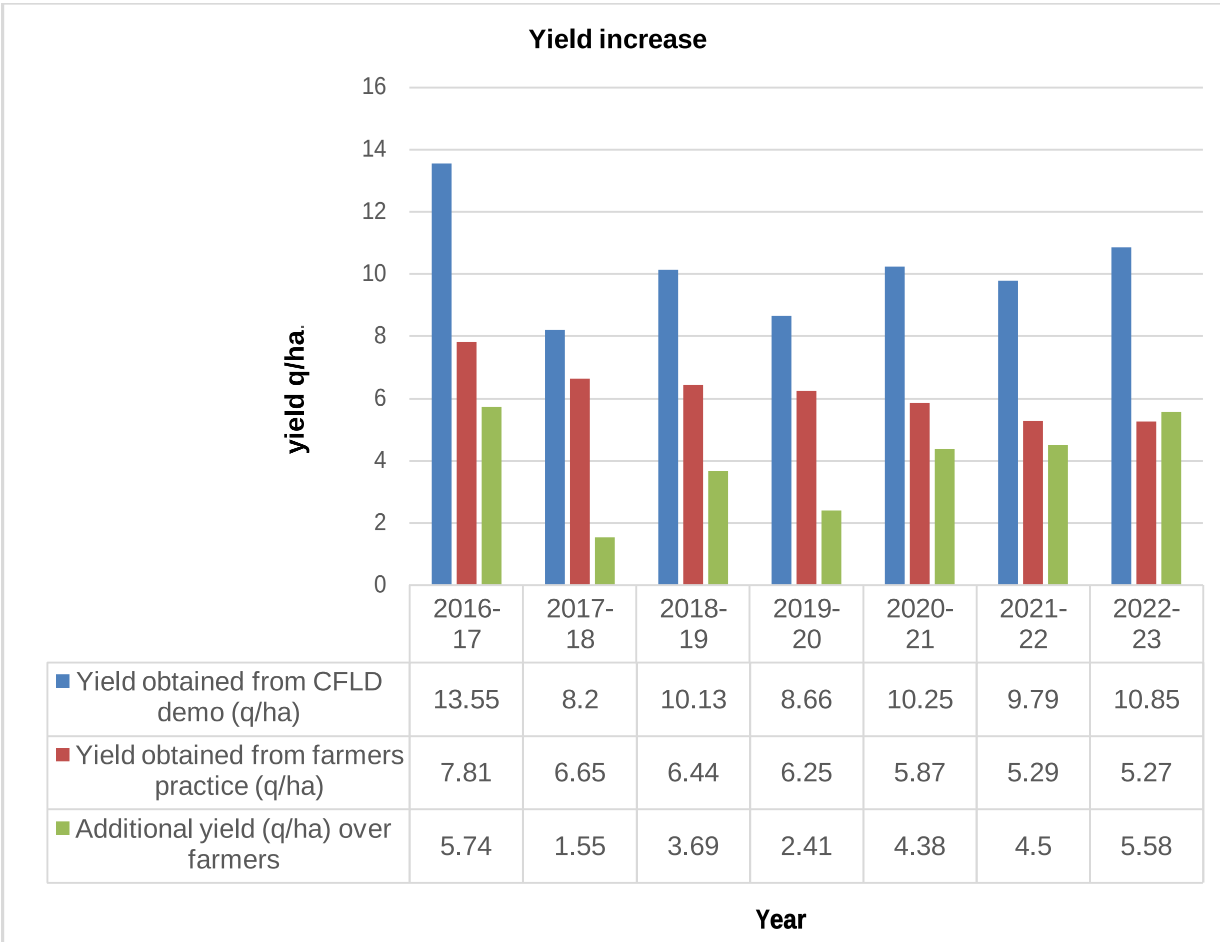

Fig 1 Yield analysis depicting the yield obtained from CFLD demonstration compared to yield obtained from Farmers practices and additional yield increase

Table 4 Economic analysis of CFLD on Red gram crop

Year	COC (Rs/ha)		Gross Returns (Rs/ha)		Net Returns (Rs/ha)		MSP (q)	B:C Ratio	
	Demo	FP	Demo	FP	Demo	FP		Demo	FP
2016-17	24000	22.823	67750	37863	43750	15040	5050	2.82	1.65
2017-18	17850	16565	41000	33250	23150	16065	5450	2.31	2.00
2018-19	26589	22850	53392	35224	26803	12374	5675	2.00	1.54
2019-20	22489	19529	49104	31213	26615	11684	5800	2.18	1.59

2020-21	20959	17188	60224	33766	39265	16578	6000	2.87	1.96
2021-22	22888	18445	58958	30880	36070	12435	6300	2.57	1.67
2022-23	25455	19073	74808	34513	49353	15440	6600	2.93	1.80
Avg.	**22890**	**16238.9**	**57890.8**	**33815.5**	**35000.8**	**14230.8**	5839	2.53	1.74

COC=Cost of cultivation, Minimum Support Price (MSP) and Benefit: Cost ratio(B:C), FP-Farmers Practice

3.2 Economic Analysis

Economic returns varied annually due to variations in grain yield and Minimum Support Price (MSP) set by the Government of India. According to the results shown in Table 4 and Fig 2, from the CFLD demonstrations, the maximum gross returns were Rs. 74,808 with net returns of Rs. 49,353 in 2022-23. In contrast, the minimum gross returns of Rs. 41,000 and net income of Rs. 23,150 occurred in 2017-18. The improved financial returns in demonstration fields were attributed to the adoption of advanced technologies, timely crop management, and consistent field visits. The benefit-cost ratio increased from least 2.0 in 2018-19 to 2.9 in 2022-23, reflecting the positive impact of CFLD on both grain yield and profitability. These findings align with earlier studies conducted by Chaudhary. S (2012) and Meena and Dudi (2018).

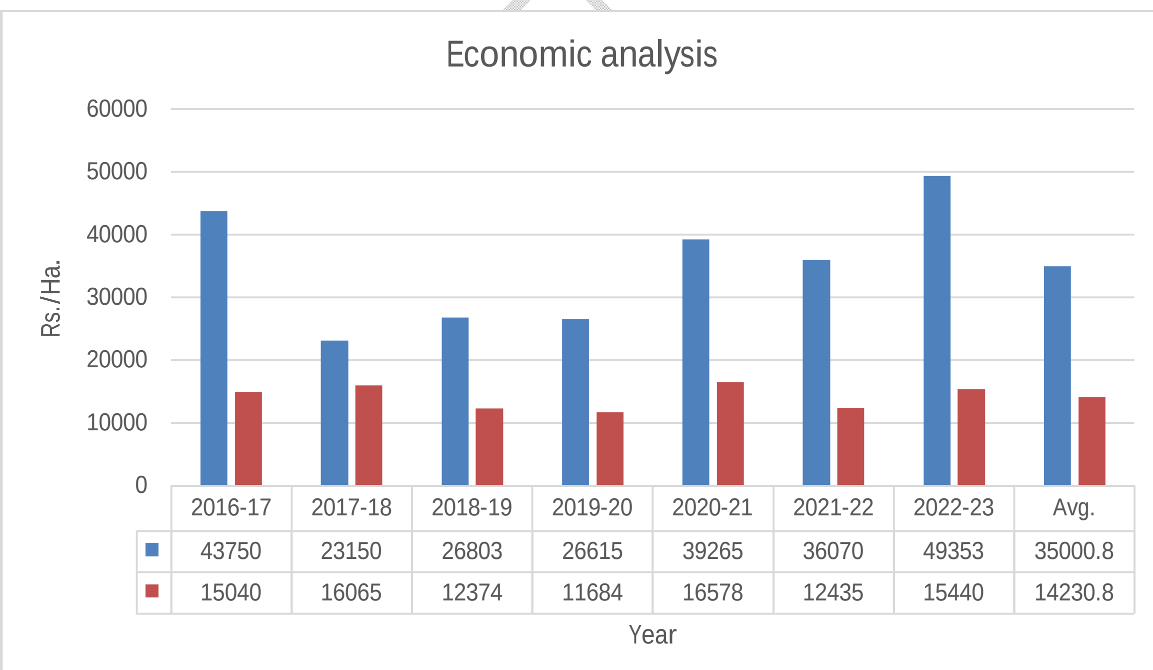

Fig 2Economic analysis depicting the increased net returns obtained from CFLD demonstration compared to that of net returns obtained under Farmers practices from 2016-17 to 2022-2023

4. CONCLUSION

Interventions through Cluster Frontline Demonstrations (CFLDs) have significantly enhanced productivity and expanded redgram production areas sustainably. These demonstrations not only showcase improved varieties and recommended crop production practices but also improve farm-level economics and restore farmer confidence. CFLDs have proven to be effective tools for technology transfer, aiming to cover extensive farm areas for broader dissemination of recommended practices. Krishi Vigyan Kendras (KVKs) play a crucial role in transitioning farmers from their traditional farm practices to improved practices through CFLD interventions. These efforts have demonstrated substantial potential to increase farmers' incomes by generating additional revenue per unit of land and input. The success of these demonstrations highlights their effectiveness in fostering the widespread adoption of improved technologies in a sustainable way.

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