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Impact of cluster frontline demonstrations on redgram productivity in Mahabubabad district of Telangana

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Abstract
Cluster frontline demonstrations (CFLDs) on redgram was conducted by Krishi Vigyan Kendra, Malyal in villages namely Kannegundla of Dornakal mandal, Chillamcherla of Maripeda mandal, Vinobanagar of Bayyaram mandal, Mahabubabad district of Telangana state during the *kharif* season of 2016-2017, 2017-18 and 2018-19 respectively. The results revealed that the variety WRG-65 with seed treatment (imidacloprid @ 2ml/kg + carbendazim @1g/kg +*Rhizobium* spp @ 25g/kg) + plant protection (Yellow sticky trap + Neem oil + insecticide) nutrient and weed management recorded average highest yield of 1420 kg/ha (2016-17) against the farmers practice of 1030kg/ha. The maximum net returns of Rs. 66250/- during the year 2016-17 and minimum net returns of Rs. 40,500/- during the year 2017-18 were obtained due to variation in MSP sale rates as declared by GOI. The study revealed that an average extension gap was 407 kg/ha between demonstrated technology and farmer's practice. The study further exhibited a wide technology gap during different years. The average technology gap of all the years was 527 kg/ha. The difference in technology gap in different years was due to better performance of recommended varieties with different interventions and more feasibility of recommended technologies during the course of study. Similarly, the technology index for all demonstrations in the study was in accordance with technology gap. It can be concluded that the red gram production could be enhanced by adoption of improved technologies through Cluster Front Line Demonstrations. Hence, there is a need to disseminate the improved technologies among the farmers with effective extension methods like trainings and demonstrations.

Keywords: CFLDs, Redgram, grain yield, benefit cost ratio

Introduction
Red gram is commonly known as Tur or Arhar in India and is the second important pulse in the country after gram (chana). The ability of redgram to produce high economic yields under soil moisture deficit makes it an important crop in rainfed and dryland agriculture. India contributes for nearly 90% of world's total redgram production. (Agricultural Market Intelligence Centre, PJTSAU, Redgram Outlook, February 2018)

According to the all India crop situation report, kharif 2017-18, Ministry of Agriculture, Government of India, the area under redgram in the country has decreased to 43.00 lakh hectares in 2017-18 from 53.39 lakh hectares in 2016-17. In India, major redgram producing states are Maharashtra (12.72 lakh ha), Karnataka (8.79 lakh ha), Madhya Pradesh (6.51 lakh ha), Uttar Pradesh (3.36 lakh ha), Telangana (2.84 lakh ha), Gujarat (2.76 lakh ha) and Andhra Pradesh (2.24lakh ha).

In Telangana State redgram was cultivated in an area of 2.84 lakh hectares in 2017-18 as against 4.85 lakh hectares in 2016-17. The major redgram growing districts in Telangana are Mahabubnagar, Medak, Nalgonda and Warangal. Even under normal rainfall the area under the crop has decreased in kharif 2017-18, because of sharp fall in its price during previous season.

National Food Security Mission (NFSM) was launched in 2007-08 to increase the production of rice, wheat and pulses by 10, 8 and 2 million tonnes, respectively by the end of 11th Plan through area expansion and productivity enhancement; restoring soil fertility and productivity; creating employment opportunities; and enhancing farm level economy. The Mission was continued during 12th Plan with new target of additional production of 25 million tones. The major interventions/activities covered under NFSM include cluster demonstrations of rice, wheat, pulses and coarse cereals, distribution of improved varieties/hybrid seeds, need based

inputs, resource conservation techniques / energy management, efficient water / application tools, cropping system based trainings and local initiatives; award for best performing districts etc. (Department of Agriculture, Cooperation & Farmers Welfare, Annual Report 2017-18)

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. Front Line demonstration is a long term educational activity conducted in a systematic manner at farmers' fields to show worth of a new technology on "Seeing is Believing" principle. Traditional or farmer's practices are no longer sustainable towards pulse production as it shows huge gap in yields in comparison to scientific production technologies. Constant efforts are needed to bridge this gap through demonstration of improved production technologies.

Materials and Methods

The present investigation of cluster frontline demonstrations (CFLDs) on redgram was conducted by Krishi Vigyan Kendra, Malyal in villages namely Kannegundla of Dornakal mandal, Chillamcherla of Maripeda mandal, Vinobanagar of Bayyaram mandal, Mahabubabad district of Telangana state during the *kharif* season of 2016-2017, 2017-18 and 2018-19 respectively. The demonstration was conducted in an area of 20 ha in every year, three locations against local variety in three years. 110 demonstrations in 60 ha (2016-17 to 2018-19) were conducted with active participation of farmers to demonstrate the improved technologies of redgram in different villages so as to establish production potentials and expand the area under the crop in the district. Present study with respect to CFLDs and farmers' practices are given in Table 1. The soils in selected villages were sandy loam. Farmers were trained to follow the package of practices for redgram cultivation as recommended by the State Agricultural University and need based input materials provided to the farmers (Table 2).

Every year 20 hectares were taken for the demonstration of technologies in redgram crop along with farmers practice as check plot. Pre-sowing trainings were organized involving the selected farmers on the crops. Selected redgram variety, WRG-65 and WRG-53 were high yielding, tolerant to wilt and suitable to all seasons. Critical inputs along with technologies like seed treatment, fertilizer application, water and weed management, integrated pest and disease management etc., were demonstrated at every stage of the crop with appropriate trainings. Regular visit by the scientist helped in proper execution of trials as well as collecting farmer's opinion on the demonstrated varieties. The performance of the varieties in the trials was judged visually as well as quantitatively by farmers themselves. Field days were conducted involving demonstration holding farmers, neighboring farmers, Scientists from University, Officials from Department of Agriculture and local extension functionaries to demonstrate the superiority of the technology. Crop yields were recorded from the demonstration and check plots at the time of harvest to identify the yield gaps between demo and check plots.

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

Operation	Existing practice	Improved practices demonstrated
Seed rate and spacing	3-4 Kg/ Acre, 120 X 30 cm	2-3 Kg/ Acre, 120 X 45 cm or 180X45 cm or 90X90 cm
Use of variety	LRG-41	WRG-65 & WRG-53
Seed treatment	No seed treatment	Seed treatment with Imidacloprid @ 2ml/kg + Carbendazim@1g/kg +*Rhizobium spp* @ 25g/kg of seed
Wilt	No tolerance	Tolerant variety
Weed management	No Weed management	Weeds control by using herbicide Pendimethalin 1kg / ha in 500 liter of water as pre-emergence treatment for effective control of weeds within two days after sowing.
Manures & Fertilizer applied for present crop	Not applied	20 Kg P as basal, 8 Kg N, Multi-K foliar spray at pod development stage
Whole package	Farmers are cultivating the redgram crop without adoption of any improved technology	All the crop (production and protection) management practices as per the package of practices for kharif crop by PJTSAU, Hyderabad were followed for raising the crop

Table 2: Details of need based inputs of redgram used in CFLD

Cluster	Number of demonstrations	Area in ha	Variety	Year	Technology Demonstrated	Need based inputs
Kannegundla of Dornakal mandal,	40	20	WRG-65 & WRG-53	2016-17	• High yielding variety- WRG-65 & WRG-53 • Seed treatment with Imidacloprid @ 2ml/kg + carbendazim @1g/kg +*Rhizobium spp* @ 25g/kg of seed • Fertilizer recommendation based on soil test results • Neem oil + insecticide	• Treated seed • *Rhizobium* spp • Neem oil • Coragen • Multi-K (13:0:45)
Chillamcherla of Maripeda mandal,	25	20	WRG-65	2017-18		
Vinobanagar of Bayyaram mandal	45	20	WRG-65	2018-19		

The data with respect to grain yield from FLD plots and farmers plots of the area were collected and evaluated. Potential yield was taken in to consideration on the basis of standard plant population and average yield per plant under recommended package of practices. Different parameters as suggested by Yadav *et al* (2004) [7] was used for gap analysis, and calculating the economics. The details of different parameters and formula adopted for analysis are as under

Extension gap = Demonstration yield - Farmers' practice yield

Technology gap = Potential yield - Demonstration yield

$$\text{Technology index} = \frac{\text{Potential yield - Demonstration yield}}{\text{Potential yield}} \text{ X } 100$$

Results and Discussion

1. Seed yield

The productivity of redgram under improved production technology ranged between 1120-1420 kg/ha, 1250-1500 kg/ha and1190-1500 kg/ha during the years 2016-17, 2017-18 and 2018-19 respectively as against a yields of 1030,1020,1150 respectively under farmers' practice. In comparison to farmer's practice, there was an increase of 38, 47 and 30 per cent in productivity of redgram under improved technologies during the years 2016-17, 2017-18 and 2018-19 respectively. The difference in yield observed during different years was due to variation in available irrigation facility at different places, dissimilarities in soil fertility levels, pest and disease incidence, improper usage of manures and fertilizers. The increased grain yield with improved technologies was mainly because of line sowing, seed treatment, nutrient management and weed management. The findings were in line with Meena *et al* (2012) [6] and Meena and Dudi (2018) [4].

Table 3: Seed yield of red gram under FLD and FP.

Year	Area (ha)	Demonstration (No)	Yield obtained (kg/ha)			Yield kg/ha		Additional yield (kg/ha) over farmer's practice	Per cent increase
			Max.	Min.	Av.	Demo	FP		
2016-17	20 ha	37	1420	1120	1200	1420	1030	390	38
2017-18	20 ha	38	1500	1250	1375	1500	1020	480	47
2018-19	20 ha	38	1500	1190	1360	1500	1150	350	30

2. Economics

Economic returns as a function of gain yield and MSP sale price varied during different years. The maximum gross returns of Rs. 86,125/- and net returns of Rs. 66125/- during the year 2018-19 and minimum of Rs. 66,000/- and net returns of Rs. 40,500/- during the year 2017-18 were obtained due to variation in MSP sale rates as declared by GOI. The higher additional returns and effective gain obtained under demonstrations could be due to improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring and also sale of seed to other farmers as a seed. The lowest and highest benefit cost ratio were 2.6 and 4.7 in 2017-18 and 2016-17, respectively (Table 4) depends on produced grain yield and MSP sale rates. The results were in confirmity with the findings of front line demonstrations on pulses by Chaudhary (2012) [2], Meena and Dudi (2018) [4].

Table 4: Economics of red gram under FLD and FP.

Year	Variety	Farmer's Existing plot				Demonstration plot			
		Gross cost (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C Ratio	Gross Cost (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
2016-17	WRG-65	15,000	51,500	36500	3.4:1	17,500	83,750	66250	4.7:1
2017-18	WRG-65	26,500	48,000	21,500	1.8:1	25,500	66,000	40,500	2.6:1
2018-19	WRG-65	21,250	58,500	37250	2.8:1	20,000	86,125	66125	4.3:1

3. Performance of FLD

Yield of frontline demonstration trials and potential yield of the crop was compared to estimate the yield gap further it was categorized into extension gap, technology gap and technology index. The extension gap and technology gap observed that it may be attributed due to dissimilarities in soil fertility levels, pest and disease incidence, improper usage of manures and fertilizers. Hence, to narrow down the yield gaps location specific technologies needs to be adopted.

The study (Table 4) revealed that an extension gap of 350 to 480 kg/ha was found between demonstrated technology and farmers' practice and on average basis the extension gap was 407 kg/ha. The extension gap was highest (480 kg/ ha) during 2017-18 and lowest (350 kg/ha) during 2018-19. Such gap might be attributed to adoption of improved technology especially with high yielding new varieties sown in line with balanced nutrition, weed management and appropriate plant protection measures in demonstrations which resulted in higher grain yield than the traditional farmers' practices. The study further exhibited a wide technology gap during different years. The average technology gap of all the years was 527 kg/ha. The difference in technology gap in different years was due to better performance of recommended varieties with different interventions and more feasibility of recommended technologies during the course of study. Similarly, the technology index for all demonstrations in the study was in accordance with technology gap. Higher technology index reflected the inadequate transfer of proven technology to growers and insufficient extension services for transfer of technology. Hence, it can be inferred that the awareness and adoption of improved varieties with recommended scientific package of practices have increased during the study period. These findings were in the conformity of the results of study carried out by Meena and Singh (2017) [5], Meena and Dudi (2018) [4].

Table 5: Technological gap analysis of frontline demonstrations on redgram farmers' field

Year	Number of FLDs	Potential Yield (kg/ha)	FLD yield (kg/ha)	FP yield (kg/ha)	EG (kg/ha)	TG (kg/ha)	TI (kg/ha)
2016-17	40	2000	1420	1030	390	580	29
2017-18	25	2000	1500	1020	480	500	25
2018-19	45	2000	1500	1150	350	500	25
Average		2000	1473	1066	407	527	26

EG= Extension gap; TG= Technology gap; TI= Technology index; FP= Farmers practices

Conclusion

The cluster frontline demonstrations conducted on redgram at farmer's field revealed that the adoption of improved technologies significantly increased the yield as well as gross and net returns to the farmers. Improved technologies can be spread by the successful implementation of front line

demonstration and various extensions activities like training programme, field day, exposure visit organized in CFLDS programmes in the farmers fields. The farmers have shown keen interest to grow these varieties in large area in the ensuing seasons.

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