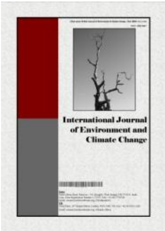

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Impact of Front Line Demonstration on Pigeon Pea in Farmers Field through a Cluster Approach

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In the operational region of KVK, Palem, a total of 175 cluster frontline demos (CFLDs) on pigeon pea were carried out with the Redgram variety PRG-176 from 2019–20 to 2021–2022. Through farmer meetings and group discussions, the crucial inputs in the production technology now in use were identified. The results for pigeon peas showed an overall yield trend of 12.50 to 13.00 q/ha and a yield improvement of 11.11 to 11.84% over the yield from local methods, respectively. Due to significant heterogeneity in the extent of adoption of recommended technology based on the level of risk associated in terms of cost, convenience, ability, and knowledge of the concerned practice, the yield levels were significantly lower under local practices. Pigeon pea had an average extension gap, technology gap, and technology index of 128.30, 125, and 8.93%, respectively. The average gross and net returns of the pigeon pea crop demonstration were, respectively, 72895 and 47045 percent higher than the farmers' practices. Throughout the trial, the average benefit cost ratio was found to be greater in pigeon pea, at 2.8 respectively. The technological gap and index percentage were found to vary as a result of differences in agro-climatic parameters, soil fertility, biotic stressors, socioeconomic status, and management practices. Therefore, it is plainly clear from the data that the frontline demonstration program's use of superior varieties, packaging, and processes together with scientific intervention has contributed to raising the productivity and profitability of pulses in the global economy.

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1. INTRODUCTION

Pulses abundance in proteins (varying from 20 to 24 percent, depending on the crop species), vital minerals, vitamins, and dietary fibres, pulses play a significant role in both human and animal diets. Grain legumes have three times as much protein as rice and twice as much as wheat. Grain legumes contain twice as much protein as wheat and three times as much as rice. As a result, one of the best strategies to fight protein-calorie malnutrition is by incorporating pulses into cereals. In addition to proteins, they constitute a substantial source of the 15 essential minerals that humans require. Pulses hold a special role in India's nutritional food security for the nation's constantly expanding population as well as the poorer segments of society who cannot afford other sources of protein. With a 26% share of global production, India is the greatest producer in the world, producing 25.23 million tonnes of pulses over 29.99 million hectares. The country's average productivity is about 841 kg/ha, which is lower than the global average production of 1023 kg/ha [1].

As of September 27, 2019, Indian farmers had planted 134.02 lakh hectares of kharif pulses, down from 136.40 lakh ha the previous year. As opposed to last year, when 45.74 lakh ha were covered, 45.82 lakh ha were. Maharashtra (12.07 lakh ha), Karnataka (11.93 lakh ha), Madhya Pradesh (5.06 lakh ha), Uttar Pradesh (3.51 lakh ha), Telangana (2.86 lakh ha), and Gujarat are the top redgram producing states in India (2.15 lakh ha). In the state of Telangana, redgram is a significant rainfed crop that is grown on roughly 1.95 lakh ha.

It is produced as a stand-alone crop or as an intercrop with groundnuts, millets, cotton, and other pulses in a variety of cropping schemes. The main growing districts are Mahbubnagar, Adilabad, Ranga Reddy, Medak, Nalgonda, Warangal, and Khammam. In Telangana, redgram productivity is 776 kg/ha on average in 2021–2022 [2].

Due to Redgram cultivation utilising a traditional farming method, non-adoption of advised production technologies due to ignorance and lack of awareness regarding cutting-edge technologies, and major abiotic and biotic stresses, the potential yield of pulse crops is decreasing. Currently, Cluster Front Line Demonstrations (CFLDs), which are essential for the adoption of superior pulse varieties and production technology, have been developed by the National Food Security Mission (NFSM) of the Indian government. Therefore, it can be said that cluster front-line demonstration is an effective extension intervention to show farmers the possibilities of increasing pulse crop production. In order to maximise the productivity potential of pulse crops, close the technology gap, speed up technology adoption, and lower disease and insect infestation, it is advised that extension agencies engaged in the transfer and application of agricultural technologies on farmer's fields priorities organizing frontline demonstrations on a cluster basis.

2. MATERIALS AND METHODS

Cluster front line demonstrations (CFLDs) are among the most effective extension strategies because, in general, farmers are motivated by the idea that "Seeing is believing." The main objective of cluster frontline demos is to demonstrate recently available crop production and protection technology, as well as their management practises, in a farmer's field in a microfarming setting. The KVK, Palem conducted cluster front line demonstrations on pulse crops throughout the kharif and rabi seasons 2019–20 to 2021–2022, as part of a centrally financed programme on pulses production and protection technology of the National Food Security Mission programme. The Krishi Vigyan Kendra, Palem, Nagarkurnool district organised 150 CFLDs with 150 acres planted in pigeon pea in the KVK, Palem operational area and adopted the villages of Khnapaur, Gorita, Ippalapally, Manthati, and Nallavelly of Thimmajipet, Binepally, and Ngarakurnool district in Red chalka soils. The rain fall was 650 mm. The total area of 60 ha was covered for the pigeon pea demonstrations, respectively [3]. Following a group discussion, a list of farmers was created, and those who were chosen received specialised training in various parts of suggested production and protection technologies. The technological interventions on pulse crop were composed of a suitable improved and short-duration variety of pigeon pea, PRG-176, and demonstrated with a full package of practises, including deep summer plowings, the best seed rate, time of sowing, and sowing method, a balanced dose of fertiliser (18 kg Nitrogen, 46 kg P2O5 ha), Trichoderma and Rhizobium culture @ 5 gm/kg of seed as seed treatment, timely irrigation, weed management, In this demonstration control plot was also kept where farmer practices were carried out (use of non-descriptive varieties, regular farm practices viz. broadcasting sowing method, no use of fertilizer, one hand weeding and indiscriminate use of plant protection measures). The demonstrations on farmers' fields were monitored by scientists of KVK, Palem right from sowing to harvesting and made to guide them. These visits were also used to gather feedback data for future research and extension programme improvements. Through demonstrations, the extension scientists in this cluster identify any gaps in the farmers' growing techniques. They also determine the adoption rate depending on the farmers' adoptability.

The gaps were categorized into three groups and given scores like full adoption (No Gap)-1, partial adoption (partial gap) -2 and no adoption (Full gap)-3 scores respectively. The yield data were collected from both the demonstration and farmers practice by random crop cutting method and analyzed by using simple statistical tools [4]. Adoption gap index was calculated using the formula given by [5]. Adoption gap index is the per cent deviation in farmers' practices as compared to the improved practices.

$$\text{Adoption gap index} = \frac{(R - A)}{R} \times 100$$

Where R = Total no. of improved practices

A = No. of improved practices actually adopted by the farmer

Yield parameters of both demonstrations and check involving farmers practices were recorded. Using the yield parameters extension gap, technology gap, yield gap, technology index was calculated as procedure suggested by [6] and [7].

Extension gap (q/ha) = Demonstrations yield – Yield under existing farmer's practice
Technology gap (q/ha)= Potential Yield – Demo. Yield

Additional return = Demonstration return – farmer's practice return

$$\text{Yield Gap (\%)} = \frac{\text{Extension gap}}{\text{Yield under farmers practice}} \times 100$$

$$\text{Technology Index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

3. RESULTS AND DISCUSSION

With technology involvement, the better package and methods are more crucial for the production and profitability of pulses. Detailed materials and procedures with technology assistance for advised practises (Table 1). Additionally, it was noted that farmers largely avoided using fungicides and used insecticides injudiciously and against recommendations. Similar observations were reported by [8].

3.1 Redgram Grain Yield and Gap Analysis

Table 2 displays the grain yield and gap analysis of Redgram in the practise of farmers and fields. Data showed that the average grain production of the fields that were displayed was higher than what the farmer had been doing throughout the years. The findings showed that Redgram's average grain yield increased by 11.20 percent, from 1147 kilogrammes per hectare under farmer's practise to 1275 kilogrammes per hectare with cluster frontline demonstrations. The aforementioned conclusion was consistent with Singh et al [9]. Technology index 8.93, extension gap 128 Kg ha-1, and technology gap 125 Kg ha-1 were all recorded (Table 2). This Extension gap should be attributed to the adoption of suggested practises' superior distribution methods, which produced higher grain yields than the farmer's methods [10].

3.2 Redgram Economics Analysis

Table 3 shows the economic performance of Redgram during the cluster frontline demonstration. According to the findings of the economic analysis, Redgram reported greater total returns from suggested practices (CFLD's) in 2019–20, 2020–20, and 2021–22 than did 62437, 66387, and 67830.00Rsha-1 farmer's practices, respectively. In comparison to farmer's practice, which had net returns of 26187, 30887, and 32830 Rs. ha-1, respectively, recommended practice had net returns of 43125, 48150, and 49862. Economic analysis revealed that in three years, advised approach produced average additional returns of 17077.00 Rupees per hectare. The benefit cost ratio was significantly higher in the recommended approach, coming in at 2.8 in both years as opposed to 1.8 in the farmer's practice. The higher grain output and better market pricing of the produce may be the causes of the Redgram demonstration's higher net returns and B: C ratio.

Table 1. Differences between technological intervention and farmers practices under FLD on Redgram

Parameters	Technology intervention in demonstration	Farmer practice	Gap
Variety	PRG-176	Local/own seed	Full gap
Seed rate	7.5 kg/ha	10 kg/ha	High seed rate
Sowing method /Spacing	150 X 20 cm, sowing with seed cum fertilizer drill	Line sowing, un even plant population	Partial gap
Time of Sowing	June 15th to 31st July	June 15th to 15th July	Partial gap
Seed treatment	Seed treatment was done with *Trichoderma* and *Rhiozibium*	Seed treatment was not by done	Full gap
Fertilizer Dose	Balanced fertilisation using 312.5 kg of SSP as the base dose and 44 kg of urea in split doses as per the results of the soil test.	Improper fertiliser use A base of 20 kg of urea and a top dressing of 50 kg of DAP.	Full gap
Weed management	Pre emergence herbicides Pendimethalin 1 lit per acre and post emergence herbicide Imazethapyr 250 ml acre at15-20 DAS.	Manual weeding / weeding with bullocks	Full gap
Plant protection	Neem oil @ 5ml/lit and Chlorophyriphos @2.5 ml/lit for control of sucking pest. Emmamectin benzoate 100 grams per acre Chlorontrinilprole 80 ml per acre	Indiscriminate use of fungicides and pesticides.	Full gap

Table 2. Gap analysis of cluster frontline demonstrations on Redgram's grain yield

Year	No. of Demonstrations	Average yield Kg ha-1		% Increase in Recommended Practice (RP)	Extension gap (Kg ha-1)	Technology gap (Kg ha-1)	Technology Index
		Demonstration	Farmers				
2019-20	50	1250	1125	11.11	125	150	10.71
2020-21	50	1300	1175	10.64	125	100	7.14
2021-22	50	1275	1140	11.84	135	125	8.93
Average	50	1275	1147	11.20	128	125	8.93

Table 3. Cluster frontline demonstrations on Redgram economic analysis

S. no		Total returns (Rs.ha-1)		Input cost (Rs.ha-1)		Net return (Rs.ha-1)		Additional return (Rs.ha-1) FLD's	B:C ratio	
1	Year	Demonstration	Farmers practice	Demonstration	Farmers practice	Demonstration	Farmers practice		Demonstration	Farmers practice
2	2019-20	69375	62437	26250	36250	43125	26187	16937	2.64	1.72
3	2020-21	73450	66387	25300	35500	48150	30887	17262	2.90	1.87
4	2021-22	75862	67830	26000	35000	49862	32830	17032	2.92	1.94
	Average	72895	65551	25850	35583	47045	29968	17077	2.8	1.8

4. CONCLUSION

The CFLD programme is an effective instrument for improving farmer knowledge, attitudes, and skills as well as productivity and output of pulses. The 11.11 to 11.84 percentage point increase in pulse yield in Redgram and CFLDs above the farmers' practises raised awareness and encouraged additional farmers to adopt the enhanced package of pulse farming practises. The friendship and trust between farmers and scientists were also strengthened by these displays. The FLD grantees also play a vital role in the widespread dissemination of high-yielding pulse types to other local farmers as a source of knowledge and top-notch seeds.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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