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# Demonstration of Integrated Crop Management Technology in Black Gram through Cluster Front Line Demonstrations (CFLDs) in West Godavari District of Andhra Pradesh, India

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## A B S T R A C T

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The present study was carried out at Krishi Vigyan Kendra, Undi West Godavari district of Andhra Pradesh to know the yield gap between recommended practice and farmers practice through cluster front line demonstrations. Blackgram farmers of West Godavari district are getting very low yields due to multiple constrains. One of the major constrains of its lower productivity was non adoption of recommended and improved technologies. The KVK, Undi organized cluster front line demonstrations in blackgram to popularize improved crop management practices *viz.*, YMV resistant variety TBG - 104, seed treatment to prevent pests and diseases, integrated pest management practices like spaying of neem oil, need based pesticide application and erection of different sticky traps. The cluster FLDs were conducted in fifty farmers' fields of West Godavari district during Kharif – 2018 & 2019. The results revealed that the highest seed yield was obtained in demonstration plots with an average yield 17.86 q/ha in comparison to average farmers practice (16.05 q/ha). An average extension gap between demonstrated practices and farmers practices was 1.81 q/ha. Higher net return (52,270 RS/ha) was obtained in the demonstration plot compared to farmers practices (39,681.5 Rs/ha); further benefit cost ratio was recorded higher in front line demonstrations (2.59) as compared to farmers practice (2.13).

## Introduction

Pulses are rich in proteins and are the second most important constituent of Indian diet after cereals. India is one of the major pulses producing country in the world, contributing 30-35% and 27-28% of the total area and production of pulses respectively. Blackgram (*Vigna mungo*) is a widely grown legume, belongs to the family *Fabaceae* and assumes considerable importance from the point of food and nutritional security in the world. India is the world's largest producer as well as consumer of black gram. Its seed are highly nutritious with protein (25-26%), carbohydrates (60%), fat (1.5%), minerals, amino acids and vitamins. Blackgram contributes to 10% of the national pulse production. The crop improves the soil fertility by fixing atmospheric nitrogen in the soil. It is reported that, blackgram and greengram are reported to meet up to 50 per cent of their requirement from the $N_2$ fixed by them (Anon, 1972) and black gram produces 22.10 kg N $ha^{-1}$ which has been estimated to be supplement of 59 thousand tons of urea annually (Senaratne and Ratnasinghe, 1993).

Pulses are water saving crops and more than 92 per cent of the area under pulses is rain fed. Currently, about 23 million tons of pulses need to be imported every year to meet the domestic demand draining valuable foreign exchange, which can otherwise utilize for other productive developmental activities. The yield of pulses is less than the global average. Adoption levels for several components of the improved technology of the crop were low indicating the existence of technological and technological gaps, emphasizing the need for better dissemination among farming community. Several biotic, a biotic and socio-economic constrains also inhibit exploitation of the yield potential of blackgram and these are needed to be addressed. Crop growth and yield are limited through poor plant nutrition and uncertain water availability during the growth cycle. Inappropriate management may further reduce the fertility of soil (Rabbing, 1995).

The major constrains or lower yield of blackgram is mainly attributed to their cultivation on poor soils with inadequate and imbalance nutrition, lack of integrated weed management (IWM), and lack of integrated pest management (IPM) (Shetty *et al.*, 2013). Cluster Front Line Demonstration is one of the most powerful tools of extension because farmers, in general, are driven by the perception that 'Seeing is believing'. The main objective of cluster front line demonstration is to demonstrate newly released crop production and protection technologies and its management practices in the farmer's field. The present investigation was undertaken to showcase the performance of potential technologies for yield improvement in blackgram via cluster front line demonstration in farmer's fields.

## Materials and Methods

The present study carried out by Krishi Vigyan Kendra, Undi in 50 farmer's field of two different villages at West Godavari district during Kharif season of 2018-19 & 2019-20 under Cluster Front Line Demonstration. Each CFLD's was laid out on 0.4 ha area, adjacent 0.4 ha was considered as control for comparison (farmers practice). Soil of the CFLD's was red soils with medium fertility status under pulse based cropping system and pH of soil is near to 6.8-7.5. The integrated crop management (ICM) technology comprised the improved variety (TBG-104), recommended seed rate, pre-emergence weedicide application, proper nutrient and pest management. Seed treatment is done with imidacloprid 600 FS @ 5 ml/kg of seed and mancozeb @ 3 gm/kg seeds to protect crop from sucking pest and diseases during the early part of crop establish stage after sowing. The seed rate of 25 kg/ha is used in demonstrated plots. The sowing of blackgram crop seed was done during the first fortnight of August during 2018-19 &2019-20. The spacing between row and plant was kept 30X10 cm in the demonstration plots. The fertilizer basal doses of 20 kg N+50 $P_2O_5$ kg/ha and foliar spraying of 13:00:45 @2.5 kg/ha at 35 days after sowing. Spraying of pre-emergence pendimethalin @ 2.5 lit/ha immediately after sowing to check the weed growth followed by post emergence application of imazethapyr 500 ml/ha at 20-25 days. At 21-25 DAS after sowing IPM practices like erection of sticky traps 10/acre for controlling of white flies and spraying of neem oil @ 5 ml/lit as prophylactic spray at 20 and 35 DAS against sucking pests and early stage lepidopterans and application of need based pesticides. The yield data were collected from both the demonstrated and farmers practice by random crop cutting method. The statistical tool like percentage was used in this study for analyzed data. The extension gap, technology gap and the technology index were work out with the help of formulas given by Samui *et al.,(*2000) as mentioned below.

$$\textbf{Extension Gap} = \text{Demonstration Yield} - \text{Farmers Yield (Control)}$$

$$\textbf{Technology Gap} = \text{Potential Yield} - \text{Demonstration Yield}$$

$$\textbf{\textit{Technology Index}} = \frac{\text{Technology Gap}}{\text{Potential Yield}} \times 100$$

## Results and Discussion

### Yield performance

### Varietal characters

The seed yield of demonstration plots was higher as compare to check plot which was due to adoption of high yielding variety and ICM practices. Cluster front line demonstrations are effective educational tools in introducing various new technologies to the farmers to boost the farmers confidence level by comparison of productivity levels between improved production technologies in demonstration trails in comparison to farmer's practices. The performance of blackgram crop owing to the adoption of improved technologies was assessed over a period of two years and the results are presented in table 1. From the data it is revealed that, the integrated crop management practices recorded 11.27 per cent increase in the yield (17.86 q/ha) as compared to the farmers practices (16.05 q/ha). Yield of the front line demonstration trails and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology and extension gaps (Hiremath and Nagaraju, 2009). Similar results of achieving higher yields by adoption of improved technologies *viz.,* high yielding varieties, integrated nutrient management and integrated pest management in chickpea was reported by Tomar *et al.,* (1999) supports the results recorded in the present investigation (Fig. 1–3).

### Extension gap

Extension gap means the differences between yields achieved in demonstration and farmers plots. Extension gap of 2.5 and 1.11 q/ha was noticed during 2018-19 and 2019-20 (Table 2), respectively indicating the scope for improving the yields by appropriate extension methods for transfer of viable technologies. On an average extension under two years CLFDs programme was 1.80 q/ha, emphasized the need to educate the farmers through various extension programs *i.e.,* cluster front line demonstration for adoption of improved production and protection technologies, to revert the trend of wide extension gap. More and more of latest production technologies with high yielding varieties will subsequently change this trend of galloping extension gap.

### Technology gap

Yield of the demonstration plot and potential yield of the crop was compared to estimate the yield gaps which were further categorized in to technology and extension gaps. The technology gap in the blackgram demonstration yield over potential yield was maximum (7.2 q/ha) and (5.52 q/ha) observed during Kharif 2018-19 & 2019-20. The observed technology gap may be attributed to dissimilarity in soil fertility status, rain fall distribution, disease and pest attacks as well as the change in the locations of demonstration plots every year. Further, the maximum extension gap of 1.8q/ha was recorded in blackgram (TBG-104) demonstrations during Kharif 2018 and 2019.

**Table.1** Technology demonstrated in CFLDs and farmers practices

| S.No. | Technology | Demonstrated practice | Farmers practice |
|---|---|---|---|
| 1 | Field preparation | 2 Ploughing | Single plough |
| 2 | Method of sowing | Line sowing | Broad casting |
| 3 | Variety | TBG-104 | LBG-752 |
| 4 | Seed treatment | Imidacloprid @3 ml/kg +Mancozed 3 gm/kg of seeds | No seed treatment |
| 5 | Seed rate and spacing | 25 kg/ha &30X10 cm | 35-40 kg/ha and no spacing |
| 6 | Manures and fertilizers | 20.50.00 NPK kg/ha and 13.00.45 - 5 gm/lit water foliar spray | Excessive use of chemical fertilizers |
| 7 | Weed management | Pendimethalin @2.5 lit/ha and post emergence Imazethapyr 500 ml/ha | No post emergence herbicide weeding operation by women labour |
| 8 | IPM Measures | IPM practices like spraying of neem oil need based pesticides and erection of sticky traps | Indiscriminate usage of pesticides |

**Table.2** Technology gap, Extension gap and Technology index of Black gram

| Year | Demo/ha | Farmers **practice** yield q/ha | Per cent yield increase over control | Extension gap (q/ha) | Technology gap (q/ha) | Technology index % |
|---|---|---|---|---|---|---|
| 2018-19 | 18.70 | 16.20 | 15.43 | 2.5 | 1.3 | 6.5 |
| 2019-20 | 17.02 | 15.91 | 6.97 | 1.11 | 2.98 | 14.9 |
| Average | 17.86 | 16.02 | 11.2 | 1.80 | 2.14 | 10.7 |

**Table.3** Impact of improved production technology on economic of Black gram

| Year | Cost of cultivation (Rs/ha) | | Gross return(Rs/ha) | | Net return (Rs/ha) | | B:C Ratio | |
|---|---|---|---|---|---|---|---|---|
| | **Demo plot** | **Farmers practice plot** | **Demo plot** | **Farmers practice plot** | **Demo plot** | **Farmers practice plot** | **Demo plot** | **Farmers practice plot** |
| 2018-19 | 35,750 | 38,300 | 93,500 | 81,000 | 57,750 | 42,700 | 2.61 | 2.11 |
| 2019-20 | 29,800 | 31,750 | 76,590 | 68,413 | 46,790 | 36,663 | 2.57 | 2.15 |
| Average | 32,775 | 35,025 | 85,045 | 74,706.5 | 52,270 | 39,681.5 | 2.59 | 2.13 |

**Fig.1**

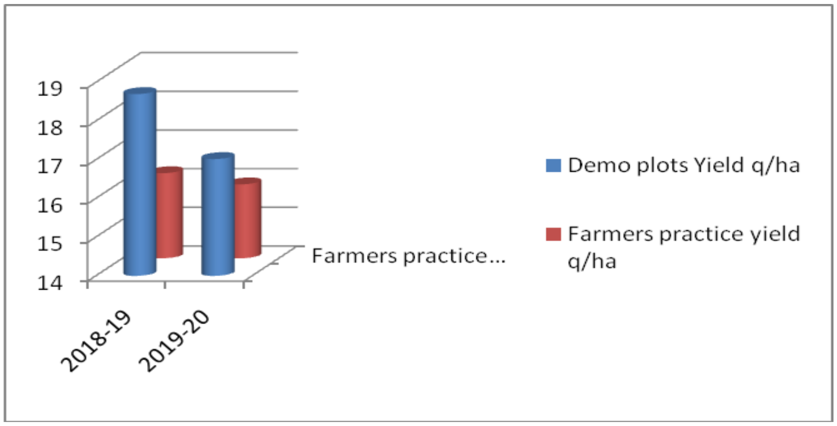


**Fig.2** CFLD Black gram seed distribution cum training program on pulses production technology


**Fig.3** Black gram field view

## Technology index

The table 2 also revealed that the technology index was 9.0 per cent. The technology index shows the feasibility of the variety at the farmers' field. The lower value of technology index more is the feasibility of technology. This indicates that a gap existed between technology evolved and technology adoption at farmer's field. The similar results were also observed by Gangadevi *et al.,* (2017), Kumar *et al.,* (2014), Bairwa *et al.,* (2013), Hiremath and Nagaraju 2010. Hence it can be concluded from the table 2 that increased yield was due to adoption of improved varieties and conducting demonstration of proven technologies Yield.

## Economic return

Data presented in table 3 reveals that the cost involved in the adoption of improved technology in black gram ICM varied and was more profitable. The cultivation of black gram under improved technologies gave higher net return of Rs 57,750 and 46,790 per ha respectively, as compare to farmers practices (Rs 42,700 and 36,663 per ha in 2018-19 and 2019-20 respectively). An average net return and BCR of demonstration field is 52,270 Rs/ha and 2.59 respectively as compare to farmers practice (Rs 39,681.5 and 2.13). Similar finding were reported by Singh *et al.*, (2014) and Raju Teggeli *et al.,* (2015). The benefit cost ratio of ICM of black gram under improved cultivation practices higher than farmers' practices in two years and this may be due to higher yield obtained under improved technologies compared to local check (farmers practice). These finding are in line with the findings of Mokidue *et al*., (2011).

It is concluded that the FLD programme is an effective tool for increasing the production and productivity. There exists a wide gap between the potential and demonstration yields in Black gram mainly due to technology and extension gaps and also due to lack of awareness about new technology in blackgram cultivation in West Godavari district of Andhra Pradesh. The FLDs produces significant positive results and provided the researcher an opportunity to demonstrate the productivity potential and profitability of the latest technology in farmers which they have been advocating for long time. This could be circumventing some of the constraints in the existing transfer of technology system in the West Godavari district of Andhra Pradesh. The productivity grain under FLDs over existing practices of blackgram cultivation created greater awareness and motivated the other farmers to adopt suitable production technology of blackgram in the district.

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