J Krishi Vigyan 2022, 11 (1) : 206-210 DOI : 10.5958/2349-4433.2022.00130.1

Impact of Cluster Frontline Demonstration on Productivity and Profitability of Blackgram

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ABSTRACT

Black gram (*Vigna mungo*) is one of the most important pulse crops grown next to Bengal gram in Nellore district of Andhra Pradesh. The productivity of black gram in the district is low and attempts were made to increase the production and productivity by adopting high yielding variety along with integrated crop management (ICM) practices. The ICM practices including sowing of improved variety (TBG 104), seed treatment + neem oil application at 25-30 DAS+ arrangement of sticky traps to monitor sucking pest vectors + spraying of monocrotophos @ 1.6 ml per litre of water at flowering to pod formation stage for insect management + spraying of carbendazim for control of leaf spot was demonstrated in farmer's field. The results revealed that increase in seed yield over farmers' practice was 22.2 and 25.0 per cent during 2020-21 and 2021-22, respectively. It was also observed that demonstrated practices recorded higher net returns/ha as compared to farmer's practice during the years 2020-21 and 2021-22. The benefit cost ratio during 2020-21 and 2021-22 was 1.59 and 1.52 respectively. The percent technology index varied between 47.0 to 54.2 per cent indicating a need to motivate the farmers to adopt economical viable technologies for increasing production, productivity and profitability of black gram in Nellore district.

Key Words: Demonstration, Extension gap, Profitability, Technology gap and Technology index, Yield.

INTRODUCTION

Blackgram (*Vigna mungo*) is one of the most important pulse crops that occupied a major position among pulse in Nellore District of Andhra Pradesh. Blackgram is grown in 24.2 per cent of the total area under pulses in Andhra Pradesh. The area under blackgram in the state is around 3.03 lakh ha with a production of 3.29 lakh tons which accounts for an average productivity of 1086 kg / ha (Anonymous, 2019). However, the productivity of blackgram in Nellore district is far below (696 kg/ha) than state average (Anonymous, 2018). The average yield obtained at farmers' field is low because no systematic efforts have been made in the past to develop a package of technology, which may ensure high seed yield of this crop (Veeramani, 2019). The main reasons for low productivity of blackgram in Nellore district are non-availability of quality seed or improved variety, rainfed cultivation in marginal and sub marginal lands under poor nutrient management and low knowledge on pest and disease management. Cluster Frontline Demonstrations (CFLDs) are aimed to increasing the productivity of pulses and to minimize the adoption gap (Malathi *et al,* 2019). Use of good quality seed of recommended variety along with application of recommended dose of fertilizers at appropriate time and adopting need-based plant protection measures against insect pests and diseases are efficient measures for reducing knowledge gap of farmers and enhancing productivity and profitability of black gram in Nellore district of Andhra Pradesh. The main objective of the study was to demonstrate and popularize the improved agro-technology at farmers' fields under varied existing farming situations.

MATERIALS AND METHODS

A total of 100 front line demonstrations were conducted during the year 2020-21 and 2021-22

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Table 1. Details of production technologies followed in blackgram crop under Cluster Front Line Demonstration and farmers' practice in Nellore district of Andhra Pradesh.

Parameter	Demo Practice	Farmers Practice
Variety	Tirupati Minumu-1 (TBG 104)	LBG 752
Seed Rate	20-25 kg/ha	30-40 kg/ha
Seed Treatment	Insecticide followed by Fungicide	No seed Treatment
Method of sowing	Line sowing	Broadcasting
Fertilizer dose	20:40 N: P2O5 (Based on soil test values)	High dose or low dose of fertilizers
Weed management	Pre emergence application of pendimethalin along with one need-based hand weeding	Pre emergence application of pendimethalin along with one need-based hand weeding
Plant protection	Neem oil application at 25-30 DAS+ Arrangement of sticky traps to monitor sucking pest vectors + Spraying of Monocrotophos @ 1.6 ml per litre of water at flowering to pod formation stage for insect management+ Spraying of Carbendazim for control of leaf spot.	Indiscriminate use of pesticides
Irrigation	Rainfed	Rainfed

Table 2. The year-wise average yield, standard deviation, coefficient of variation and increased yield of blackgram

S. No.	Year	Demonstrated Practices (CFLD)			Farmers' Practices			Percent increase in yield over Farmers practices (%)
		Average yield (kg/ ha)	SD (kg/ ha)	CV (%)	Average yield (kg/ha)	SD (kg/ha)	CV (%)	
1	2019-20	825	93.5	11.34	675	80.4	11.91	22.23
2	2020-21	953	86.5	9.24	762	82.4	8.43	25.01

under rainfed conditions in Nellore district of Andhra Pradesh. Each demonstration was conducted on an area of 0.4 ha. The ICM practice included sowing of improved varieties (TBG 104), application of fertilizers based on soil test values, seed treatment + neem oil application at 25-30 DAS+ arrangement of sticky traps to monitor sucking pest vectors + spraying of monocrotophos @ 1.6 ml per litre of water at flowering to pod formation stage for insect management + spraying of carbendazim for control of leaf spot (Table 1). The demonstrations were conducted in black soils with low to medium fertility status. The pH of the soil varied from 6.4 to 7.5. Yield data for the improved practice and farmers' practice were recorded at the time of threshing. The season-wise details of sowing and harvesting were presented in Table 1. The yield gain in demonstrations above farmers' practice was computed using the method proposed by Yadav *et al* (2004). The estimation of technology gap, extension gap and technology index were done using following formula (Samui *et al*, 2000)

Economic analysis

The cost of cultivation of blackgram includes cost of inputs like seeds, fertilizers and pesticides *etc*., purchased by the farmer's or provided by the KVK including labour charges and operational

Table 3. Technology gap, extension gap and technology index of blackgram crop in Nellore district of Andhra Pradesh.

Year	Area (ha)	No of FLDs	Variety	Technology Gap (kg/ha)	Extension Gap (kg/ha)	Technology Index (%)
2019-20	20	50	TBG 104	975	150	54.2
2020-21	20	50	TBG 104	847	191	47.0

Table 4. Economic analysis of CFLD's on blackgram in Nellore district of Andhra Pradesh.

Year	Cost of cultivation (Rs/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		Benefit: cost Ratio	
	Farmers' Practice	Demo Practice	Farmers' Practice	Demo Practice	Farmers' Practice	Demo Practice	Farmers' 'Practice	Demo Practice
2020-21	43750	36250	47250	57750	3500	21500	1.08	1.59
2021-22	40828	39600	48006	60039	7178	20439	1.18	1.52

costs borne by the farmers. Gross returns were obtained by converting the harvest into monetary terms at the prevailing market rate during the course of demonstration. Net returns were obtained by deducting cost of cultivation from gross returns. The Benefit: Cost ratio was calculated by dividing gross returns by cost of cultivation (Deva *et al,* 2019).

RESULTS AND DISCUSSION

Comparison of Production Practices

It was evident that farmers generally did not follow recommended and improved technologies which created a wide gap for blackgram production (Table 1). Farmer's adopted higher seed rate against the recommended optimum seed rate resulting in higher cost of seed input. Farmers also did not practice seed treatment, as seed treatment not only protects seeds from seed and soil-borne diseases but also protects emerging seedlings against sucking insect pests that wreak havoc on crop emergence and its early growth (Sharma *et al,* 2015). However, many farmers in the country are neither familiar with the practice nor follow it instead of many efforts by agriculture scientists and officials from the line departments.

Yield

The yields of black gram in demonstration plots was higher when compared to farmer's plots. The percent increase in yield of demonstration plots over farmers plots ranged from 12.0 to 42 per cent. The increase in seed yield of demonstration plots was mainly due to the improved package of practices. Use of TBG 104 seed not only improved the yield of the crop but also decreased the incidence of YMV disease. Introduction of seed treatment, applying fertilizers based on soil test values and adoption of plant protection measures for vector management of YMV followed under CFLDs really jumped the yield of black gram compared to farmers` practices. It was evident that the yield of demonstration was found better than the farmer's practice under the similar environmental conditions. Farmers who didn't adopt these technologies were motivated by results of demonstrations and agro-technologies followed in the CFLDs and were willing to adopt these all-new technologies in their fields in future (Table 2). These findings were in corroboration with the findings of Dwivedi *et al* (2018), Rao *et al* (2020) and Anuratha *et al* (2018).

Technology gap

The technology gap is the difference between potential yield of the variety and yield observed in demonstration plot. The technology gap during 2020-21 and 2021-22 was 975 and 847 kg/ha respectively (Table 3). The observed technological gap may be attributed due to cyclonic rains that occurred during the NE monsoon period during both the years. Other constraints like dissimilarity in the soil fertility status, availability of moisture content and management of insect pests and diseases. Similar findings were observed by Devi *et al* (2017) and Kumar *et al* (2020). As the technology gap reflects the cooperation of farmers in conducting the CFLDs, the results were encouraging.

Extension gap

Extension gap is the difference between the yield of demonstration plot and farmer's plot. Extension gap of 150 and 191 kg/ha was observed during the years 2020-21 and 2021-22, respectively (Table 3). Implementation of recommended package of practices along with high yielding varieties as suggested by the ANGR Agricultural University subsequently helped in increasing the yield in demonstration plots. The extension gaps created need to be emphasized by educating the farmers through various extensions means. The present study was in line with earlier findings of Kumar *et al* (2020).

Technology index

The technology index represents the feasibility of the evolved technology at the farmers' fields. The lower the values of technology index indicate more the feasibility of the technology to go through farmer's field. Maximum technology index value 54.2 per cent was noticed during 2020-21 while, minimum value of technology index of 47.0 per cent was noticed during 2021-22 (Table 3). This variation in technology index was due to cyclonic rains that occurred during the NE monsoon period during both the years of study. Moreover, reduction of technology index over the years of study clearly indicted the feasibility of technologies demonstrated in frontline demonstrations. Similar findings in reducing the technology index by adopting the FLDs were also noticed by Saikia *et al* (2018) and Singh *et al* (2020).

Economic Returns

The economic analysis revealed that during both the years of demonstration, gross returns, net returns and benefit: cost ratio was higher in demonstrated plots compared to farmer's practice indicating higher profitability. The benefit cost ratio of demonstration plots was 1.59 and 1.52 during the years 2020-21 and 2021-22 respectively (Table 4). Hence, by adopting improved production practices in blackgram, yield potential and economic returns of the farming community of Nellore district can be raised. These results were in line with the earlier findings by Singh *et al* (2020), Nagarajuna *et al* (2021) and Kumar *et al* (2020).

CONCLUSION

The findings of the study revealed that by adopting the recommended practices and improved technology, the yield of blackgram can be increased to a greater extent in Nellore district of Andhra Pradesh. The increase in yield of blackgram may be attributed due to use of quality seed along with recommended along with recommended package of practices as provided by the ANGRAU university. The economic viability in the demonstrations created greater consciousness and inspired other farmers to adopt the ICM practices in blackgram. Thus, it can be concluded that technology gaps and extension gap can be minimized by adopting scientific intervention in the farmer's field, which lead to enhancement in the production and productivity of blackgram in Nellore district of Andhra Pradesh.

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Received on 10/07/2022 *Accepted on 14/10/2022*