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The Impact Analysis on Productivity Enhancement of Blackgram through Front Line Demonstration in Chandel District of Manipur State

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ABSTRACT

Background: Blackgram is the major pulse crop cultivated all over the India. The crop is resistant to unfavourable weather patterns and helps in enhancing soil fertility. It is a significant component of the Indian diet since it provides vegetable protein and balances the diet. About 26 per cent of it is protein, which is nearly three times more than cereal and other vitamins and minerals. In addition, it is utilised as nutrient-rich fodder, particularly for dairy cattle. A significant obstacle to expanding blackgram production in Chandel district, Manipur State is the technology gap. Frontline demonstration (FLD), is one of the most significant and effective methods for technology transfer. By using the newest technologies, Krishi Vigyan Kendra Chandel's interventions aim to boost productivity and production.

Methods: The study on Blackgram var. PU-31 under rainfed farming situations of Chandel district, Manipur was carried out by ICAR-Krishi Vigyan Kendra-Chandel, during *Kharif* 2017 to 2022 with the objectives to increase production and productivity of pulse in the district conducted in the farmers' field for 118 hectares of land with all the scientific package of practices.

Result: The average grain yield of 776.50 kg/ha was obtained in the demonstration plot with 38.13 per cent increase in yield over farmers practices. The technological and extension gap were 723.50 kg/ha and 214.33 kg/ha respectively. Similarly, technological index was decreased from 50.33 percent to 44.53 percent during the study period, revealing satisfactory performance of technological interventions which can further be improved by bridging the gaps with more efficient research and extension services.

Key words: Blackgram, Extension gap, Frontline demonstration, Impact analysis, Productivity, Technology gap, Technology index, Yield gap.

INTRODUCTION

Pulses are very important food and nutritionally rich. In this era of nutritional insecurity, pulses can act as not only an important role in protein requirement but also minerals and vitamins. India is one of the world's largest producer, consumer and importer of pulses. Despite of the diverse role of pulses in solving the problems of food and nutritional security, they are assumed as secondary crops not only in the developing world but also in India. With 3% of the world area, India accounts for 22% of the world production of the pulses (Rimal and Kumar, 2015). Pulses in India are grown mostly in rainfed situation with less than ideal condition which may be the major cause for the lower yield. Almost 24 per cent of total GDP in terms of Global output is been contributed by pulses in the country. India imported pulses worth over 110 billion Indian rupees in financial year 2021, an increase from the previous financial year.

One of the major pulse crops framed all over the nation is Black gram (*Vigna Mungo* L.). The urdbean production of India was 2.78 million tonnes from acreage of 4.63 million hectares with a productivity of 600 Kg/ha (Agricultural Statistics Division, DES, MoAFandW, 2022). The crop is resistant to adverse climatic conditions and improves soil fertility by fixing atmospheric nitrogen in the soil. Due to its vegetable protein content and ability to augment a diet centred on cereals, the pulse known as "black gram" holds significant value in Indian cuisine. It has around three times the amount of protein (approximately 26%) of other minerals and vitamins combined with grains. In addition, it is utilized as nutrient-rich fodder, particularly for dairy cattle.

Chandel district of Manipur is situated between 24°28' North latitude and 94°31' East longitude with an elevation

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varying from 880 meters to 770 meters above mean sea level and endowed with broad range of soil types and agroclimatic conditions that make different pulses possible as an essential part of the hill production system. Black gram (*Vigna mungo*) is mostly grown during *kharif* season by the farmers of the district. The productivity of pulses in Chandel district is quite low compared to national average, mainly due to their cultivation under rainfed and marginal lands besides poor crop management practices. Moreover, lack of technical knowledge, unavailability of quality seed and non-adoption of plant protection measures further aggravate the problem of poor productivity in the district. There exists a wide yield gap in between the experimental plots, frontline demonstrations plots and farmers' field. KVK, Chandel has conducted various FLDs on blackgram using high yielding variety PU-31 with the objectives of showing the production potential of the new production technologies under actual farm situation. Keeping in view of the above, the present study was undertaken to find out the effects of FLDs on bridging the yield gap in terms of technology gap, extension gap and technology index.

MATERIALS AND METHODS

The study was carried out by ICAR-KVK Chandel during *Kharif* 2017, 2018, 2019, 2020, 2021 and 2022 in the farmers′field for 118 hectares of land. During these six years of Front Line Demonstrations (FLD), an area of 118 ha was covered involving 314 practicing farmers. In general, soils of the area under study were clay loam and medium to low in fertility status.

The different training programmes on scientific cultivations of blackgram and method demonstrations were conducted by the ICAR-KVK-Chandel to the FLD farmers. The critical input materials provided to the farmers and they were trained to follow the package and practices for blackgram cultivation as recommended by the ICAR Manipur Centre. The farmers followed the scientific package of practices like line sowing, nutrient management, seed treatment, fertilizer application, weed management, insect-pest and diseases management *etc.* and whole package of practices were used in the demonstrations and blackgram seed variety PU-31 was taken under FLD. Whereas, in case of local check, the traditional practices were followed in existing varieties by the farmers. The seeds of blackgram were sown to insure recommended plant spacing within a row because excess population adversely affects growth and yield of crop. Sowing was done in the middle week of June to last week of July with a seed rate of 20 kg/ha. The details of package of practices are shown in Table 1. The yield data from both the demonstration and farmers practice were recorded and their Yield gap (technology gap, extension gap) and the technology index were worked out using methods developed by Samui *et al*. (2000) and Meena and Dudi, (2018) as stated below:

$$\text{Tech. gap} = \text{Potential yield-Demo. Plot yield}$$

$$\text{Ext. gap} = \text{Demo. Plot yield-Farmer's plot yield}$$

$$\text{Technology index} = \frac{\text{Pi - Di}}{\text{Pi}} \times 100$$

Where,

Pi= Potential yield.

Di= Demonstration yield.

RESULTS AND DISCUSSION

Grain yield

Grain yield of blackgram has fluctuated over years, which could be due to the soil moisture availability and rainfall condition, climatic aberrations, disease and pest attacks as well as the change in the location of trials every year. However, the maximum grain yield was recorded in improved management practices with PU-31 fields (FLDs) as compared to farmers' practices with local variety in all the years of demonstrations. The Front Line Demonstration revealed that maximum grain yield of 832 kg/ha during 2022 and minimum grain yield of 745 kg/ha during 2017 were recorded under demonstrated plot and mean grain yield of 776.50 kg/ha were recorded in all the six years under demonstrated plots which was higher over local check 562.16 kg/ha. On an average there was increased in the yield by 38.08 % over local check (Table 2). This clearly indicates the positive impact of front line demonstration with improved technology. The findings are in close conformity with the finding of Khumlo Levish Chongloi *et al.* 2020, Amuthaselvi *et al.* 2023 and Sunil *et al.* 2023.

Technological gaps

The technological and extension gaps were used to categorized yield gaps in the present investigation. The technology gap observed ranges from 668 to 755 kg/ha

Table 1: Details of improved package and farmers practice.

Particulars	Improved package	Farmers practices (Local check)
Variety	PU-31	Sagol hawai amubi
Seed rate	20 kg/ha	30 kg/ha
Sowing method	Line sowing	Broadcasting
Time of sowing	Mid June to July	August
Irrigation	Rainfed	Rainfed
Fertilizer dose	20:40:20 (N:P:K kg/ha)	Nil
Plant protection measures	Need based insecticides and fungicides spray	No insecticides and fungicides spray

during the years of investigation. The highest technological gap was obtained during 2017 (755 kg/ha) while lowest gap was observed during 2022 (668 kg/ha). This may be due to higher yield of blackgram variety in demonstration plots. Adoption of new improved production technologies with new high yielding and disease resistance variety has helped in reducing the extension gap. These results were in conformity with Hiremath and Nagaraju (2010) and Choudhary (2013).

Extension gaps

The extension gap ranged from 196 to 252 kg/ha during the period of study. The higher the extension gap, the more we need to educate and motivate the farmers on adoption of improved agricultural production technologies over existing local practices to minimize the extension gap. Maximum extension gap of 252 kg/ha was observed during 2022 and lowest (196 kg/ha) during 2017. Extension yield gaps are the indicators of lack of awareness for the adoption of improved farm technologies by the farmers. Technology and extension gap can be bridge by popularizing package of practices with emphasis on improved varieties, use of proper seed rate, balanced nutrient application and proper use of plant protection measures. (Khumlo Levish Chongloi *et al*. 2021).

Technology index

The data of the technology index (Table 2) showed the feasibility of the evolved technology at the farmers' field. The lowest values of technology index indicate the more feasibility of the technology. Technology index varied from 50.33 to 44.53% in different years of study. The lowest technology index 44.53% was recorded during 2022 and the highest 50.33% was recorded during 2017. This indicate that a strong gap exists between the generated technology at the research institution and disseminated at the farmers' field. But the introduction of HYVs and demonstration of improved technology followed by intensive awareness campaign will eventually lead to adoption of generated technology among farmers of the district to accelerate the crop diversification, crop intensification and productivity enhancement in the black gram. Similar findings were also reported by Shaktawat and Chundawat (2021) and Ganga *et al*. (2017).

Economic analysis

Adoption of a technology purely depends on its economic feasibility and the economic analysis of the data during the six years study period for blackgram presented in Table 3 clearly revealed that the gross return, net returns and benefit: cost ratios were higher in frontline demonstrations, where recommended practices were followed as compared to farmers' practice indicating higher profitability. The average benefit cost ratios of demonstration plots were 2.23:1 which was higher than the local check (1.74:1). A higher yield that resulted from the adoption of improved practices which were absent in local check plots might be responsible for

Table 2: Yield performance and Gap analysis of blackgram var. PU-31 in rainfed conditions under FLDs.

Year	Area	No. of demo	Potential yield kg/ha	Grain yield of blackram kg/ha			Tech gap (kg/ha)	Ext. gap (kg/ha)	Tech. index %
				Demo	Local	% increase over control			
2017	10	25	1500	745	549	35.7	755	196	50.33
2018	13	35	1500	755	554	36.28	745	201	49.67
2019	30	82	1500	764	558	36.92	736	206	49.07
2020	15	40	1500	778	564	37.94	722	214	48.13
2021	25	65	1500	785	568	38.2	715	217	47.67
2022	25	67	1500	832	580	43.45	668	252	44.53
Total	118	314							
Mean			1500	776.50	562.16	38.08	723.50	214.33	48.23

Table 3: Economic analysis on blackgram var. PU-31 under FLD in Chandel district of Manipur.

Year	Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		Net return (Rs./ha)		B: C ratio	
	Demo	Local	Demo	Local	Demo	Local	Demon	Local
2017	25755	24450	52150	38430	26395	13980	2.02:1	1.57:1
2018	26700	25235	60400	44320	33700	19085	2.26:1	1.76:1
2019	28160	26570	61120	44640	32960	18070	2.17:1	1.68:1
2020	29140	27570	70020	50760	40880	23190	2.40:1	1.84:1
2021	31090	28950	70650	51120	39560	22170	2.27:1	1.77:1
2022	32040	29560	79040	55100	47000	25540	2.27:1	1.86:1
Mean	28814.2	27055.8	65563.3	47395	36749.2	20339.2	2.23:1	1.74:1

the demonstration's higher benefit-cost ratio. The outcomes supported Singh *et al*. findings (2022), Singh *et al*. (2021). Meena *et al*. (2018) and Paramasivan and Selvarani (2017).

CONCLUSION

It may be concluded that the frontline demonstrations conducted with improved crop management practices along with PU-31, a new short duration variety resistant to mungbean yellow mosaic virus incidence has proven to be the best technologies in obtaining higher grain yield and given a new hope to other farmers of Chandel district and also helps in enhancing blackgram production and productivity through horizontal and vertical expansion. It increased the productivity by 38.08 per cent. The productivity gain under FLD over farmers′ practice created awareness and motivated the other farmers to adopt appropriate production technology of black gram in the district.

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Conflict of interest

We the Authors also declare that we do not have any conflict of interest.

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