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Short Communication

Analysis of Yield Gaps and Profitability in Blackgram (*Vigno mungo* L.) in Mandsaur District of Madhya Pradesh

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INTRODUCTION

Pulse crops play an important role in agricultural economy. In India, pulses are grown in 29.99 mha area with a total production of 25.23 mt and productivity of 841 kg/ha out of which 7.48 mha area with a production of 8.11 mt and productivity of 1084 kg/ha is under Madhya Pradesh with first rank (Anonymous, 2018). In Madhya Pradesh, most of the *kharif* pulse crops are grown in rainfed or semi irrigated situation. In India, yield gap is very high as compared to other countries yield in different pulse crops. On the other hand, due to increasing population in India, per capita consumption of pulses has falling constantly due to stagnant production and productivity. This has been due to presence of a number of impediments in pulse production in India, such as higher yield gaps, abrupt climatic changes, attack of pest and diseases, lack of quality seeds, low adoption rates etc.

The productivity of kharif pulses can be increased by adopting improved technology of pulse production. Under front line demonstrations (FLD), the improved technologies are first time demonstrated at farmer's field by the scientist themselves before being fed into the main extension system of the State Department of Agriculture. Thus, front line demonstration is the most powerful tool of extension because farmers, in general, are driven by the perception that is "Seeing is Believing'. The basic objective of cluster front line demonstration is speedy spread of new technology and its management practices in the farmer's field under different agro-climatic zone and farming situation of different crops in the district. While, demonstrating the technologies at farmer's field, the scientists are required to study the factor constraints of production of any crop. Considering the prevailing scenario of pulse, study of yield gaps in major pulse crops was taken through front line demonstrations to know the, status of yield gaps and factors that contributes to yield gaps to develop suitable extension interventions for the benefit of pulse growers in agro-climatic situation of Mandsaur district of Madhya Pradesh.

MATERIALS AND METHODS

Cluster front line demonstrations (CFLD) on blackgram crop were conducted by RVSKVV – Krishi Vigyan Kendra, Mandsaur during kharif seasons of 2016 to 2019. In this programme, total 397 demonstrations having 158.8 ha area were conducted in cluster approach. In cluster front line demonstrations (CFLD) plot, full package of practice was adopted with critical input provided by KVK and the adjoining farmer's field was served / treated as control plot or farmer practice. These two treatments *i.e.,* farmer's practice and recommended practice for demonstration plot were tested in Randomized black design technique using total number of farmers as replications each year. The detail of technology adopted in Cluster front line demonstrations (CFLD) and farmer's plot are given in Table 1.

The economics of treatments were calculated on the basis of prevailing market price of produce. The data related to yield and economics of crops

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Table 1: Demonstration's package and farmer's practice under CFLD on pulses in Mandsaur district of Madhya Pradesh

Component	Demonstration	Farmer's practice
Variety	IPU 94-1, PU-31, Pratap Urd -1	Local mixture (T-9)
Seed rate	20 kg/ha	30 kg/ha
Fertilizer dose	20:50:20 Kg NPK/ha	9:23 Kg NP/ha
Seed treatment	Carbendazim @ 2.5 g/kg seed	No seed treatment
Plant protection	Quinalphos @1 l/ha and Dimethoate @1 l/ha	Indiscriminate use

were collected from the beneficiary farmers through personnel interview. The incremental benefit cost ratio (IBCR) was calculated through increase in cost and benefit in between treatments. The estimation of technology gap, extension gap and technology index were calculated using following formulae suggested by Kadian *et al* (1997) and Samui *et al.* (2000).

1. Technology Gap = Potential yield – Average Demo Yield
2. Extension Gap = Average Demo Yield – Average Farmer's Practice Yield
3. Technology Index = {(Potential yield – Average Demo Yield) X 100}/ Potential yield

RESULTS AND DISCUSSION

Grain Yield

It was evident (Table 2) that the grain yield of blackgram crop was 66.40, 36.58, 26.47 and 35.16 per cent higher under demonstration plots as compared to the grain yield of farmer's plot during 2016, 2017, 2018 and 2019, respectively. While, on the basis of average of data, there was 41.80 per cent higher under demonstration plots as compared to the grain yield of farmer's plot. This indicates that with adoption of improved technology in blackgram crops can be raised by 41.89 percent over farmer's plots. The yield advantages have also been reported by Kumar *et al* (2015) and Singh *et al* (2019).

Yield Gaps

The technological yield gap and extension yield gap were calculated under present study. The results revealed that technological yield gap was maximum in blackgram crop variety Pratap Urd 1 (1078 kg/ha) during *kharif,* 2019 followed by variety IPU 94-1 during kharif 2017 (262 kg/ ha) while the lowest technological yield gap was observed in blackgram crop variety IPU 94-1 (27 kg/ha) during *kharif* 2016. The technological yield gaps appear when any demonstration is laid out at farmer's field even if the demonstration is conducted under the supervision of scientist. During *kharif,* 2019 the technological yield gap was maximum because of heavy rainfall (2151.6 mm) during the growing period of blackgram crop while average rainfall of district is only 826.5 mm. Further, this technological yield gaps may be attributed due to lack of facility, variation soil fertility and local specific management problems to attaining the potential and demonstration yield of crops. These results are in close conformity with the Kumbhare *et al* (2014) and Gireesh *et al* (2019).

Table 2: Yield and economic analysis of blackgram under frontline demonstration on pulses

Treatment	Yield (kg/ha)					Cost of cultivation (Rs/ha)				
	2016	2017	2018	2019	Mean	2016	2017	2018	2019	Mean
Demonstration	1273	1038	1075	222	909	20100	20100	22500	21000	20938
Farmers' Practice	765	760	850	170	641	19600	19600	21050	20000	20063
F Test	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG

Table 3: Economic analysis of blackgram under frontline demonstration on pulses

Treatment	Gross Return (Rs/ha)					Net Return (Rs/ha)				
	2016	2017	2018	2019	Mean	2016	2017	2018	2019	Mean
Demonstration	70015	53976	61417	12632	49884	49915	33876	38867	-8368	28946
Farmer Practice	42075	39520	48800	9690	35286	22475	19920	27750	-10310	15223
F Test	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG	SIG

The maximum extension yield gap of 508 kg/ha was observed in blackgram crop variety IPU 94-1 during kharif, 2016. The lowest extension yield gap of 52 kg/ha was observed in in blackgram crop variety IPU 94-1 during *kharif*, 2019. The higher extension yield gap indicates that there is a strong need to motivate the farmers for adoption of improved technology over their local practices (farmer's practice). The extension yield gaps in cluster front line demonstrations on pulses have been reported by many extension workers which observed that extension gap was maximum due to lack of awareness in adoption of improved and recommended package of practice in pulses crop production. The present study is in close conformity with the findings of Choudhary (2013) and Thakur and Bhushan (2016).

Technology Index

The data presented in Table 2 revealed that technology index varied from 2.08 to 82.92 per cent in the blackgram crop during the kharif, 2016 to 2019. The lowest technology index 2.08 was recorded in blackgram variety IPU 94-1 during kharif 2016 followed by 17.31per cent in blackgram variety PU 31 during kharif 2018. Further, highest technology index value was observed with blackgram variety Pratap Urd 1 (82.92%) during *kharif,* 2019. The technology index indicates the feasibility of evolved technology in the farmer's field. If the value of technology index is lower, there is higher the feasibility of improved technology. During *kharif,* 2019 the technological index was maximum because of heavy rainfall (2151.6 mm) during the growing period of blackgram crop while average rainfall of district is only 826.5 mm. Thus, this indicates that blackgram crop variety IPU 94-1 is more popular among the farmers of Mandsaur district in comparison to other varieties demonstrated at farmer's field during 2016 to 2019. The present study was in close conformity with the findings of Dwivedi *et al* (2014).

Economic

It was evident that highest gross and net return was with blackgram crop variety IPU 94-1 during *kharif,* 2016 followed by blackgram variety PU 31 crop during *kharif,* 2018 under demonstration plots. The lowest gross and net return were recorded during *kharif,* 2019 in blackgram crop at farmer's

Table 4: Technology gap, extension gap and technology index of FLD on blackgram in Mandsaur district of Madhya Pradesh

Season / Year	Area (ha)	No. of farmers	Yield (kg/ha)			Technology Gap (kg/ha)	Extension Gap (q/ha)	Technology Index (%)	Additional Cost (Rs/ha)	Additional Return (Rs/ha)	IBCR
			Potential Yield	Demonstration Yield	Farmers Practice						
Kharif, 2016	38.8	97	1300	1273	765	27	508	2.08	500	27440	54.88
Kharif, 2017	40.0	100	1300	1038	760	262	278	20.15	500	13956	27.91
Kharif, 2018	40.0	100	1300	1075	850	225	225	17.31	1500	11117	7.41
Kharif, 2019	40.0	100	1300	222	170	1078	52	82.92	1000	-1942	-1.94
Mean	--	--	1300	909	641	391	268	30.07	875	13723	15.68

plot. The average additional cost and additional net return of Rs 875/- and 13723/- were recorded from 2016 to 2019.

CONCLUSION

It was concluded from the present study that there is a wide technology yield gap (391 kg/ha) and extension yield gap (298 kg/ha) in blackgram crops which reflect in demonstration yield (909 kg/ha) of different varieties of blackgram demonstrated in study at Mandsaur district of Madhya Pradesh. The profitability and productivity of blackgram crop can be improved by adopting improved production technology under agro-climatic conditions of Mandsaur district of Madhya Pradesh.

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