 Full Research

Doi: HTTPS://DOI.ORG/10.23910/IJEP/2019.6.6.0348

Analysis of Yield Gaps in Black Gram (*Vigna mungo*) in Shimla District of Himachal Pradesh

Neelam Kumari*, Ashok K. Thakur and N.S. Kaith

Dr Y S Parmar University of Horticulture and Forestry, Krishi Vigyan Kendra Shimla, Rohru, Himachal Pradesh (171 207), India

Corresponding Author

Neelam Kumari
e-mail: neelkumari90@gmail.com

Article History

Article ID: IJEP0348
Received in 28th October, 2019
Received in revised form 17th November, 2019
Accepted in final form 28th November, 2019

Abstract

Blackgram (*Vigna mungo*) is an important pulse widely consumed in India. Area and production under this crop are declining in Shimla district of Himachal Pradesh due to non-adoption of improved varieties and recommended practices. Krishi Vigyan Kendra Shimla conducted cluster frontline demonstrations on blackgram with an objective to demonstrate and popularize the improved technologies on farmers' fields for effective transfer and fill the gap between recommended practices and farmers' practices. Frontline demonstrations on blackgram during *Kharif* season were studied for four years (*Kharif* 2016-17, *Kharif* 2017-18, *Kharif* 2018-19 and *Kharif* 2019-20) in Shimla district of Himachal Pradesh. Data revealed that there was a wide yield gap between the potential and demonstration yields mainly due ineffective transfer of technology. Increase in blackgram yield over farmers practice ranged from 7.22 to 54.84%over four years. Improved technology package has also improved the profitability of blackgram crop in terms of gross and net returns besides enhanced benefit cost ratio ranging from 1.62 to 2.68. The technology index in blackgram (13.20 to 36.00%) has revealed that demonstrated improved crop technology is feasible under prevailing farming situations in Shimla district of Himachal Pradesh, but there is urgent need to aware the farmers to adopt the technologically feasible and economically viable farm technologies.

Keywords: Blackgram, economic analysis, extension gap, technology gap, technology index

1. Introduction

Shimla district of Himachal Pradesh is situated between 30˚45' and 31˚44' North latitude and 77˚0' and 78˚19' East longitude with an elevation varying from 600 meters to 6000 meters above mean sea level and endowed with wide variety of agro-climatic conditions and soil types, that enable various pulses as vital component of hill production system. Black gram (*Vigna mungo*) and rajmash (*Phaseolus vulgaris*) during *kharif* and chickpea (*Cicer arietinum*) during *rabi* seasons are the three major pulse crops grown by the farmers of the district. The productivity of pulses in Himachal Pradesh is quite low compared to national and global average, mainly due to their cultivation under rainfed and marginal lands besides poor crop management practices (Choudhary, 2009; Choudhary et al., 2009). Besides this, 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 (Paul et al., 2011). There exists a wide yield gaps in between the experimental plots, frontline demonstrations plots and farmers' fields.

Food legumes are the vital source of protein. These crops contain high amount of protein, macro and micro nutrients, vitamins, fibre and carbohydrates for balanced nutrition. They are rich in lysine and essential amino acids which are found only at low levels in cereal proteins (Mohmoud, 2009). Pulse production in India has fluctuated widely leading to steady decline in the per capita availability over last 20 years (Gregory et al., 2003). Blackgram (*V. mungo*) is an important food legume widely consumed in India. It also plays an important role in sustainable agriculture enriching the soil through biological nitrogen fixation. On account of its short duration, photosensitivity and dense crop canopy, it assumes special significance in crop intensification, diversification and conservation of natural resources and sustainability of production system (Katiyar and Dixit, 2010). The productivity of pulses in Himachal Pradesh continues to be quite low over the years because of their cultivation under rainfed conditions on less productive lands with no or little inputs compared to those used for cereals. Thus, there is a great challenge for policy makers, farm scientists, extension functionaries and farming community to enhance pulse productivity and diversify their cropping systems to meet out the national and local pulse requirements.

Keeping in view the above facts, present investigation was carried out to demonstrate and transfer the generated farm technology through FLDs' in pulses under rainfed production systems with the objectives of enhancing productivity, profitability and narrowing extension yield gaps.

2. Materials and Methods

2.1. Yield increase

Frontline demonstrations on pulse crop blackgram were conducted by KVK Shimla during *Kharif* 2016-19 for consecutive four years. A total of 35 ha area was covered under frontline demonstration on blackgram under rainfed conditions in 29 villages on 294 farmers' fields during all the years under study. In frontline demonstrations, full package of practices was adopted whereas in the farmers' practice, existing practices being used by the farmers of the area were followed (Table 1). The primary data on yield and farmers' practice was collected from the beneficiary farmers. The yield increase in demonstrations over farmers' practice (YIOFP) was calculated by using the following formula:

Table 1: Comparison of recommended practices demonstrated and farmers' practice in blackgram technologies in Shimla district of Himachal Pradesh

Crop Operation	Recommended Practices Demonstrated	Farmers' practice
Variety	Him-1	Local
Land preparation	Two ploughings	One ploughing
Seed rate	20 kg ha^{-1}	30 kg ha^{-1}
Method of sowing	Line sowing	Broadcasting
Time of sowing	Mid-June	June-July
Fertilizer dose	30:60:30 kg NPK ha^{-1}	No fertilizer use
Weed management	Hand weeding	Hand weeding
Plant protection	Need based pesticide application	No pesticide application
Irrigation	Rainfed	Rainfed

YIOFP (%)= ((Demonstration plot yield-Farmer's plot yield)÷ Farmers's plot yield)×100

2.2. Assessment of technology gap, extension gap and technology index

The estimation of technology gap, extension gap and technology index were done using following formula (Samui et al., 2000):

i) Technology gap=Potential yield-Demonstration plot yield

ii) Extension gap=Demonstration plot yield-Farmer^' s plot yield

iii) Technology index (%)= ((Pi-Di)÷Pi)×100

Where,

Pi= Potential yield of i^{th} crop

Di= Demonstration yield of i^{th} crop

2.3. Economic analysis of cluster FLD on blackgram

Cost of cultivation of blackgram include cost of inputs like seed, fertilizers, pesticides etc. not available with the farmers and purchased by the farmers (in farmers practice) or supplied by the KVK (in recommended practice) as well as hired labour (if any), sowing charges by bullocks or tractor (if any) and post-harvest operation charges (if any) paid by the farmers. The farmers' family labour was not taken into consideration in the present study. The gross and net returns were worked out accordingly by taking cost of cultivation and price of grain yield of respective crop into consideration. Additional costs in frontline demonstrations include expenditure on improved technological inputs in frontline demonstrations over farmers' practice. Similarly, benefit-cost ratio was worked out as a ratio of returns and corresponding costs.

3. Results and Discussion

3.1. Yield

Perusal of the data in Table 2 revealed that with the adoption of recommended practices in frontline demonstration of pulse crops, the yield can be raised by 7.22 to 54.84% in blackgram over the farmers' practice. This superiority of recommended practices in frontline demonstration over farmers' practice was also reported by Sagar and Chandra (2004), Vaghasia et al. (2005), Mitra and Samajdar (2010) and Balai et al. (2012). The year to year fluctuation in yield and cost of cultivation can be explained on the basis of variation in prevailing social, economic and microclimatic conditions of that particular village.

3.2. Technology gap, extension gap and technology index

The technological gap shows the gap in the recommended

Table 2: Technology gap, extension gap and technology index in blackgram in Shimla district of Himachal Pradesh

Season and Year	Variety	Area (ha)	No. of Farmers	No. of villages	Yield (q ha^{-1}) DP*	Yield (q ha^{-1}) FP*	Yield increase (%)	Technology gap (q ha^{-1})	Extension gap (q ha^{-1})	Technology index (%)
Kharif 2016-17	Him-1	5	50	6	9.60	6.20	54.84	5.40	3.40	36.00
Kharif 2017-18	Him-1	10	80	9	10.40	9.70	7.22	4.60	0.70	30.67
Kharif 2018-19	Him-1	10	94	7	13.02	11.43	13.91	1.98	1.59	13.20
Kharif 2019-20	Him-1	10	70	7	11.75	9.66	21.64	3.25	2.09	21.67

DP*: Front line demonstration Plots; FP*: Farmers practice plots practices frontline demonstrations yield over potential yield and it ranged from 1.98 to 5.40 qha^{-1} in blackgram (Table 2). The observed technology gap may be attributed to dissimilarity in soil fertility status and weather conditions. Similar findings were documented by Hiremath and Nagaraju (2009). Hence to narrow down the gap between the yield of recommended practices and farmers' practice location specific recommendation appears to be necessary.

The extension gap which ranged from 0.70 to 3.40 qha^{-1} in blackgram during the period of study emphasized the need to educate the farmers through various means for the adoption of recommended and improved agricultural production technologies to reverse this trend of wide extension gap. The feasibility of the evolved technology in the farmer's fields is indicated by the technology index. The lower the technology index more is the feasibility of the technology (Mishra et al., 2007). In blackgram crop, technology index varied from 13.20 to 36.00%. Reduction of technology index in general over the year of study clearly exhibited the feasibility of technologies demonstrated in frontline demonstrations.

3.3. Economic analysis

The economic analysis of the data (Table 3) for the study period for blackgram 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 benefit cost ratios of demonstration plots ranged from 1.62 to 2.68 in blackgram. Similar findings were also reported by Kumari et al. (2007).

Table 3: Economic analysis of cluster FLD on blackgram in Shimla district of Himachal Pradesh

Season and Year	Cost of cultivation (INR ha^{-1})		Gross returns (INR ha^{-1})		Net returns (INR ha^{-1})		B:C ratio	
	DP*	FP*	DP*	FP*	DP*	FP*	DP*	FP*
Kharif 2016-17	10500	12700	27500	21900	17000	9200	1.62	0.88
Kharif 2017-18	9700	12000	29000	27000	19300	15000	1.99	1.25
Kharif 2018-19	9500	11000	31000	25000	21500	14000	2.26	1.27
Kharif 2019-20	9500	10000	35000	27000	25500	17000	2.68	1.70

DP*: Front line demonstration Plots; FP*: Farmers practice plots

4. Conclusion

The wide gap between potential and demonstration yield in black gram (*V. mungo*) was mainly due to technological and extension gaps. The productivity of the pulse crops can be improved under rainfed conditions by adopting the improved agricultural technologies in the Shimla district. It is also observed that higher extension gap emphasized that there is further need to educate and motivate farmers for adoption of improved technologies, so that marginal farmers with limited resources could improve their livelihood and diversify their farming situation.

5. References

Balai, C.M., Meena, R.P., Meena, B.L., Bairwa, R.K., 2012. Impact of frontline on rapeseed and mustard yield improvement. Indian Research Journal of Extension Education 12**,** 113−116.

Choudhary, A.K., 2009. Role of phosphorus in pulses and its management. Indian Farmers' Digest 42, 32−34.

Choudhary, A.K., Yadav, D.S., Singh, A., 2009. Impact of front-line demonstrations in pulses on technology transfer, productivity and profitability in Mandi district of Himachal Pradesh. 4th World Congress on Conservation Agriculture, New Delhi, 395.

Gregory, K., Price, L.R., Govindan, A., 2003. India's Pulse sector: Results of Field Research. Electronic Outlook Report of Economic Research Service, USDA. WRS-03-01, May, 2003, 1−23.

Hiremath, S.M., Nagaraju, M.V., 2009. Evaluation of demonstrationtrials on onion in Haveri district of Karnatka. KarnatkaJournal of Agricultural Sciences29, 1092-1093.

Katiyar, P.K., Dixit, G.P., 2010. Genetic divergence in Indian blackgram (*Vigna mungo*) cultivars. Indian Journal of Agricultural Sciences 80, 242−243.

Kumar, S., Prasher, D., 2012. An analysis on changing trends of food grains in Himachal Pradesh. International Journal of Pharmacy andLife Sciences 3, 1739−1742.

Mishra, D.K., Tailor R.S., Pathak G., Deshwal A., 2007. Yield gap analysis of blight disease management in potato through frontline demonstration. Indian Research Journal of Extension Education7, 82−84.

Mitra, B., Samajdar, T., 2010. Yield gap analysis of rapeseed and mustard through frontline demonstrations. Agricultural ExtensionReview 22, 16−17.

Mohmoud, S., 2009. Global partnership in eradicating hunger and malnutrition of resource poor farmers in non-tropical dry areas. International conference on grain legumes, Kanpur, India.

Paul, J., Suri, V.K., Sandal, S.K., Choudhary, A.K., 2011. Evaluation of targeted yield precision model for soybean and toria crops on farmers' fields under sub-humid sub-tropical NW Himalayas. Communications in Soil Science

and Plant Analysis 42, 2452−2460.
Sagar, S.L., Chandra G., 2004. Frontline demonstration on sesame in West Bengal. Agricultural ExtensionReview16, 7−10.
Samui, S.K., Maitra, S., Roy, D.K., Mondal, A.K., Saha, D., 2000. Evaluation on frontline demonstration on groundnut. Journal of the Indian Society of Coastal Agricultural Research18, 180−183.
Vaghasia, P.M., Savalia, R.L., Kelaiya, G.R., 2005. Evaluation of frontline demonstrations on groundnut in Saurashtra region of Gujarat. Journal of Oilseeds Research 22, 238−239.
Kumari, V., Kumar, A., Kumar, A., Bhateria, S., 2007. Demonstration- an effective tool for increasing the productivity of rape seed–mustard in Kangra district of Himachal Pradesh. Himachal Journal of Agricultural Research 33, 257−261.