Impact of Front-Line Demonstration on Pulses Productivity and Profitability in Farmers Farmers'Fields

ABSTRACT

Front-Line Demonstration (FLD) is the long-term educational activity carried out systematically by agricultural experts in the field of farmers to demonstrate the value of new practices/technology in the micro-agriculture situation.The aim of FLD was to demonstrate the improved technologies of pulses for production potential. The improved technologies consist includeusing useof improved varieties, seed treatment with Rhizobium and PSB culture, sowing method, balanced fertilizer application, and improved pest control techniques. The results of pulses harvest crops in 2021-2022 showed that improved varieties with improved practice packages recorded a higher yield compared to farmers' practices. The improved technologies saw yield increases of 26.33 percent, 24.63 percent, 23.41 percent, and 22.83 percent yield increase over farmer practices in Green gram, Chick peaChickpea, Pigeon pea, and Black gram respectively. The averagepercentage yield increased over farmers' practices of farmers was 24.30 percent. The mean technological yield gap was highest forChick peaChickpea (3.47 q/ha) followed by Pigeon pea (1.36 q/ha) and Green gram (1.34 q/ha) while for Black gram (1.26 q/ha)was the lowest. The maximum mean extension yield gap in the study was recorded in Pigeon pea at 11.83 q/ha followed by Black gram (5.22 q/ha) and Green gram (3.57 q/ha) while the lowest extension yield gap was in Chick peaChickpea (2.44 q/ha) was recorded. The technology index varied between 7.16 and 17.35% while the lowest (7.16) was recorded with Pigeon pea**.** The highest gross return (Rs. 81,654/ha), net return (Rs. 56,370/ha) and benefit-to-cost ratio (3.23) was recorded with chickpea demonstration followed by Black gram and green gram while lowest gross return (Rs. 44,848/ha), net return (Rs.24,634 /ha) and benefit costbenefit-cost ratio (2.22) which was markedly higher compared to gross return (Rs. 36,342/ha), net return (Rs.16,430/ha) and benefit cost benefit-cost ratio (1.83) in farmersfarmers' practice. The improved technologies yielded a higher gross return, net return with a higher benefit-to-cost ratio compared to farmers' practices.

Keywords: Pulses, Yield, Technology Gap, Extension Gap, Technology Index and Economic Returns and FLDs

INTRODUCTION

In terms of quantity and variety, India produces the most pulses in the world. For the impoverished and vegetarians who make up the majority of the Indian population. Pulses are the primary source of protein. While a pulse crop was almost always included in the traditional cropping pattern, either as a mixed crop or in rotation, the commercialization of agriculture has favoured sole cropping. 'India is the largest producer (25% of global production), consumer (27% of world consumption), and importer (14%) of pulses in the World. Although it is the world's largest pulses producer, India is importing 4-6 million tons (MT) and consumer (26-27 MT) of pulses every year to meet its domestic demand' (DAC & FW, 2018; GOI, 2018-19).The use of ancient varieties, greater seed rates, and disseminating sowing methods, as well as biotic/abiotic challenges in the specific region/area, are all factors that contribute to low-pulse productivity.As a result, there is a need to raise awareness within the farming community in order to popularize location-specific enhanced varieties in order to boost pulse crop yield and productivity in a certain region/area. Farmers and agricultural researchers have made many types of initiatives to boost legume production and productivity from time to time. As a result, policymakers, farm scientists, extension officials and farming community have a significant challenge in increasing pulse yield and diversifying cropping systems to fulfill national and local pulse requirements.

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Front-line demonstration (FLD) of pulses areis a unique approach to providing a direct interface3 between researchers and farmers as the scientists are directly involved in planning, execution, and monitoring of demonstrations for technologies they have developed and receive direct feedback from farmers farmers' field about production in general and the technology being demonstrated in particular.With the above facts in mind, an intensive intervention was carried out, such as front-line demonstrations, to transfer the generated farm technology through FLDs in pulses under the trial belt in the specific region/area, with the goals of increasing productivity, profitability, and closing the extension yield gaps. In this comprehensive study, technological extension yield gaps under pulses are also discussed in this paper for developing a suitable extension plan for effective technology transfer to target farmers in the district of Buldana.

METHODOLOGY

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The Krishi Vigyan Kendra, Jalgaon Jamod, District Buldana, Maharashtra, considered the front-line demonstration on pulses crop in four villages of the Jalgaon (Ja) tahsil for the studies in 2021-2022, which were put out in adopted villages. Front-line demonstrations were held in four adopted communities with 60 ha area and each with 150 farmers and a 0.4 hectare 0.4-hectare field (Table 1).

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Table 1: Details of Front lineFront-line demonstration on pulses

Sr. No.	Crops	Variety	Name of Village	Tahsil and District	Area (ha)	No. of FLD's
1	Black gram	AKU-10-1	Nimgaon	Jalgaon tahsil, Buldana district	10	25

2	Green gram	BM-2003-2	Wadgaon	Jalgaon tahsil, Buldana district	10	25
3	Pigeon pea	PKV-Tara	Bhedwad	Jalgaon tahsil, Buldana district	20	50
4	Chick pea	Phule-Vikram	Asalgaon	Jalgaon tahsil, Buldana district	20	50
				Total	**60**	**150**

~~Crop cutting~~Crop-cutting methodology was used to acquire primary data on grain yield farmer practices, which was followed by personal interviews with the beneficiaries. Farmers were educated about proposed technologies to be demonstrated before receiving the key input through a training session. In a front-line demonstration at various sites, quality seeds of improved varieties, seed treatment, recommended fertilizer doses, Rhizobium, PSB bio-fertilizer, and plant protection management approaches were exhibited on the ~~farmer's~~ farmers' fields. In the case of local checks, the standard procedures were followed. All major farm operations were carried out under the supervision of KVK scientists who paid regular visits to the property.The information was gathered from front-line demonstration fields as well as control fields (farmer practices), and the technology gap, extension gap, and technology index were determined using the formulas:

Extension Gap (q/ha) = Demonstration Yield – Check Yield

Technology Gap (q/ha) = Potential Yield – Demonstration Yield

Technology Index (%) = [Technology Gap / Potential Yield] X 100

Data analysis

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according to Hejase and Hejase (2013), "descriptive statistics deals with describing a collection of data by condensing the amounts of data into simple representative numerical quantities or plots that can provide a better understanding of the collected data" (p. 272). Therefore, this study analyzed data collected with descriptive statistics such as frequencies and percentages supported with tables for clarity.

RESULTS AND DISCUSSION

Table 2 reveals that farmers did not implement a single suggested practice~~s~~ in the pulses crop, despite the fact that technologies used in FLDs and practices adopted by the farmers~~'~~ in control plots.

GrainYield

During 2021-2022 frontline demonstrations carried pulses in farmers' fieldsTable 3 showed thatGreen gram grain yield ~~was~~ increasedby 26.33 percent over local control plots followed by 24.63 percent, 23.41 percent, and 22.83 percent byChickpea, Pigeon pea, and Black gram. An average of 24.30 percent increase in grain yield of pulse crops over local control plots during the study year was observed. The result showed that the front-line demonstration has a good impact on the farming community of Buldana district as it was motivated by the new agricultural technologies applied on the FLD plot. The finding is in ~~collaborated~~ accordancewith the finding of Singh et al. (2020).

Extension & Technology gap

The yield of the demonstration trails and the potential yield of the crop were compared to estimated yield gaps, which were further categorized into technology and extension gaps(Table 4). The technological gap ~~shows~~ between demonstrated yield and the potential yield of black gram~~and~~ shows it was the maximum (3.43 q/ha) observed in 2021-2022 for Chickpeasfollowed by Pigeon pea (1.36 q/ha), Green gram (1.34 q/ha),and Black gram (1.26 q/ha). ~~'~~The overall average technology gap was 1.86 q/ha across all pulse crops. 'The observed technological gap can be attributed to different soil fertility states, rainfall distribution, disease, and pest infestation, and annual change of demonstration plot locations' (Kumar et al., 2019).

In addition, the maximum extension gap of 11.83 q/ha was recorded in the 2021-2022 Pigeon pea followed by Black gram (5.22 q/ha), Green gram (3.57 q/ha), and~~Chick pea~~Chickpea (2.44 q/ha). The average total elongation gap was 5.77 q/ha across all pulses. Table 4 also shows that the technology index varied from 7.16 to 17.35 percent of the Black gram, Green gram, Pigeon pea, and ~~Chick pea~~ Chickpeaand the average technology index overall was 12.10 percent across all pulses.The lower the value of the technology index, the more the feasibility is proven~~where as~~ whereasPoor field establishment in the early vegetative phase due to water stress in rainfed agriculture with uneven distribution of rainfall, long drought, and increasing pressure from diseases and insect pests are the possible reason for poor yields causing higher technology index.

Economic Return

The economics of improved technologies versus farmers' practices were calculated as a function of the prevailing inputs and outputsprices (Table 5). It was found that the cost of cultivation of pulses crop varied from Rs. 17,877to Rs. 25,284/ha with an average of Rs. 20,441/ha of demonstration as against the variation cultivation cost of Rs. 16,737 to Rs. 26,114/ha with an average of Rs. 20,032/ha in farmer practice. The cultivation of pulses crops under demonstration gave an average net return of 33,014/ha as compared to farmers' practice which recorded Rs. 22,967/ha. The averagecost-benefit ratio of 2.57 was found under demonstration compared to 2.11in farmers' practice in the corresponding seasons. This may be due to higher yields obtained atdemonstrations compared to the farmers' practice.

CONCLUSION

It is concluded that the FLDs program is an effective tool to increase pulses area, production, and productivity and to change farmers' knowledge, attitude, and skillsin relation to the adoption of improved technologies.The result showed convincingly that the yield of pulses can be increased by intervention in recommended practices package. This also improved links between farmers and scientists, and built confidence for the adoption of the improved technology. The increase in productivity among FLDs over pulses growing practices created greater awareness, and motivated other non-pulses growers to adopt improved technologies. These practices can be popularized in this area to fill the extension agency to bridge the larger extension gaps.

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Table 2 : Difference between technological intervention and farmers practices for Pulses

Crop	Component	Demonstration Plots	Farmers plots
Blank gram	Variety	AKU-10-1	Local variety
	Seed rate	10 kg/ha	12 kg/ha
	Seed treatment	seed treatment with Rhizobium culture @ 250 ml/10 kg seed + PSB @ 250 ml/10 kg seed and Trichoderma 1.25kg /10 kg seed	No seed treatment
	Sowing time	Last week of June to First fortnight of July	As per mansoon
	Fertilizer does	On the basis of soil testing report chemical fertilizers used	Overdoses of fertilizers
	Plant protection	Need based application under technical guidance	Indiscriminate use
Green gram	Variety	BM-2003-2	Local variety
	Seed rate	10 kg/ha	12 kg/ha
	Seed treatment	seed treatment with Rhizobium culture @ 250 ml/10 kg seed + PSB @ 250 ml/10 kg seed and Trichoderma 1.25kg /10 kg seed	No seed treatment
	Sowing time	Last week of June to First fortnight of July	As per mansoon
	Fertilizer does	On the basis of soil testing report chemical fertilizers used	Overdoses of fertilizers
	Plant protection	Need based application under technical guidance	Indiscriminate use
Pigeon pea	Variety	PKV-Tara	Local variety
	Seed rate	12 kg/ha	15 kg/ha
	Seed treatment	seed treatment with Rhizobium culture @ 250 ml/10 kg seed + PSB @ 250 ml/10 kg seed and Trichoderma 1.25kg /10 kg seed	No seed treatment
	Sowing time	Last week of June to First fortnight of July	As per mansoon
	Fertilizer does	On the basis of soil testing report chemical fertilizers used	Overdoses of fertilizers

	Plant protection	Need based application under technical guidance	Indiscriminate use
Chick pea	Variety	Phule-Vikram	Local variety
	Seed rate	60 kg/ha	75 kg/ha
	Seed treatment	seed treatment with Rhizobium culture @ 250 ml/10 kg seed + PSB @ 250 ml/10 kg seed and Trichoderma 1.25kg /10 kg seed	No seed treatment
	Sowing time	First fortnight of October	As per soil moisture
	Fertilizer does	On the basis of soil testing report chemical fertilizers used	Overdoses of fertilizers
	Plant protection	Need based application under technical guidance	Indiscriminate use

Table 3 : Grain yield analysis of front line demonstration on Pulses

Crops	Area (ha)	No. of farmers	Yield qt/ha			% increase over farmer practices
			Potential	FLD plots	Farmer practices	
Black gram	10	25	12	6.78	5.52	22.83
Green gram	10	25	10	6.43	5.09	26.33
Pigeon pea	20	50	19	7.17	5.81	23.41
Chick pea	20	50	20	17.56	14.09	24.63
			Mean	**9.49**	**7.63**	**24.30**

Table 4 : Gap analysis of front line demonstration on Pulses

Crops	Technology gap (qt/ha)	Extension Gap (qt/ha)	Technology Index (qt/ha)
Black gram	1.26	5.22	10.50
Green gram	1.34	3.57	13.40
Pigeon pea	1.36	11.83	7.16
Chick pea	3.47	2.44	17.35
Mean	**1.86**	**5.77**	**12.10**

Table : 5 Economics analysis of demonstrated plots and farmers practices of Pulses

Crops	Av. Cost of cultivation (Rs/ha)		Av. Gross return (Rs/ha)		Average net return (Rs/ha)		B;C ratio	
	Demo. Plots	farmers practices	Demo. Plots	farmers practices	Demo. Plots	farmers practices	Demo. Plots	farmers practices
Black gram	18390	17364	44816	36487	26426	19123	2.44	2.10
Green gram	17877	16737	42502	33645	24625	16908	2.38	2.01
Pigeon pea	20214	19912	44848	36342	24634	16430	2.22	1.83
Chick pea	25284	26114	81654	65519	56370	39405	3.23	2.51
Mean	**20441**	**20032**	**53455**	**42998**	**33014**	**22967**	**2.57**	**2.11**