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EFFECT OF FRONTLINE DEMONSTRATIONS OF IMPROVED CROP MANAGEMENT PRACTICES ON YIELD AND ECONOMICS OF SUMMER MOONG

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Abstract

Keeping in view the importance of pulses in crop diversification, maintenance of soil health and nutritional security in Punjab, Krishi Vigyan Kendra Mohali conducted frontline demonstrations on improved agricultural technologies of summer moong crop at farmers' fields during the year 2017–18 and 2018–19. Fourty nine front line demonstrations in cluster approach were conducted during 2017-18 covering an area of 20.0 hectare and fifty five demonstrations were carried out in 30 hectare area during 2018-19. Latest crop production and protection technologies including improved high yielding varieties (SML 668 AND SML 832, during 2017-18 and 2018-19, respectively), seed treatment with fungicide and biofertiliser, soil test based nutrient management, use of herbicide for weed control, gramaxone for synchronous maturity and plant protection chemicals based on economic threshold level of pests were demonstrated to farmers to show them productivity potential and profitability. The productivity and economic returns of summer moong in demonstrated plots were calculated and compared with the corresponding farmers' practices (local check). Results revealed that the improved technologies recorded mean yield of 13.00 q/ha, which was 18.3 percent higher grain yield in demonstration plots as compared to the farmer's practices, however SML 832 performed better than SML 668. The average extension gap, technology gap and technology index recorded were 0.42 q/ha, 2.0q/ha and 2.3 percent, respectively. Sowing of high yielding varieties coupled with scientific monitoring of demonstrations and improved crop management technologies resulted in higher gross monetary returns, net returns and B:C ratio with improved technology compared to farmer's practice during both the years. In order to improve the productivity of summer moong in S.A.S. Nagar (Mohali) district, necessary efforts have to be made involving all the stakeholders to popularize improved technologies.

Key words: Summer moong, Frontline demonstrations, Technology index, Yield, B:C ratio

Introduction

Pulses are very important for Indian agriculture as both in terms of enriching soil health and source of proteins for providing nutritional security to the ever increasing population. India is the largest producer, consumer and importer of pulses having 25.2 m ha under pulse with 19.2 MT potential. However, the area and production stagnated last two decades. The current per capita availability of pulses is 41.7 g/capita/day which is much below the recommendations of ICMR of 51 g/capita/day. Although the demand among pulses was high but the production has not risen up to fulfill the domestic demand of 22.42 million tones. Hence, there is a need to increase production and productivity of pulses with an average annual growth of 4.2% to reach the target of 32 million tonnes by the year 2030 (Singh *et al.*, 2016).

India is the largest producer of Mungbean in the world. Mungbean grown in summer season has potential to produce 1.3 times higher than the *kharif* crop. Summer moong fits well in the existing cropping systems viz paddy-potato, basmati-wheat and paddy-wheat in. It can ideally be grown in irrigated tracts as catch –cum – cash crop after harvesting *rabi* crops. Average yield of summer moong in Punjab is 8.45 q/ha, which is much below the potential yield. The unavailability of quality seed and lack of technological awareness were major issues as reported by 94.2 and 74.2 percent farmers (Purushottam *et al.*, 2011). As mungbean is a popular pulse in diet in Punjab, increase in area in general will not only boost farmer's

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income but also tackle the protein rich food availability and nutritional security for rural community in future (Shalendra *et al*., 2013). Success in summer cultivation will not only increase mungbean production, but can also help in defeating malnutrition, crop diversification, sustaining agricultural production and increasing house-hold income of farmers. Thus, it is evident that summer cultivation of mungbean must be encouraged. It has been proposed to enhance the area under moong bean from existing 20 thousand hectares to 60 thousand hectares under diversification programme in central districts of Punjab (Kaur *et al*., 2018).

Though much progress has been made in the field of agriculture research and education, but benefits of these developments could not be realized by the farming community because of low adoption of technologies at the farmers' level. Cluster front line demonstrations (CFLD) of pulses on farmers field has been devised as a powerful tool for augmenting the production and productivity of pulses in India. The project under National Food Security Mission (NFSM) of Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW) was started during rabi 2015 to give a boost to the domestic production of pulses. The project continued thereafter, in which *Krishi Vigyan Kendras* (KVKs) of Punjab were given responsibility to demonstrate and popularize cultivation of pulses with improved package of practices and latest technologies for realizing better yield. Keeping the importance of FLDs, KVK, S.A.S Nagar (Mohali) conducted demonstrations on summer moong at farmers' fields under irrigated situations. The present study has been undertaken to evaluate the difference between demonstrated technologies and farmer practices in summer moong.

Materials and Methods

The study was carried out in operational area of Krishi Vigyan Kendra, S.A.S. Nagar (Mohali) of Punjab falling under sub mountainous zone (30.69°N latitude, 76.72°E longitude having an average altitude of 316 m from the sea level). Forty nine front line demonstrations in cluster approach were conducted during 2017-18 covering an area of 20.0 hectare and fifty five demonstrations were carried out in 30 hectare area during 2018-19. Farmers were selected from all the blocks of S.A.S. Nagar district through survey, group meetings and conducting discussions with them. The necessary steps for selection of site, selection of farmers, layout of demonstrations etc were followed as suggested by Choudhary (1999). Selected farmers were guided about improved production technology recommended by Punjab Agricultural University, Ludhiana through training programmes, farm literature and personal contact method for conducting frontline demonstrations at their fields. Soils from each demonstration were collected and analyzed for pH, EC, OC(%), available P and K. Among all demonstrations, the soil texture was loamy sand to loam. However, the soil was medium in OC and available P and high in available K in the entire demonstration site. Existing local cultivation practices were followed in case of check plots. Mungbean crop was grown after three previous crops *i.e.* wheat, potato and mustard crop. During study years, sowing was done between 20 March to 20th April with 30 Kg seed/ha in SML 832 and 37.5 Kg seed/ha in SML 668 with 22.5 cm row to row spacing. All N, P and K were applied according to soil test results. Seed treatment was with fungicide captan (3 g/ kg seed) and biofertiliser (Rhizobium sp LSMR-1 and Rhizobacterium RB 3). Recommended weed control measure (pre emergence application of Pendimethaline @2.5 l/ha) was taken up and irrigation was given according to the requirement of the crop. Gramoxone 24 SL was sprayed for synchronous maturity of pods, when 80% of pods mature, @ 2 l/ha, using 500 l of water. All the important farm operations were performed under the supervision of KVK scientist by regular visits. At front line demonstration site off campus trainings were organized to extent the technology to other farmers of the area. Opinion of the farmers about technologies used under demonstration was collected for further improvement in research and extension activities. The extension activities like group meetings and field days were also organized at the demonstration sites as to provide opportunities for other farmers of the area to interact and to seek benefits from these demonstrations.

The crops were harvested at perfect maturity and yield data was collected. Besides this, demonstrated plot yield was obtained using the data from front line demonstrations conducted in the farmers field under the close supervision of scientists from KVK in different locations of the district. Further, information on actual yield obtained by the farmers on their farms under their own management practices was collected. Gross returns were estimated based on the prevailing market prices and the yield obtained by the farmers during both the years. For obtaining input cost, the sum of expenditure on land preparation, planting method, fertilizer, insecticide, fungicide, herbicide, irrigation, labour and harvesting cost, etc. were calculated from each plot. Further, net returns and benefit : cost were calculated from these data. Benefit: Cost was calculated as ratio of net return over cost of cultivation. Feedback from the farmers was taken so that further research and extension activities were improved. Finally the technology gap, extension gap, technology index were calculated as formula given by Samui *et al*., (2000). Extension gap is the difference between

Table 1: Package of practices followed for demonstrations and Local check (Farmers' practice Plot) in summer moong crop.

Practices	Local check (Farmer's practice Plot)	Demonstration Plots
Variety	Local varieties	Improved high yielding varieties (SML 832 and MH 668)
Seed Treatment	Not applied	Captan @ 3g/kg seed + biofertiliser culture
		(Rhizobium sp LSMR-1 and Rhizobacterium RB 3)
Weed control	One hoeing	Pre-emergence spray of pendimethalin @ 2.5 litre/ha
Fertilizer dose	Irrational use of nitrogenous fertilizer	
	and non application of SSP	Urea @ 32.5 kg/ha and SSP @ 125 kg/ha (On soil test basis)
Plant protection	Over dose/ under dose of pesticides	Recommended pesticides (Malathion and acephate)
measures		were sprayed on ET level of insects
For synchronous	Not applied	Gramoxone 24 SL
maturity		

demonstrated plot yield and farmers practice plot yield. Technology gap is the difference between potential yield and demonstrated plot yield. The technology index shows the feasibility of evolved technology at the farmers' fields.

Percent increase in yield =

$$\frac{Demonstration\ yield - Farmer's\ Practice}{Farmer's\ Practice\ yield} \times 100$$

Technology Gap = Potential yield – Demonstration yield.

Extension Gap = Demonstration yield – Farmer's yield.

Technology index =

$$\frac{Potential\ yield - Demonstration\ yield}{Potential\ yield} \times 100$$

Results and Discussion

Grain Yield: A comparison of yield performance between demonstrated practices and local checks is shown in table 2. The average grain yield of summer moong was higher among demonstrations (13.0 q/ha) over farmer practices (11.0 q/ha). SML 668 and SML 832 recorded 10.9 and 25.7% higher grain yield over local check plot during 2017-18 and 2018-19, respectively. As we compared about different varieties, SML 832 variety produced 4% higher grain yield over SML 668. Similar findings were reported by Chanda (2010) and Singh *et al*., (2012), where demonstration plots gave higher yield in mungbean crop. The major differences were observed between demonstration package and farmer's practices are regarding seed treatment, time of sowing, fertilizer dose, method of fertilizer application and plant protection measures.

Table 2: Yield, technology gap, extension gap and technology Index of summer moong demonstrations in District S.AS Nagar.

Year	Variety	Average Demonstration Yield (q/ha)	Local Check Yield (q/ha)	Increase in Yield (%)	Potential Yield of Improved Variety (q/ha)	Technology Gap (q/ha)	Extension Gap (q/ha)	Technology index
2017-18	SML 668	12.7	11.45	10.9	13.0	0.3	1.25	2.30
2018-19	SML 832	13.2	10.5	25.7	13.75	0.55	2.7	1.96
Mean	13.0	11.0	18.3	13.38	1.6	2.0	2.13	

Extension gap: During 2017-18 extension gap was 1.25 q/ha, during 2018-19 it was 2.70 q/ha table 2. There is a need to decrease this wider extension gap through implementation of latest techniques. It could be reduced through considerable co-ordination between researchers, extension workers and farmers. These findings are in line with those of Hiremath and Hilli (2012).

Technology gap: The major technological gaps were observed regarding

Table 3: Economics of the Front Line Demonstrations on Summer moong in District S.AS Nagar.

Year	Variety	Farmers' Practice Plots (FPP/Local Check)				Demonstration Plots				
		Gross Cost (Rs./ha)	Gross Return (Rs./ha)	Net Return (Rs./ha)	B:C Ratio	Gross Cost (Rs./ha)	Gross Return (Rs./ha)	Net Return (Rs./ha)	B:C Ratio	Net Return increase (%) over FPP
2017 - 18	SML 668	18550	59826	41276	2.23	18700	66357	47657	2.55	12.8
2018-19	SML 832	18980	58537	39557	2.08	19150	73590	54440	2.84	37.6
Mean	18765	59181	40416	2.16	18925	69973	51048	2.70	25.2	

recommended varieties, seed rate, time of sowing, fertilizer dose, method of fertilizer application and plant protection measures. The technology gap was recorded 30 kg/ha and 55 kg/ha during 2017-18 and 2018-19, respectively. These findings are in agreement with that of Sandhu and Dhaliwal (2016). The causes for such a large total yield gap may be attributed to environmental differences between research stations, extension worker and farmer's fields and non adoption of production technology. Due to this location specific recommendations are necessary to decrease this gap.

Technology index: The technology index shows the feasibility of new technology at the farmer's fields and the lower the value of technology index more is the feasibility of the technology. The technology index in SML 832 was 1.96 % and in SML 668 and during 2017-18 it was 2.30% during 2018-19. The results of the present study are in recurrence with the findings of Bar and Das (2015). The average technology index was 2.13 percent in S.A.S Nagar district during study period table 2. It means the technology is feasible for S.A.S Nagar District of Punjab.

Economic return: The economics of summer moong production under frontline demonstration have been presented in table 3. During the two year period higher average gross return was recorded with demonstration plots (Rs 59181/ha) as compared to FP plots (Rs 69973 /ha). During 2018-19 improved technology produced higher gross return (Rs. 73590/ha) compared to FP (Rs. 58537/ha). Similar results were obtained during 2017-18 also where demonstration gave higher gross return in comparison to FP plot due to higher grain yield obtained. However, the increase in net return of demonstration plots was 25.2% over check plot. Higher net returns among demonstration was due to higher grain yield obtained as compared to FP plots. Ajrawat *et al*., (2013) and Sandhu and Dhaliwal, (2016) also reported similar results. The benefit: cost ratio during 2017-18 was 2.55:1 in demonstration plots as compared to FP plot (2.23:1). However, during 2018-19 demonstration gave higher B:C ratio *i.e.* 2.84:1 and 2.08:1, respectively. The results confirm the findings by Singh *et al.,* (2018) on chickpea.

Table 4: HRD component: Cumulative data of 2017-18 & 2018-19.

S.no.	HRD components	Frequency	Beneficiaries
1.	Trainings on summer		
	moong production	17	560
2.	Kisan sangosthi	4	50
3.	Field day	10	150
4.	Folders and Pamplets		
	distribution	4	700
5.	Agro advisory through		
	M Kisan Portal	11	Mass

Table 5: Client satisfaction index (CSI) of farmers after demonstrations of improved technologies of summer moong.

Satisfaction level	Number	Percentage
High	36	60
Medium	16	26.7
Low	8	13.3

HRD components: During the study period, Human Resources Development Components *i.e.* training, field day, and Kisan Sangosthi were also adopted to increase the farmers understanding and skill about the recommended practice on summer moong production table 4.

Farmer's satisfaction: Client satisfaction index (CSI) presented in Table 5 observed that majority of the respondent farmers expressed high (60%) and medium (26.7%) level of satisfaction regarding the performance of FLDs, whereas, very few (13.3 %) of respondents expressed lower level of satisfaction. Majority of responding farmers under higher and medium level of satisfaction with respect to performance of demonstrated technology indicate stronger conviction, physical and mental involvement in the frontline demonstrations which in turn would lead to higher adoption. The results are corroborated with the results of Dhaka *et al*., (2010) and Hussain *et al*., 2018.

Conclusion

From this study it is concluded that variety SML 832 gave higher grain yield than variety SML 668 in S.A.S Nagar District of Punjab. Whereas, both these varieties performs better under demonstrations than farmer's practices. The findings of the study revealed that gap exists in yields of FLD plots and FP plots due to technology and extension gaps. The increase in yield of summer moong to the extent of 18% in FLDs over the farmers practice created greater awareness and motivated other farmers to adopt the improved package of practices of summer moong. In order to upscale the adoption of technologies by large number of farmers, necessary partnerships are to be forged with the stakeholders such as agricultural department, farmers and processors. Apart from yield and economic advantages, conducting demonstrations in farmers' fields improved the relationship between farmers and scientists and built confidence as well as rapport between them. The farmers involved demonstration acted also as primary source of information on the improved practices of summer moong cultivation and also acted as source of good quality seed in their locality and surrounding area.

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