

Impact of Front Line Demonstrations on Productivity and Profitability of Major Food Grain Crops at Tribal Farmers' Fields in Kota District of Rajasthan

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Received: 22.06.2020 | Revised: 26.07.2020 | Accepted: 03.08.2020

ABSTRACT

Blackgram, chickpea and wheat are the major food grain crops cultivated in the Kota district of Rajasthan. To popularize improved varieties and production technologies, frontline demonstrations were conducted on these crops by Krishi Vigyan Kendra, Kota under Tribal Sub Plan (TSP) during kharif and rabi seasons of 2017-18 and 2018-19 on tribal farmers' fields. Technological interventions demonstrated mainly consisted of improved varieties Pant urd-31, GNG-1958 and Raj-4079 of blackgram, chickpea and wheat; respectively along with recommended improved agronomic practices. Analysis of two years data revealed that demonstrated improved technologies increased the productivity and profitability of demonstrated crops during both the years. On pooled basis, demonstrated techniques enhanced the productivity of blackgram, chickpea and wheat to the extent of 40.87, 20.52 and 10.49 per cent; respectively over farmers practice (5.75q, 16.88q and 43.88 q/ha). Economic analysis confirmed the cost-effectiveness of the demonstrated techniques on farmer fields as demonstrated techniques fetched higher net returns during both the years. It was also observed that, on an average, tribal farmers could be able to get additional returns of Rs. 7363, Rs.13458 and Rs.8230/ha due to application of improved technologies in blackgram, chickpea and wheat crops; respectively. This study emphasizes the need for conducting demonstrations to adopt improved technologies by the farmers of tribal area to uplift their status of livelihood.

Key words: Blackgram, Chickpea, Frontline demonstration, Tribal sub plan, Wheat, Yield

INTRODUCTION

The Tribal Sub-Plan (TSP) is a planning concept used in India to channelize the flow of benefits from the Central government for the development of tribal populations in the states

(Anonymous, 2019). The objective of TSP is to bridge the gap between Scheduled Tribe (ST) population and others by accelerating the development of STs.

Cite this article: Goyal, M.C., Sharma, K.M., Singh, M., Tanwar, A., & Sharma, A.K. (2020). Impact of Front Line Demonstrations on Productivity and Profitability of Major Food Grain Crops at Tribal Farmers' Fields in Kota District of Rajasthan, *Ind. J. Pure App. Biosci.* 8(4), 215-220. doi: <http://dx.doi.org/10.18782/2582-2845.8247>

The Scheduled Tribe population in Rajasthan state is 13.5 per cent whereas it is 9.4 per cent in the Kota district (Anonymous, 2011). Agriculture, with its allied sectors, is unquestionably the largest livelihood provider in India, more so in the vast rural areas. Kota is one of the most important district of Rajasthan with a view of agriculture production potential. Villages with more share of tribes in population were identified in the district under TSP and their needs were assessed for improving agricultural productivity. Based on need assessment, frontline demonstrations and trainings were organized for bridging the extension gap in production technologies among tribal farming community.

Among food grain crops blackgram, chickpea and wheat are the major crops cultivated in the Kota district. More than 95 per cent of its net sown area is irrigated in the district and soils are clay loam with higher production potential. There are several technologies generated at agricultural universities and research stations, but the productivity of these crops is still lower at tribal farmers' fields due to extension gap. It has been reported that there existed extension yield gap of 2.36 q, 3.56 q and 5.50 q/ha in blackgram, chickpea and wheat crops productivity in the Kota district; respectively (Sharma et. al.2019, 2020^a & 2020^b) which emphasizes the need for transferring the feasible improved technologies among farmers to bridge the extension yield gap. Front Line Demonstrations (FLDs) are the important extension techniques to convince the farmers about latest farm technologies. The main objective of frontline demonstration is to demonstrate newly released crop production technologies under different farming situations. Therefore, frontline demonstrations were laid out on blackgram, chickpea and wheat crops during kharif and *rabi* seasons of the year 2017-18 and 2018-19 on tribal farmer's fields in Kota district under TSP with the objectives of demonstrating the performance of improved varieties Pant urd-31, GNG-1958 and Raj 4079 along with

recommended improved agro-techniques and to analyse the profitability of improved techniques on tribal farmer's fields.

MATERILS AND METHODS

Front Line demonstrations (FLDs) were conducted under TSP on blackgram, chickpea and wheat crops at the fields of tribal farmers by the Krishi Vigyan Kendra Kota during 2017-18 and 2018-19 to exhibit the performance of improved varieties & technologies. Farmer's for the FLDs were selected based on population of ST category, suitable site and adoptive attitude of the farmers in Sultanpur, Ladpura and Kherabad Panchayat Samiti of Kota district of Rajasthan. Two villages from each Panchayat Samiti were selected on the basis of highest number of ST category farmers among the villages of concerned Panchayat Samiti. Villages finally selected were, Kacholiya and Fatehpur from Sultanpur, Kalyakheri and Tholpura from Ladpura and Raikhera and Rajpura from Kherabad panchayat samiti. Kota District falls under Agro-climatic Zone-V "Humid South-eastern plain zone" of Rajasthan. The climate in the district is semi-arid and moderate. Soils of the study area are clay loam in texture with low nitrogen, low to medium phosphorus, high in available potassium and widely deficient in zinc. The area under each FLD's were kept 0.4 ha. Technological interventions demonstrated in blackgram during kharif 2017 & kharif 2018 mainly consisted of improved variety Pant Urd-31, seed treatment with carbendazim 50 wp @ 2 g/kg seed and Rhizobium culture inoculation, recommended doses of (N 20 kg & P 40 kg/ha) and sucking pest management through imidacloprid 17.8 SL @250ml/ha. Technologies demonstrated for chickpea crop during rabi 2017-18 & 2018-19 comprised of variety GNG-1958, seed treatment with carbendazim 50 wp @ 2 g/ kg seed and Rhizobium culture inoculation, recommended doses of (N 20 kg & P 40 kg/ ha) and pod borer management through integrated approach. While technological interventions for wheat crop FLDs during rabi 2017-18 and 2018-19 included improved variety Raj-4079,

seed treatment with carbendazim 50 wp @ 2 g/kg seed and recommended doses of fertilizers (N 120 kg & P 40 kg/ha, soil application of zinc sulphate @ 25 kg/ha). Farmers were also suggested for efficient use of fertilizers by drilling in furrows, split application of urea, need based weed management and irrigation at critical stages.

All steps like site and farmer selection, layout of demonstration, farmer's participation etc. were followed as suggested by Choudhary (1999). Selected farmers were provided technological information of FLDs through training programmes before onset of sowing time. Critical inputs of demonstrations were provided to the farmers and other suggested inputs were managed by the farmers. The sowing of blackgram was done during last week of June to second week of July by drilling in 30 cm rows spacing with seed rate of 20 kg/ha and harvesting of crop was done during second fortnight of September. Chickpea crop was sown during November month by drilling in 30 cm rows apart with seed rate of 80 kg/ ha. The sowing of wheat crop was done during first week of November to first week of December by drilling in 22.5 cm rows apart using seed rate of 100 kg/ha and harvesting of crop was done during first fortnight of April. KVK scientists visited FLD sites periodically for monitoring and needful suggestion were given to the farmers. Field days were also organized at crop maturity to demonstrate the results of FLDs among other farmers of the neighboring area for acceptance & further adoption of improved technologies. Data related to yield and cost of cultivation were collected separately for FLD plots and farmers practice (local check) plots.

RESULTS AND DISCUSSION

The results of the frontline demonstrations conducted at tribal farmers' fields clearly reveals that productivity of blackgram, chickpea and wheat were improved substantially under demonstration in comparison to the local checks (farmer's practice) during both the years. Due to improved yield advantage, farmers get higher

profitability under improved practice of demonstration. Crop wise performance data on productivity and profitability are presented in table 1 and 2.

Yield Performance

Blackgram As evident from table-1, yield of blackgram was enhanced under demonstrated techniques during both the year as compared to local farmers practice due to improved variety Pant Urd-31 and management practices followed in demonstration plots. Demonstrated techniques recorded yield of 10.58 q/ha during kharif 2017 which was 41.07 per cent higher over farmers practice (7.50 q/ha). The good yield level of blackgram could not be achieved during kharif 2018 due to excessive rainfall at maturity stage which caused crop losses as a consequence of water logging. However, improved techniques recorded 40.50 per cent higher yield of improved techniques over the farmers practice (4.00 q/ha) in this season. On pooled basis, demonstration improved techniques showed 40.87 per cent improvement in the productivity level over farmers practice (5.75 q/ha). Sharma et al. (2019) also reported yield improvement in blackgram on farmer's fields due to variety Pant Urd-31 and improved techniques.

Chickpea Demonstration on chickpea improved variety GNG-1958 along with recommended agronomic practices resulted in higher yield advantage to the tribal farmers during both the years. As depicted in table-1, demonstrated technologies provided average yield of 19.78 and 20.88 q/ha which were 21.72 and 19.31 per cent higher over local farmers practice (16.25 & 17.50 q/ha) during rabi 2017-18 and rabi 2018-19; respectively. Two years pooled data shows that demonstrated technologies recorded mean yield of 20.33 q/ha which represents 20.52 per cent yield improvement over farmers practice (16.88 q/ha). Higher productivity of chickpea under demonstration in comparison to farmer's local practice could be ascribed mainly to the higher yielding capacity of improved variety GNG-1958 and recommended package of practices applied. The variety showed better branching, comparatively higher number of

Pods per plant, bold size grain and also found moderately resistance to wilt disease. Yield enhancement in chickpea crop through frontline demonstrations at different locations were also documented by Tiwari & Tripathi (2014), Sharma et al. (2015) and Sharma et al. (2020a) **Wheat** Demonstration on wheat variety Raj-4079 with improved agro-techniques resulted in improved productivity level during both the years. Farmers could be able to get above 10 per cent higher yield over local practice. Wheat yield of 48.51 and 48.44 q/ha were observed under demonstrated techniques which were 10.25 and 10.72 per cent higher

over farmers local practice yield (44.00 & 43.75 q/ha) during rabi 2017-18 and 2018-19 respectively. On an average, wheat productivity was enhanced to the extent of 10.49 per cent over farmers practice (43.88 q/ha). The improved productivity of wheat under demonstration could be mainly due to the use of improved variety Raj-4079 and use of optimum seed rates, proper use of recommended doses of NP fertilizers and bio-fertilizers inoculants application. Similar yield enhancement trends in wheat crop due to application of improved technologies were also reported by Sharma et al. (2020b).

Table 1: Yield performance of blackgram, chickpea and wheat under frontline demonstrations

Crop	Season & Year	Variety	No. of FLD	Area of FLD (ha)	Yield (q/ha)		% increase in yield over FP
					IP	FP	
Blackgram	Kharif 2017	Pant urd-31	25	10	10.58	7.50	41.07
	Kharif 2018	Pant urd-31	80	32	5.62	4.00	40.50
	Pooled			105	42	8.10	5.75
Chickpea	Rabi 2017-18	GNG-1958	40	16	19.78	16.25	21.72
	Rabi 2018-19	GNG-1958	52	20.8	20.88	17.50	19.31
	Pooled			92	36.8	20.33	16.88
Wheat	Rabi 2017-18	Raj-4079	52	20.8	48.51	44.00	10.25
	Rabi 2018-19	Raj-4079	52	20.8	48.44	43.75	10.72
	Pooled			104	41.6	48.48	43.88

IP= Improved practice FP= Farmers practice

Impact on profitability

Values of economic indicators i.e. gross cost of cultivation, gross returns, net returns and B:C ratio were estimated based on average prices of inputs and output commodities prevailed during each year of demonstrations, which are presented in table-2. Data clearly shows that application of recommended improved technologies enhanced the profitability of blackgram, chickpea and wheat cultivation on tribal farmer's fields during both the years of demonstration.

Blackgram: Gross cost of cultivation for blackgram under demonstrated technologies were estimated to be Rs. 19865 and Rs. 15601/ha against local check where gross cost were Rs.17030 and Rs. 13875/ha during kharif 2017 and kharif 2018; respectively. Farmers get higher net returns under demonstration

techniques in comparison to the farmers practice during both the years. However, higher net returns was fetched during kharif 2017 over kharif 2018 as the expected yield level could not be achieved during kharif 2018 due to excessive rainfall at maturity stage. Economic analysis reveals that farmers could be able to get additional returns of Rs. 9485 and Rs.5240/ha due to improved practices during kharif 2017 and 2018; respectively.

Chickpea: The cost of cultivation for chickpea were estimated to be Rs. 26760 and Rs.28698 /ha under demonstration techniques and Rs.24300 and Rs. 27670/ha under farmers practice during rabi 2017-18 and 2018-19; respectively. Higher net returns under demonstration techniques in comparison to the farmers practice were fetched during both the years. Based on two years average, improved

technologies fetched net returns of Rs. 64223/ha with B:C ratio of 3.32, higher in comparison to local practice (Rs.50765/ha, B:C ratio 2.97). Economic analysis further reveals that improved technologies provided average additional returns of Rs. 13458/ha.

Wheat: Gross cost of cultivation for wheat under demonstrated technologies worked out as Rs. 25557 and Rs.28530/ha with a mean value of Rs. 27044/ha while under local check these values were estimated as Rs. 25702 and Rs.28390/ha during rabi 2017-18 and 2018-19;

respectively. Wheat crop with improved variety also fetched higher net returns in comparison to the farmers practice during both the years. On two years average, demonstrated technologies fetched net returns of Rs. 59604/ha with B:C ratio of 3.21, higher in comparison to local practice (Rs.51374/ha, B:C ratio 2.91). Further, it was observed that improved technologies provided average additional returns of Rs. 8230/ha due to yield improvement.

Table 2: Economic indicators of blackgram, chickpea and wheat under frontline demonstrations

Season & Year	Gross Cost of cultivation (Rs./ha)		Gross Return (Rs./ha)		Net Returns (Rs./ha)		B:C ratio		Additional Returns due to IP
	IP	FP	IP	FP	IP	FP	IP	FP	
Blackgram									
<i>Kharif 2017</i>	19865	17030	42320	30000	22455	12970	2.13	1.76	9485
<i>Kharif 2018</i>	15601	13875	24166	17200	8565	3325	1.55	1.24	5240
Average	17733	15453	33243	23600	15510	8148	1.84	1.50	7363
Chickpea									
<i>Rabi 2017-18</i>	26760	24300	90032	74500	63272	50200	3.36	3.07	13072
<i>Rabi 2018-19</i>	28698	27670	93872	79000	65174	51330	3.27	2.86	13844
Average	27729	25985	91952	76750	64223	50765	3.32	2.97	13458
Wheat									
<i>Rabi 2017-18</i>	25557	25702	84165	76340	58608	50638	3.29	2.97	7970
<i>Rabi 2018-19</i>	28530	28390	89130	80500	60600	52110	3.12	2.84	8490
Average	27043.5	27046	86647.5	78420	59604	51374	3.21	2.91	8230

IP= Improved practice FP= Farmers practice

CONCLUSION

Frontline demonstrations conducted at tribal farmers' fields under TSP clearly indicates that productivity of blackgram, chickpea and wheat was enhanced substantially and farmers achieved higher profitability under improved practice of demonstration. Productivity of blackgram, chickpea and wheat enhanced to the extent of 40.87, 20.52 and 10.49 per cent; respectively over farmers practice. Due to application of improved technologies in blackgram, chickpea and wheat crops, tribal farmers could be able to get additional returns of Rs. 7363, Rs.13458 and Rs.8230/ha; respectively. The present study shows the need

of conducting such type of demonstrations for transfer of technologies suitable for improving the productivity and profitability on tribal farmer's fields to upliftment of their economic status.

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