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Impact of Front Line Demonstration on Productivity and Profitability of Rainfed Chickpea in Churu District of Rajasthan, India

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A B S T R A C T

KVK, Chandgothi, Churu (Rajasthan) conducted total 50 Front Line Demonstrations on chickpea at farmers field in Churu District (Rajasthan) during two consecutive *rabi* seasons from 2014-15 to 2015-16. The farming situation was rainfed and soil was sandy loam low in nitrogen, medium in phosphorus and medium to high in potash. Assessment of gap was done and on the basis of gap assessment, improved recommended technologies were demonstrated. On overall average basis, 16.03 per cent higher grain yield was recorded under demonstrations than the farmer's traditional practices (Local check). The extension gap, technology gap and technology index were 189 kg/ha, 779 kg/ha and 13.78 per cent, respectively. An additional investments of Rs 1100 per ha consist with scientific monitoring of demonstration and non–monetary factors resulted in additional return of Rs 6030 per ha. On two year average basis incremental benefit : cost ratio was found 5.66.

Introduction

Pulse or 'Daal' are an integral part of the average Indian meal. A large population of the Indian population is vegetarian and pulses form the main source of protein. The protein content in pulses is about 18-25 per cent. This makes pulses one of the cheapest sources of protein for human consumption (Dayanand *et al.*, 2014). Pulse is the second most important groups after cereals (Dash and Rautaray, 2017). Pulse crops are primarily grown under rainfed condition and a low fertility neglected soil in India.

It can be grown on a variety of soil and climatic conditions as it is tolerant to drought (Malik *et al.*, 2006). The per capita availability of pulses has declined from 60.55 g/day in 1951 to 41.64 g/day in 2012. The productivity of pulses is very low in India is 588 kg/ha, as compared to highest 2034 kg/ha in USA during 2016 (Anonymous, 2018).

Chickpea or Gram or Chana is botanically known as *Cicer arietinum* and it is most important and extensively grown *rabi* pulse crop. In Rajasthan state, the total area under chickpea cultivation is 15.72 lakh hectares with production of 16.88 lakh tonnes.

The average productivity of chickpea in Rajasthan is 1074 kg/ha. So far, as Churu district of Rajasthan is concerned total area under chickpea cultivation 1.07 lakh hectare with productivity of 383 kg/ha (Anonymous 2017-18), which is much lower than the potential.

At present the productivity of chickpea is not sufficient due to several biotic and abiotic stresses besides unavailability of quality seeds of improved varieties in time and poor crop management practices due to unawareness and non-adoption of recommended production and plant protection technologies. To enhance the productivity of chickpea, it is necessary to cultivate chickpea in scientific manner and brought the newly developed production technologies at farmer's field.

Therefore, Front Line Demonstration on chickpea at farmer's field may be helpful to establish the technology at farming community. The basic objective of this programme is to demonstrate improve proven technologies of recently released, short duration, high yielding disease resistant varieties in compact block with INM, IWM and IPM at farmer's field (Table 1) through Krishi Vigyan Kendras to enhanced adoption of modern technologies to generate yield data with farmers feedback.

Keeping this in view, KVK, Chandgothi, Churu conducted 50 demonstrations on chickpea crop at farmer's field during *rabi* 2014-15 to *rabi* 2015-16. The objectives of this study were as follows:

- To find out the performance of recognized and recommended high yielding variety of chickpea with full recommended package of practices.
- To compare the yield of FLD organized by KVK with local check (farmer's practices).
- To collect and consider the feedback information from farmers for further improvement in research.

Materials and Methods

KVK, Chandgothi, Churu conducted total 50 Front Line Demonstrations on chickpea varieties i.e. RSG 963 and GNG 1581 at 50 selected farmer's field in a compact block in Churu District (Rajasthan) during *rabi* 2014-15 and *rabi* 2015-16. The selection of villages was done on basis of non-adoption of improved and recommended varieties (RSG 963 and GNG 1581). After the selection of villages, most approachable side of farmer's field was selected, so that the performance of demonstrated technology can be seen by other farmers.

The farming situation was rainfed and soil was sandy loam low in nitrogen, medium in phosphorus and medium to high in potash. The area for demonstration was 0.4 ha each and were conducted by using recommended package of practices. The KVK provided high quality seed of chickpea varieties i.e. RSG 963 and GNG 1581 @ 60 kg/ha and other critical input like DAP, micro-nutrients, bio fertilizers, herbicide and pesticides were purchased by the farmers and used with the guidance of KVK during both the years. The sowing of crops was done in the months of October and harvested during first week of April. The scientist of KVK, Chandgothi, Churu regularly visited and monitored demonstrations on farmers fields from sowing to harvesting. The grain yield of demonstration and local check was recorded and analyzed. Other parameters as suggested by Verma *et al.*, (2014) were used for calculating gap analysis, cost and returns. The details of different parameters are as follows:

Extension gap = Demonstration yield (D_1) - Farmers practices yield (F_1)

Technology gap = Potential yield (P_1) - Demonstration yield (D_1)

$$\text{Technology index} = \frac{\text{Potential yield } (P_1) - \text{Demonstration yield } (D_1)}{\text{Potential yield } (P_1)} \times 100$$

Additional return =
Demonstration return (D_r) - Farmers practices return (F_r)

Effective gain =
Additional return (A_r) – Additional cost (D_c)

$$\text{Incremental B:C ratio} = \frac{\text{Additional return } (A_r)}{\text{Additional cost } (D_c)}$$

Results and Discussion

Grain Yield: The grain yield of chickpea under demonstration plot was ranged from 1368 kg/ha to 1374 kg/ha with an average (Year 2014-15 & 2015-16) of 1371 kg/ha, while, in farmer's local practices plot it ranged from 1160 kg/ha to 1204 kg/ha with an average (Year 2014-15 & 2015-16) of 1182 kg/ha (Table 3 & Fig. 2).

The grain yield was increased from 13.62 to 18.44 per cent over farmer's practices (local check) during both the years. On average basis, 16.03 per cent increase in yield was recorded under demonstrations plot as compared to farmer's local cultivation practices of chickpea. While it was 58.50 %, 69.47 %, 300.88 % and 15.99 % higher as compared to national, state, district and farmers practices yield, respectively (Table 2 & Fig. 1) while it was -36.23 % less as compared to potential yield.

Gap analysis

An extension gap between demonstrated technology and farmer's practices was ranged from 164 kg/ha to 214 kg/ha during both the year. On two year average basis, extension gap of total 50 demonstrations was observed 189 kg/ha (Table 3). Such big gap might be attributed to adoption of improved technology in demonstration which resulted in higher grain yield than the traditional farmer's practices. Wide technology gap of 626 to 932 kg/ha in yield was observed during the demonstration years.

Average technology gap of 50 demonstrations was 779 kg/ha. This less technology gap during all the years indicated more feasibility of recommended technologies during study periods. Lower technology gap showed (Table 3) that combination of improved varieties with recommended package of practices perform better than the potential yield of varieties. Similarly, the technology index for all the demonstrations during the study period were in accordance with technology gap. Technology index were ranged from 11.99 per cent to 15.57 per cent with an average of 13.78 per cent. Lower technology index reflected the adequate proven technology for transferring to farmers and sufficient extension services for transfer of technology.

Economics analysis

Improved variety seed, fertilizers, bio fertilizers, herbicides and pesticides were considered as cash inputs for the demonstrations as well as farmers practices.

On an average additional investment of Rs 1,100 per hectare was made under demonstration resulted in additional return of Rs 6,030 per hectare. Economics returns as a function of grain yield and selling price varied during both the years. The total return under demonstration plot was ranged from Rs 38,472 per hectare to Rs 50,616 per hectare with an average of Rs 44,544 per hectare. Higher return was obtained during year 2015-16 due to higher selling price. While, in farmer's practices plot total return ranged from 32,480 Rs per hectare to 44,548 Rs per hectare with an average of 38,514 Rs per hectare (Table 4). The higher effective gain of 4,930 Rs per hectare was obtained under demonstration. The higher additional returns and effective gain under demonstration could be due to improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring. The Incremental B:C ratio (IBCR) during both the years was found between 4.67 to 6.66.

On the average of two years, IBCR was found 5.66. Higher IBCR could be due to higher additional return with low additional cost in demonstration. The results confirm with the finding of front line demonstration on chickpea and clusterbean crops by Poonia and Pithia (2011), Dayanand *et al.*, (2014), Mishra and Khare (2017), Parmar *et al.*, (2017), Wadkar *et al.*, (2018), Ali and Singh (2020) and Bamboriya *et al.*, (2020).

Table.1 Comparison between technological intervention and local check and gap analysis under FLDs on chickpea

Sr. No.	Particulars	Technological Intervention (Demonstration Practices)	Farmers Practices (Local Check)	Technological Gap
1.	Farming Situation	Rainfed	Rainfed	No Gap
2.	Variety	Improved varieties i.e. RSG 963 and GNG 1581	Locally available	Full Gap (100 %)
3.	Seed Rate	60 kg/ha	50 kg/ha	10 kg less then recommendation
4.	Sowing dates	IInd week of October	Last week of October & Ist week of November	Full Gap (100 %)
5.	Seed inoculation	*Rhizobium* and PSB	No seed inoculation	Full Gap (100 %)
6.	Sowing Method	Line Sowing (30x10 cm)	Line sowing (30x10cm)	No Gap
7.	Fertilizer	10 kg N, 25 kg P_2O_5	No use of fertilizer	Full Gap (100 %)
8.	Micro-nutrients	Use of micro nutrients for balance fertilizer (75 gm/15 liters of water as foliar spray)	No use of Micronutrients	Full Gap (100 %)
9.	Weed Control	Herbicide application (Pendimethalin 30 EC @ 2 li./ha as PE)	Hand weeding at 25-30 DAS	No herbicide use Full Gap (100 %)
10.	Plant protection	Need based spray of Insecticides and fungicides	No spray	Full Gap (100 %)

Table.2 Comparison of yields of chickpea (Average of 2014-15 and 2015-16)

	National*	State**	District**	Potential	Demonstration	Farmers practices
Yield (kg/ha)	865	809	342	2150	1371	1182
% increased	58.50	69.47	300.88	-36.23	--	15.99

*Anonymous (2018) **Anonymous (2015-16)

Table.3 Grain yield and gap analysis and technology index of front line demonstration on chickpea at farmer's field

Year of demonstration	No. of Demo	Variety	Potential Yield (kg/ha)	Demo yield (kg/ha)	Farmers practices yield (kg/ha)	Increased over farmers practices (%)	Extension gap (kg/ha)	Technology gap (kg/ha)	Technology index (%)
***Rabi*, 2014-15**	25	RSG 963	2000	1374	1160	18.44	214	626	15.57
***Rabi*, 2015-16**	25	GNG 1581	2300	1368	1204	13.62	164	932	11.99
Average	--	--	**2150**	**1371**	**1182**	**15.99**	**189**	**779**	**13.78**

Table.4 Economics analysis of front line demonstration on chickpea at farmer's field

Year of demonstration	Cost of Cultivation (Rs/ha)		Additional cost in demo (Rs/ha)	Sale Price of grain (Rs/qt.)	Total return (Rs/ha)		Additional return in demo (Rs/ha)	Effective gain (Rs/ha)	Incremental B:C ratio (IBCR)
	Demo	Farmers practices			Demo	Farmers practices			
***Rabi*, 2014-15**	11800	10900	900	2800	38472	32480	5992	5092	6.66
***Rabi*, 2015-16**	20600	19300	1300	3700	50616	44548	6068	4768	4.67
Average	**16200**	**15100**	**1100**	**3250**	**44544**	**38514**	**6030**	**4930**	**5.66**

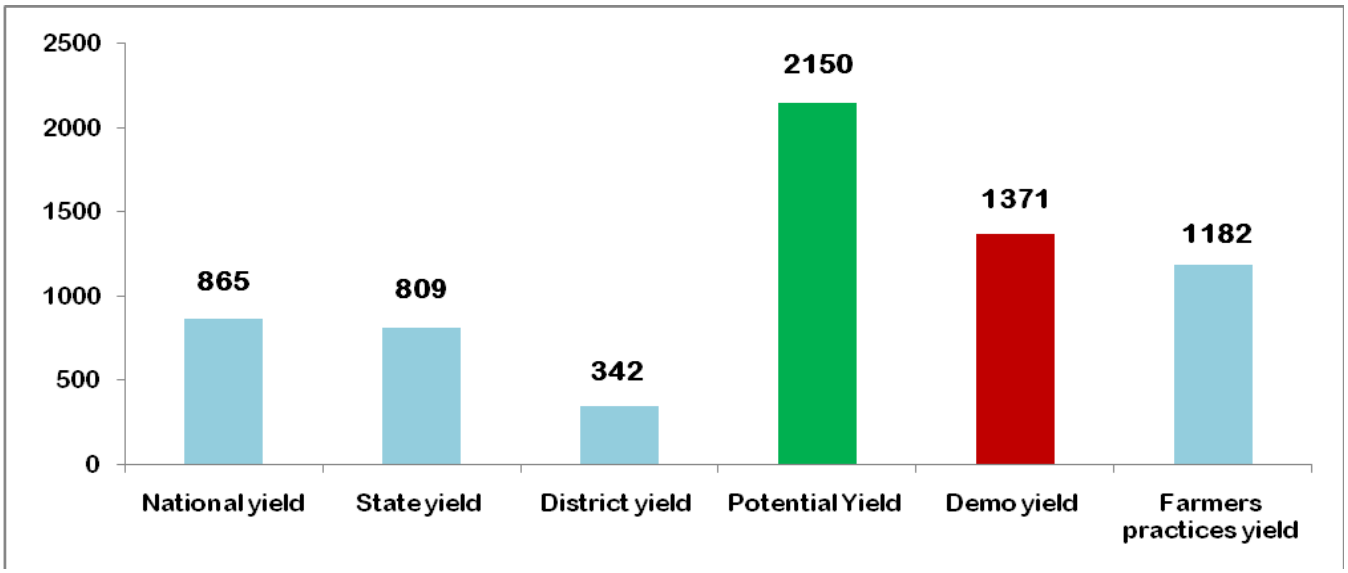

Fig.1 Comparison of chickpea yields kg/ha (Average of 2014–15 & 2015-16)

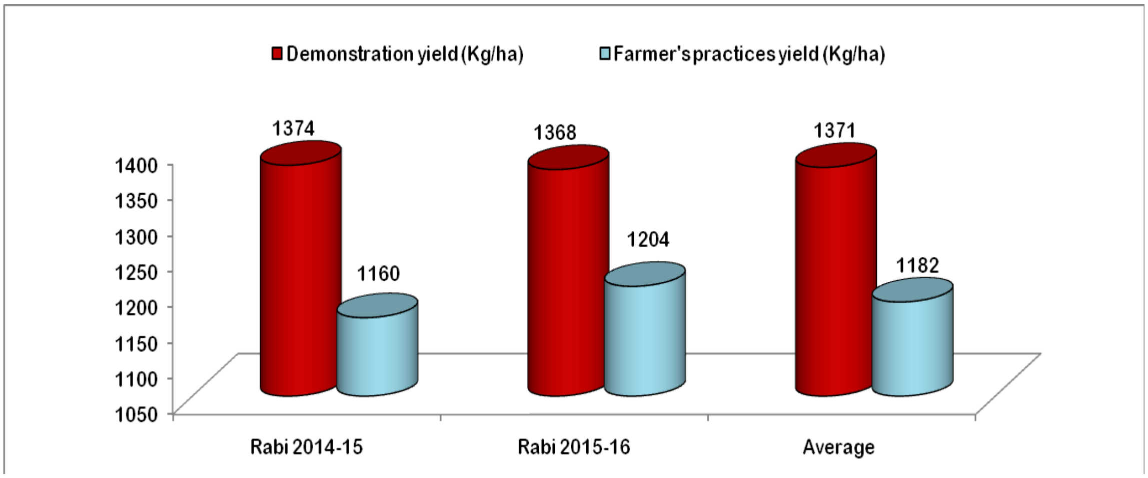

Fig.2 Grain yield of chickpea in demonstration and farmer's practices plot

On the basis of two years of Front Line Demonstration it can be concluded that by adopting recommended package of practices under demonstration can increased 15.99 per cent yield of chickpea over farmer's practices. The increase was recorded with little extra spending of Rs 1,100 per hectare. This amount is not big enough that even a small and marginal farmer can afford this. The adoption of improved technology not affected by the additional cost but the ignorance and unawareness is the primary reason and it is quite appropriate to call such yield gap as extension gap. Moreover, extension gap can be also be minimized by adopting such technology under FLD. The IBCR (5.66) is much high to motivate the farmers for adoption of technology.

Therefore, Front Line Demonstration of chickpea was found effective for farmers in changing mind sate, attitude, skill and knowledge of improved practices of chickpea cultivation including adaption. Farmers and scientist relationship also improved by this and built confidence between them. Demonstrated farmers is a good primary source of knowledge or information on improved practices of chickpea cultivation and also source of good quality seed in locality and surrounding area for next season. Front Line Demonstration helps in speedy and wider dissemination of the improved proven technology to the farming community.

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