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Original Research Article

Evaluation of Front Line Demonstration on Chick Pea (*Cicer arietinum L.*) in Sonbhadra District of U.P.

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A B S T R A C T

Chickpea (*Cicer arietinum* L.) is most important pulse crop in Bindhya region of Uttar Pradesh. Front line demonstrations were conducted at 190 farmers' fields under 30 ha in two block of Sonbharda district namely Ghorawal and Robertsganj of 10villages, to demonstrate production potential and economic benefits of improved technologies comprised viz., wilt tolerant and resistant varieties (GNG 1581 @ 90 Kg/ha plot, line sowing (45x20 cm), integrated nutrient management (20:60:20, NPK Kg/ha+Rhizobium+PSB @ 20g/Kg of seeds)+pheromone trap @ 04/plot.+ bird percher (T-shaped pegs) @ 10/plot.+ spray of 250 LE, HaNPV after 10 days of second spray +seed treatment with *T.viride* @ 5g/Kg seed+ Rhizobium+PSB @ 2.5 Kg/ha+ spraying of Neem Seed Kernel Extract (NSKE) @ 5% at 15-days interval from pod formation stage and weed removal (at 25-days after sowing).The demonstration were carried out at Sonbhadra district of Uttar Pradesh under Bindhya agro-climatic zone during Rabi season of four consecutive years in 2014-15 to 2017-18. The improved technologies gave higher yields and recorded a mean yield of 18.78q/ha which was 68.20 percent higher than that obtained with farmer's practices yields 11.16 q/ha. The improved technologies resulted higher mean net income of Rs.70406/ha with a cost benefit ratio of 2.08 as compared to farmer's practices Rs.41859/ ha.

Keywords

Chickpea, Pulses, technology gap, BC ratio, Extension gap

Introduction

Chickpea (*Cicer arietinum, L.*) is the premier pulse crop of India subcontinent. India is the largest chickpea producer as well as consumer in the world. India grows chickpea on About 7.11 million ha area producing 7.06 million tons which represents 37.00% and 42.74% of the national pulse acreage and production, respectively. Chickpea production has gone up from 3.65 to7.06 million tons between 1950-51 and 2015-16, registering a growth of 0.69% annually (AICRPC, 3). This plant holds a good repute in 'Ayurvedic' and 'Unani' system of medicine, and according to ayurvedic method of treatment and improve taste and appetite. Moreover the leaves are used to cure chronic bronchitis and the seeds are considered as antibilious, used as tonic, stimulant and aphrodisiac acid is also supposed to lower the blood cholesterol level (Duke *et al.*, 1981). The average productivity of pulses in the states Uttar Pradesh is about 974 kg/ha in 2017-18 (Pocket Book of Agricultural Statistics, 2018). A 100 g of chickpea seeds provide 360 calories more energy than any other legume except ground nut and lucerne.

The high nutritional value makes chickpea an important food particularly in famine prone areas of the world. Overall chickpea crop is best for health and income generation but the production of chickpea is decreasing day by day because farmers unaware of new technology. The major constraints responsible for lower yield potential are inappropriate production technologies viz., broadcast method of sowing, usage of wilt and pod borer susceptible local varieties, no use of fertilizer and untimely weed management at 45 DAS (Anon,2013). Genotypes may behave differently due to their plant architecture particularly because of poor plant growth under such situation plant population may play an important role in improving the productivity of crop (Kumar *et al.,* 2003). Frontline demonstration programme was effective in changing attitude, skill and knowledge of improved practices of HYV of urd including adoption this also improved the relationship between farmers and scientist and built confidence between them (Kirar *et al.,* 2006). On the other hand, in partial and full adoption condition 17.50 and 7.50 per cent farmers increased in adopter condition over non adopter condition respectively (Verma 2013). The reasons of low productivity of chickpea in Sonbhadra district are lack of suitable varieties (seed replacement rate of the district in rabi season is only 12%), lack of irrigation facilities (only 25% in rabi season), low fertilizer consumption (49 kg NPK/ha), poor agronomic management (broadcasting method of sowing, higher seed rate and delayed in sowing) and poor plant protection measures are responsible for the low productivity of chickpea. (Singh and Bajpai 1996) reported that fertilizer and plant protection are most critical inputs for increasing seed yield of chickpea. Hence, an effort made by the KVK scientists by introducing the recommended technologies of chickpea production with HYV GNG 1581 through front line demonstration on farmers field during rabi season of 2014-15 to 2017-18.

Materials and Methods

The present study was carried out by the Krishi Vigyan Kendra, Sonbhadra Achrya Narendra Deva University of Agriculture & Technology, Ayodhya (U.P.) during rabi season of 2014-15 to 2017-18 four consecutive years in the farmer's field in two block Ghorawal and Robertsganj of 10 adopted villages viz., Silhata, Pagia, Bari, Obradeeh, Banjaria, Pithori, Gourahi, Ailahi, Papi, Ghuwani and Manapur of Sonbhadra district. The soil was red, black with shallow depth and rocky nature located in undulated terrain is another problem of the district. Each demonstration was conducted in an area of 0.4 ha and 0.4 ha area adjacent to the demonstration plot as farmer's practices i.e. prevailing cultivation practices served as local check. All 190 front line demonstrations in 40 ha area were conducted in different villages. The improved technologies package included chickpea wilt resistant varieties, line sowing, integrated nutrient management and timely weed removal. The variety of chickpea GNG 1581 the spacing was at 45x20cm on date of sowing 20 Oct – 30 Oct in all years with a seed rate of 90 kg/ha. Farm manure @ 10 ton/ha and entire dose of Nirogen and Phashphorus through di-ammonium phosphate, and potash through muriate of potash @ 20:40:25 kg/ha, respectively was applied before sowing as basal. The seeds were treated with *Trichoderma viride* @ 5g/kg seed them inoculated by Rhizobium and Phosphosolubilizing bacteria bio-fertilizers each 20g/kg of seeds+pheromone trap @ 04/plot.+ bird percher (Tshaped pegs) @ 10/plot.+ spray of 250 LE, HaNPV after 10-days of second spray, spraying of Neem Seed Kernel Extract (NSKE) @ 5% at 15-days interval from pod formation stage. Hand weeding was done once at 25-days after of sowing. The crop was harvested during 20 March to 30 March. Seed treatment with *Trichoderma viride* 5gm/ Kg seed for seed and soil born diseases, –INM- Farm manure @ 10 ton/ha, fertilizers (N: P: K) 20:40:25 Kg/ha. Seed treatment with Rhizobium and PSBculture with @20 gm/Kg seed each – Adoption of IPM. For pod borer-The improved technologies package included-pheromone trap @ 04/plot.+ bird percher (T-shaped pegs) @ 10/plot.+ spray of 250 LE, HaNPV after 10 days of second spray, spraying of Neem Seed Kernel Extract (NSKE) @ 5% at 15-days interval from pod formation stage. Due to climatic conditions, no pest infestation was observed over the year. Before harvesting final plant height (cm) was recorded. The crop was harvested at maturity stage. From front line demonstration plots and farmers practice plot (control plot) and finally extension gap, technology gap, and technology index were calculated as given as formula suggested by Samui *et al.*, (2000) [8] and Dayanand *et al.*, (2012) [9] as given below.

% increase over farmers practices = Improved practices – Farmers practices / farmers practices x 100

Technology gap = Potential yield – Demonstration yield

Extension gap = Demonstration yield – farmers yield

Technology index = [(Potential yield – Demonstration yield) /Potential yield] x 100

The data of adoption and horizontal spread of technologies were collected from the farmers with the interaction them. Data were subjected to suitable statistical methods. The following formulae were used to assess the impact on different parameters of chick pea crop. Impact of yield = Yield of demonstration plot- yield of control plot/Yield of control plot X 100

Impact on adoption (% change) = No. of adopters after demonstration- No. of adopters before demonstration /No. of adopters before demonstration X 100

Impact on horizontal Spread (% change) = After area (ha) - Before area (ha)

Results and Discussion

The perusal of data (Table 2) indicate that due to front line demonstration on chick pea average yield from 2014 to 2018 18.78 q/ ha in demonstration plots and from 11.16 q/ ha in farmer's practice plot in four years of demonstration. This results clearly indicated that the higher average yield in demonstration plots over the years compare to farmers practice due to knowledge and adoption of full package of practices i.e. use of FYM, recommended dose of fertilizers, line sowing, mulching, pheromone traps and timely application of plant protection. The average yield of chick pea is increased by 68.20 percent. The yield of chick pea could be increased over the yield obtained under farmers practices (lack of knowledge on use of no use of the balanced dose of fertilizer, no plant protection) of chick pea cultivation. The above findings are in similarity with the findings of (Singh *et al.*, 2011). Extension gap on an average extension gap under four year FLD programme was 7.67 q/ha. This emphasized the need to educate the farmers through various techniques for the adoption of improved agricultural production technologies to reverse this trend of wide extension gap. The technology gap, the differences between potential yield and yield of demonstration plots was average 3.23 q /ha respectively. This may be due to the soil fertility, managerial skills of individual farmer's and climatic condition of the area. The technology index shows the feasibility of the demonstrated technology at the farmer's field. The technology index 14.66 (Table 3), which shows the effectiveness of technical interventions. This accelerates the adoption of demonstrated technical interventions to increase the yield performance of chick pea.

Table.1 Differences between technological intervention and farmers practices under front line demonstration on chickpea

S. No.	Component	Technological intervention	Farmers practice	Gap
1.	Land preparation	Three ploughing	Three ploughing	Nil
2.	Variety	GNG 1581	Old mix variety	Full
3.	Seed rate	90 kg/ha	100-120 kg/ha	Higher seed rate
4.	Seed treatment	*Trichoderma viride* 5gm/ Kg seed	No seed treatment	Full
5.	Seed inoculation	Rhizobium and PSB culture with @20 gm/Kg seed	No seed inoculation	Full
6.	Sowing method	Line Sowing	Line Sowing	Nil
7.	Spacing	Row to row 45 cm and plant to plant 20 cm	Row to row 30 cm and plant to plant 15 cm	Partial
8.	Farm manure	5 t/ha.	No. farm manure	Full
9.	Fertilizer dose	FYM 5t/ha,20:40:25 Kg/ha (NPK)	No use	Full
10.	Weed management	Two mechanical weeding	No. weeding	Full
11.	Irrigation	One irrigations at pre flowering and	No	Full
12.	Plant protection	pheromone trap @ 04/plot.+ bird percher (T-shaped pegs) @ 10/plot.+ spray of 250 LE, HaNPV after 10 days of second spray, spraying of Neem Seed Kernel Extract (NSKE) @ 5% at 15-days interval from pod formation stage.	• Application of insecticide Partial with out knowledge • Use of incorrect dose	Partial

Table.2 Influence of stand-establishment method and variety on yield attributes and yields of rice

Year	Total Farmers	Total Area ha	Plant Height (cm)		Straw Yield q/ha.		Grain yield (q/ha)		Harvest index (%)	
			FLD	FP	FLD	FP	FLD	FP	FLD	FP
2014-15	50	12.00	36.9	30.2	22.40	15.10	17.25	10.10	44	40
2015-16	55	8.00	41.2	29.8	23.90	16.80	18.20	11.90	43	41
2016-17	60	14.00	45.7	35.2	22.10	17.90	19.40	12.25	47	41
2017-18	75	8.00	42.9	34.6	23.60	18.20	20.25	10.40	46	36
Mean	**190**	**30.00**	**41.7**	**32.45**	**23.00**	**17.00**	**18.78**	**11.16**	**45**	**40**

Table.3 Yield and gap analysis of FLD on Chickpea at farmers field

Year	Potential grain yield (q/ha)	Grain Yield (q/ha)		% increase over FP	Extension gap (q/ha)	Technology gap (q/ha)	Technology index
		FLD	FP				
2014-15	22	17.25	10.10	70.79	7.15	4.75	21.59
2015-16	22	18.20	11.90	52.94	6.30	3.80	17.27
2016-17	22	19.40	12.25	58.37	7.15	2.60	11.82
2017-18	22	20.25	10.40	94.71	9.85	1.75	7.95
Mean	**22**	**18.78**	**11.16**	68.20	**7.61**	**3.23**	**14.66**

Table.4 Economic analysis of front line demonstrations Chickpea at farmers field

Year	Potential grain yield (q/ha)	Cost of cash input		Additional cost in demonstrations (Rs./ha)	Sale price of grain (MSP) (Rs./qt)	Grain Yield (q/ha)		Total returns Rs. (ha		Extra returns	Incremental Benefit : Cost ratio
		FLD	FP			FLD	FP	FLD	FP		
2014-15	23	32400	29100	3300	3175	17.25	10.10	54769	32068	22701	1.69
2015-16	23	33910	30500	3410	3425	18.20	11.90	62335	40758	21578	1.84
2016-17	24	34100	31900	2200	4000	19.40	12.25	77600	49000	28600	2.28
2017-18	24	35000	32150	2850	4400	20.25	10.40	89100	45760	43340	2.55
Mean	**23.5**	33853	30913	2940	3750	**18.78**	**11.16**	70406	41859	28547	2.08

Table.5 Impact of Front Line Demonstration (FLDs) on adoption of Chick pea production technology

Crop operation	Numbers of adopters Impact		Change in No. of adopter	(% Change) After demonstration
	Before demonstration	After demonstration		
Land preparation	125	268	143	114.40
Variety	145	255	110	75.86
Seed rate	59	215	156	264.41
Seed treatment	56	296	240	428.57
Seed inoculation	67	254	187	279.10
Sowing method	73	310	237	324.66
Spacing	72	290	218	302.78
Farm manure	89	340	251	282.02
Fertilizer dose	101	327	226	223.76
Weed management	46	215	169	367.39
Irrigation	23	302	279	1213.043
Plant protection	81	329	248	306.1728

The economic viability of improved demonstrated technology over farmers practice was calculated depending on prevailing price of inputs and outputs cost and represented in the term of B:C ratio (Table 4). It was found that the cost of production of chick pea under demonstration with an average Rs. Rs. 28547 under control. The additional cost increased in demonstration was mainly due to more cost involved in balanced fertilizer, procurement of improved seed and ICM practices. The cultivation of chick pea under improved technologies gave average net return of Rs. 70406/ha which was lower 41859 in farmer's practices. The benefit cost ratio of chick pea with an average of 2.08 in demonstration plots. This may be due to higher yield obtained and lower cost of cultivation under improved technologies compared to farmers practice.

The result of improved technology intervention brought out that adoption of recommended new variety of pigeon pea by farmers before demonstration was negligible, which increased by 348.51% after demonstration. New variety was increased by 75.86 % due to intervention through FLD. The overall adoption level of pigeon pea production technology was increased by about 348.51 percent (Table 5).

The FLD produced a significant positive result and provided an opportunity to demonstrate the productivity potential and profitability of the latest technology (intervention) under real farming situation.

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