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Original Research Article

Impact of Front Line Demonstration on Yield and Profitability of Chickpea (*Cicer arietinum*) in Eastern Uttar Pradesh

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A B S T R A C T

Chickpea is an important pulse crop grown and consumed all over the world, especially in the Afro Asian countries. Front line demonstrations were conducted at 56 farmers' fields under 22.80 ha in 4 villages, to demonstrate production potential and economic benefits of improved technologies comprised viz., wilt tolerant and resistant varieties (Pant G 186 and Pusa 256 @ 90 Kg/ha plot, line sowing (30x10 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). There was a wide yield gap between the potential and demonstration yields in both the pulse crops due to technology and extension gaps. The result reveals the increases yield of demonstrated plots that was 46.30 percent as compared to existing farming practices for chickpea, respectively due to adoption of improved package of practices.

Keywords

Chickpea, Frontline demonstrations, pulses, Technology gap, BC ratio and extension gap

Introduction

Pulses are good source of protein and commonly called the poor man's meat (Reddy *et al.*, 2007). The chickpea (*Cicer arietinum* L.) is a legume (a type of pulse) of the family Fabaceae. It is also known as gram and sometimes known as Egyptian or Kabuli chana particularly in northern India. India is the major chikpea producing country and contributing for over 75% of total world chickpea production. In the production process, pulses improve soil fertility through biological nitrogen fixation, requires less water than cereals, and their rotation with cereals help in controlling diseases and pests. It is also one of the major pulse crops cultivated and consumed in India and also known as Bengal gram. Chickpea accounts for about 45% of total pulses production.

This plant holds a good repute in 'Ayurvedic' and 'Unani' system of medicine, and according to ayurvedic method of treatment, chickpea leaves are sour, astringent to bowels, and improve taste and appetite. India is the largest producer in the world, with 26 per cent share in the global production by producing 25.23 million tons of pulses from an area of 29.99 million hectares. The average productivity of country is about 841 kg/ha against the average global productivity of 1023 kg/ha (DES, 2018). The average productivity of pulses in the states Uttar Pradesh is about 974 kg/ha in 2017-18 (Pocket Book of Agricultural Statistics, 2018).It is a good source of protein (18-22 %), carbohydrate (52-70 %), fat (4-10%), minerals (calcium, phosphorus, iron) and vitamins (Singh *et al.,* 2014). It is an excellent animal feed. Its straw also had good forage value. 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). Yield gap among all zone is largest in the Northeast Zone (148%) can be filled by farmers adoption of the recommended package of practices.

Frontline demonstration programme was effective in changing attitude, skill and knowledge of improved practices of urd including adoption this also improved the relationship between farmers and scientist and built confidence between them. Kirar *et al.,* (2004) reported that on partial and full adoption condition 17.50 and 7.50 per cent farmers increased in adopter condition over non adopter condition respectively. Verma (2013) shows the distribution of beneficiaries according to their change of area after conducting the FLD on their field. Unfortunately use of local varieties and poor nutrient management results in very low yield.

Materials and Methods

The present study was carried out in Rabi seasons on the farmers fields of 5-villages of Sohaon, Balliaby the Krishi Vigyan Kendra, Achrya Narendra Deva University of Agriculture & Technology, Ayodhya (U.P.) during 2014-15, 2015-16, 2016-17 and 2017-18 in The soil was sandy clay-loam in texture with moderate water holding capacity, low in organic carbon, low in available nitrogen, low to medium in available phosphorus and also low in available potassium. 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. Prevailing cultivation practices served as local check. All 56 front line demonstrations in 22.80 ha area were conducted in 4 different villages. The improved technologies package included chickpea wilt resistant varieties, line sowing, integrated nutrient management and timely weed removal. The variety of chickpea (FLD 2013-14 and 2014-15) Pant G 186 it was developed at G.B. pant University of Agriculture and Technology, Pantnagar. It was matures in 125 days and yield potential is 22-25 q/ha and FLD 2015-16, 2016-17 and 2017-18 variety of chickpea Pusa 256 it matures in 140-145 days, grain are bold and brown in color, this variety is equally suitable for timely and late sown, it is resistant to Ascochyta blight, yield potential is 22-25 q/ha. were included in demonstrations. The spacing was at 30x10cm on date of sowing 20 Oct – 30 Oct in 2013-14, 15-22 Oct in 2014-15, 19-28 Oct in 2015-16, 22-28 Oct 2016-17, 16-23 Oct in 2017-18 with a seed rate of 90 kg/ha. Farm manure @ 5 ton/ha and entire dose of Nitrozen 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 @ 5 ton/ha, fertilizers (N: P: K) 20:40:25 Kg/ha. Seed treatment with Rhizobium and PSB culture 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. At harvesting five random samples of one meter square area from each demonstration field were harvested and composite sample was weighed for total biological yield. The gross returns, cost of cultivation, net returns and benefit cost ratio (B:C ratio) were calculated by using prevailing prices of inputs and outputs and finally the extension gap, technology gap and technology index were worked out. Technology gap, extension gap and technology index were as per methods of (Samui *et al.,* 2000 and Sagar *et al.*, 2004).

1.Harvest index= Grain yield/ Biological Yield x100

2.Technology gap = Potential yield – Demonstration yield

3.Extension gap = Demonstration yield – farmers yield

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

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

6.Per cent increase yield=Demonstration yield-Farmer practice yieldx100/Farmer practice yield

Results and Discussion

Performance of chickpea during the years from 2014 to 2017 in different villages of Ballia district. From the results of 57 front line demonstrations, it is clear that plant height recorded an average of 44.6 cm. Straw yield recorded an average of 23.13 q/ha against an average of 17.20 q/ha in farmer practice. Grain yield in chickpea recorded an average of 17.02 q/ha against a potential yield of 23.5 q/ha. farmer practice recorded an average yield of only 11.67 q/ha. There was a difference between harvest index (%) of chickpea and farmer practice were recording a harvest index of ranges from 41 to 44 in demonstrated and 40 to 41 in farmer practice (Table 1) clearly demonstrates the superiority over local check, respectively.

Data pertaining to total grain yield, yield gaps, technological gap, extension gap and technology index (%) is presented in Table 2. Demonstration yield was recorded (17.02 q/ha) increase of 46.30% over farmer practice (FP), where the grain yield harvested was only 11.67 q/ha. Technological gap, which is the difference between potential and demonstration yield was (5.35 q/ha) respectively. The findings confirm with the findings of (Narwale *et al.*, 2009 and Purushottam Singh *et al.*,) they were reported that the more yield under FLD plots as compared to farmers (control plot) in the different study.

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	Pant G 186 & Pusa 256	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	10 t/ha.	No. farm manure	
9.	Fertilizer dose	20:40:25 Kg/ha (NPK)	No use	Full
10.	Weed management	Two mechanical weeding	No. weeding	Full
11.	Irrigation	Two irrigations at pre flowering and One irrigation Partial pod development stage	One irrigation	Partial
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.	1- Application of insecticide Partial without knowledge 2- 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	8	3.20	40.1	32.2	21.30	17.5	16.53	12.14	56	56
2015-16	7	2.80	44.2	29.7	22.40	16.9	16.20	11.19	58	58
2016-17	25	10.00	47.2	34.6	23.20	15.6	16.34	10.26	63	63
2017-18	25	10.00	46.9	33.1	25.60	18.8	19.00	13.10	60	60
Mean	**57**	**22.80**	**44.6**	**32.4**	**23.13**	**17.2**	**17.02**	**11.67**	**59**	**59**

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	23	16.53	12.14	36.16	4.39	6.47	28.13
2015-16	23	16.20	11.19	44.77	5.01	6.80	29.57
2016-17	24	16.34	10.26	59.25	6.08	7.66	31.92
2017-18	24	19.00	13.10	45.03	5.90	5.00	20.83
Mean	**23.5**	**17.02**	**11.67**	**46.30**	**5.35**	**6.48**	**27.59**

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	30000	28000	2000	3175	16.53	12.14	52483	38545	13938	1.75
2015-16	23	31190	29100	2090	3425	16.20	11.19	55485	38326	17159	1.78
2016-17	24	32269	30150	2119	4000	16.34	10.26	65360	41040	24320	2.03
2017-18	24	34400	31600	2800	4400	19.00	13.10	83600	57640	25960	2.43
Mean	**23.5**	31965	29713	2252	3750	**17.02**	**11.67**	63816	43772	20044	2.00

However, overall average technological gap in the district was 6.48 q/ha. Similarly, extension gap of 5.35 q/ha was recorded. Extension gap indicates that there is a tremendous scope of extension activities in the region. Mass awareness through print media (folder, leaflets and handbills) is the need of the hour. Package of practices for the chickpea crop as need to be followed strictly particularly seed rate, optimum application of nutrients and other management practices. The recommended packages of practices will increase the yield and subsequently reduce the extension gap. Technology index shows the feasibility of evolved technology at the farmer's field and lower the value of technology more is the feasibility of the technology (Jeengar *et al.*, 2006). Technology index in the present average 27.59%. Table 3 gives the economics of growing Pant G 186 and Pusa 256 in the region. The data clearly indicates the advantage of growing released variety over local check. The findings confirm with the findings of (Yadav *et al.*, 2007) they were found that the improved practices gives higher yield than the local chack under pulses crops.

Since grain yield as well as straw yield is more in the variety used under front line demonstrations, therefore naturally income generated is also more. Total gross income from both grain and straw is Rs.63186/- hectare as against only Rs. 43772/- in the farmer practice. Net income obtained under FLD was only Rs.20044/- per hectare, respectively (Table 4). The findings confirm with the findings of (Chandra *et al.*, 2018, Mahadik *et al.*, 2016, Meena *et al.*, 2012, Rathore *et al.*, 2016 and Sreelakshmi *et al.*, 2012) they reported in frontline demonstration farmers have more benefit as compared to existing practices in pulses crops like gram, moong, pigeon pea and cluster bean crops in different areas.

References

1. Anon (2013). Report of Agricultural statistics Division, Directorate of Economics & Statistics, Department of Agricultural & Cooperation, Fourth Advance Estimation of Production of Food grain and Oil seed production and other commercial crops for 2012-13. pp 1-2.
2. Chandra S, Singh P, Lakhera JP. Factors associated with economic motivation of legume growers in desert area of Rajasthan. Journal of Food Legumes. 2012; 25(4):326-329.
3. DES. Directorate of Economics and Statistics, Department of Agriculture Cooperation and Welfare, Ministry of Agriculture, Government of India, New Delhi, 2018.
4. Jeengar KL. Panwar P, Pareek OP. Front Line Demonstration on Maize in Bhilwara district of Rajasthan. Current Agriculture 2006; 30(1-2):115-116.
5. Kirar, B.S.; Mahajan, S.K. and Nashine, R. (2004). Impact of technology practices on the productivity of soybean in FLD. Ind. Res. J. Ext. Edu. 5(1):15-17.
6. Mahadik RP, Talathi MS. Impact of frontline demonstrations organized by Krishi Vigyan Kendra, Roha. Indian Journal of Extension Education and Rural Development. 2016; 24: 162-165.
7. Meena ML, Dudi A. On farm testing of chickpea (*Cicer arietinum* L.) cultivation for site specific assessment under rainfed condition of western Rajasthan. Indian Journal of Extension Education, 2012; 48 (3-4): 93-97.
8. Narwale SS, Pawar AD, Lambade BM, Ugle NS. Yield maximization of chickpea through INM applied to sorghum-chickpea cropping sequence under irrigated condition. Legumes

Research. 2009; (4): 282-285.

9. Pocket Book of Agricultural Statistics. Government of India, Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation and Farmers Welfare, Directorate of Economics and Statistics, New Delhi, 2018.
10. Purushottam Singh SK, Chaudhary RN, Kumar K, Praharaj CS, Krishana B. Assessment of technological inputs for major pulses in Bundelkhan region. Journal of Food Legumes. 2012; 25(1): 61-65.
11. Rathore RS, Solanki RL and Sisodia SS. Impact of frontline demonstrations on cluster bean production in farmers' field. Indian Journal of Extension Education and Rural Development. 2016; 24:52-54
12. Reddy, A. A., V. C. Mature, M. Yadav and S. S. Yadav (2007). Profitablity in chickpea cultivation. Pages 292-321. In: The Chickpea Breeding and Management (Yadav, S. S., B. Redden, W. Chen and B. Sharma eds). Wallingford, Oxon. UK: CAB International.
13. Sagar R.L. and Chandra G. (2004) Indian J. Of Extension Education, XXXX (3&4), 96-97.
14. Samui S.K., Maitra S., Roy K., Mondal A.K. and Saha D. (2000) J. Of Indian Society of Costal Agriculture Research, 18(2), 180- 183.
15. Singh, D.,Patel, A.K., Baghel, S.K., Singh, M.S., Singh, A. and Singh, A.K. (2014). Impact of front line demonstration on the yield and economics of chickpea (*Cicer arietinum* L.) in Sidhi district of Madhya Pradesh. J. Agric. Res., 1(1): 22-25.
16. Sreelakshmi, CH, Sameer Kumar CV and Shivani D. Productivity enhancement of pigeon pea (*Cajanus cajan* L.) through improved production technology. Madras Agricultural Journal. 2012; 99 (4-6): 248-250.
17. Verma, Deependra Prakash (2013). A study on impact of Front Line Demonstrations on pulses by Krishi Vigyan Kendra, Panna M.P. M.Sc. (Ag.) Thesis Submitted to Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur.
18. Yadav VPS, Kuma R, Vashishtha AK, Bhela SL. Boosting the pulse production technology through frontline demonstrations. Indian Research Journal, of Extension Education. 2007; 7(2-3): 12-15.