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Assessment of Technology Gap and Productivity Gain through Improved Technology Demonstration in Chickpea

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A B S T R A C T

This study was undertaken in Krishi Vigyan Kendra, Balagaht (M.P.) during the period from 2014-15 to 2017-18 conducted a total 48 frontline demonstration of Chickpea crop. Cultivation practices comprised under FLD *viz.* use of improve variety (JG -14, JG-130), seed treatment, seed inoculation, spacing 30 cm, soil test based nutrient management, irrigation water management and integrated pest management show that percentage increase in the yield of Chick pea ranged from 22.73 % to 46.11 % over farmer's practice. The highest seed yield 16.80 q ha^{-1} was recorded in the year 2016-17 in FLD, which was 22.73% more over the farmer's practice (13.20 q ha^{-1}). The additional cost Rs. 2650 to Rs. 3740 gave additional net return, it was ranged from Rs. 9460 to Rs. 14544 per hectare. The increased benefit: Cost ratio was also calculated, it was ranged from 1:2.46 to 1:3.41 in demonstration &1:2.11 to 1:3.38 in farmers practice.

Introduction

Chickpea (*Cicer arietinum* L.) is the premier pulse crop of India. India is the largest producer of chickpea accounting to 75 per cent of world production. Madhya Pradesh shares 36 per cent of the country's area under chickpea. However, the average productivity in the state is low (1105 kg/ha). This is not because of the unavailability of improved varieties but lack of adoption of improved production technologies. India produces 98.80 lakh ton chickpea in area of 99.27 lakh ha. and given average productivity 995 kg/ha. Madhya Pradesh produces 17.30 lakh ton chickpea in area of 34.46 lakh ha. and district Balaghat produce 58.86 tons chickpea in area of 41.10 ha. and given average productivity 1432 kg/ha (http://mpkrishi.mp.gov.in, 2016-17). The frontline demonstration programme (FLD's) in pulses is a noble initiative by Ministry of Agriculture, Govt. of India, which is conducted under close supervision of the scientists.

The main objective of FLD's in pulses is to demonstrate and popularize the improved agro-technology on farmers' fields under varied existing farming situations for effective transfer of generated technology and fill the gap between improved technology and adopted/ indigenous technology to enhance the pulse productivity and farm gains through pulses intensification and diversification for sustaining the production systems. Keeping in view the importance of pulses in food security

and being vital component of our farming systems, KVKs to bring in enhanced application of modern technologies to generate yield data and collection of farmer's feedback. Keeping this in view, front line demonstrations of chickpea were conducted, to exhibit the performance of recognized and recommended high yielding chickpea varieties with Full recommended package of practices for harvesting higher crop yields and compare the yield levels of local check (farmers' field) and FLD fields.

Materials and Methods

The present study was carried out by the Krishi Vigyan Kendra, Balaghat (M.P.) during *Rabi* season from the year 2014-15, 2015-16, 2016-17 and 2017-18 in farmer's field of 5 adopted villages *viz*. Amlajeeri, Badgaon, Bagdmara, Kosate and Amgaon. The total number of farmers under this programme was 48. The total area in 4 years was 20 hectare for demonstration of recommended improve practices of Chick pea. Data were collected with the help of personal contact and observations on yield data was also recorded at the time of separate threshing. The yield of each demonstration was recorded in appropriate manner and the yield of farmer's practices was also recorded at the same time.

The results on farmers practice were compared with recommended practice (Improved variety JG – 14, JG-130) under demonstrations. Package of practices as developed for the region were strictly followed. Recommended seed rate i.e.75 kg /ha against existing farmers practice of using 100 kg/ha (local check) was broadcasting method The seeds were treated with *Trichoderma*or carboxin + thiram, then seeds were inoculated by *Rhizobium* and Phospho-solubilizing bacteria biofertilizers each 100 ml or 200 g/ 30 Kg seeds. The Pheromone trap @ 10 No/ha and bird purchers @ 50 No/ha were fixed after 20 days of sowing. As per soil test value, nutrients i.e. N.P.K in the ratio of 20: 60: 20 kg /ha applied through DAP, MOP and urea. Total amount of P and S and half of N was applied as basal dose and the remaining 50% of N was top dressed in two equal splits at 30 and 45 days after sowing. In control group (local check) farmers were apply of DAP fertilizers in chickpea crop. Technological gap, extension gap and technology index were calculated using following equations Kumar R (2014).

Technology gap = Potential yield- demonstration yield

Extension gap = Demonstration yield - farmer's yield

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

Effective gain = Additional return - Additional cost

Additional return = Dem. return - Farmers practice return

$$\text{Incremental B: C ratio} = \frac{\text{Gross Return}}{\text{Gross Cost}}$$

Results and Discussion

The findings of the present study as well as relevant discussion have been presented as under:

Total 48 frontline demonstrations were conducted at farmer's field in their farming situation. Indicated the factor considered for selection of critical input under FLD. There was partial gap in adoption of recommended practices over farmer's practices with regards to improved varieties, seed rate, fertilizers and plant protection measures. Whereas completed gap was renowned for variety, seed treatment, seed inoculation and spacing (Table 1).

Table.1 Adoption gap of recommended chick pea production technology and percentage of farmers of non-adoption recommended practices

S.N.	Items	Existing practices	Recommended practices	Gap in adoption	% of farmers	Farmers prioritization for critical input
1.	Variety	Old variety, Cheni	JG-130, JG-14	Partial	90	II
2.	Seed rate	100 Kg ha-1	75 Kg ha-1	Partial	80	V
3.	Seed treatment	No use of fungicide	Seed treatment with carboxin + thiram @ 3 gm / Trichoderma @ 5gm/ Kg seed	Full	85	III
4.	Seed inoculation	No use of culture	Seed inoculation with Rhizobium & PSB @ 200gm or 100 ml each for 30 kg seed	Full	85	IV
5.	Spacing	20 cm	30 cm	Full	90	VIII
6.	Fertilizers	50 kg DAP ha-1	20:60:20 Kg ha-1 N:P:K (As per STV)	Partial	75	I
7.	Irrigation	One pre sown &one irrigation before flowering	One pre sown & one irrigation before flowering second during pod formation	Partial	80	VI
8.	Plant Protection	Improper use of insecticide	Application of IPM module –Pheromone trap, Bird purcher and Need based application of insecticide	Partial	90	VII

Table.2 Grain yield and gap analysis of front line demonstrations on chickpea at farmer's field

Year	Area (ha)	No. of Demo	Variety/ Technology	Potential Yield (q/ha)	Yield q/ha		% increase	Extension gap q/ha	Technology gap q/ha	Technology index%
					Demo	FP				
2014-15	5	12	JG-14	19.00	14.96	10.36	44.40	4.60	4.04	21.26
2015-16	5	12	JG-14	19.00	15.86	10.84	46.31	5.02	3.14	16.53
2016-17	5	12	JG-14	19.00	16.80	12.98	29.43	3.82	2.20	11.58
2017-18	5	12	JG-130	18.00	16.20	13.20	22.73	3.00	1.80	10.00
Total	20	48	-	-	-	-	-	-	-	-
Mean	-	-	-	**18.75**	**15.96**	**11.85**	**35.72**	**4.11**	**2.80**	**14.84**

Table.3 Economic analysis of front line demonstrations on chickpea at farmer's field

Year	Cost of cultivation (Rs/ha)		Additional cost in Demo (Rs/ha)	Gross Return (Rs/ha)		Average Net Return (Rs/ha)		Additional return in Demo (Rs/ha)	Effective gain (Rs./ha)	Incremental Benefit-Cost Ratio	
	Demo	FP		Demo	FP	Demo	FP			Demo	FP
2014-15	19300	15620	3680	47498	32893	28198	17273	10925	7245	2.46	2.11
2015-16	19050	16400	2650	54321	37127	35271	20727	14544	11894	2.85	2.26
2016-17	20250	17570	2680	58800	45430	38550	27860	10690	8010	2.90	2.59
2017-18	20900	17160	3740	71280	58080	50380	40920	9460	5720	3.41	3.38
Mean	19875	16688	3188	57975	43383	38100	26695	11405	8217	2.91	2.58

Grain yield

The increase in grain yield under demonstration was 22.73 to 46.11 per cent than farmers 'local practices. On the basis of four years, 35.72 per cent yield advantage was recorded under demonstrations carried out with improved cultivation technology as compared to farmers' traditional way of chickpea cultivation (Table 2).

Gap analysis

An extension gap of 3.00 – 5.02 quintal per hectare was found between demonstrated technology and farmers practices during different four years and on average basis the extension gap was 4.11 quintal per hectare (Table 2). The extension gap was lowest (3 q/ha) during 2017-18 and was highest (5.02 q/ha) during 2015-16. Such gap might be attributed to adoption of improved technology in demonstrations which resulted in higher grain yield than the traditional farmer's practices. Wide technology gap were observed during different years and this was lowest (1.08 q/ha) during 2017-18 and was highest (4.04 kg/ha) during 2014-15. On four years average basis the technology gap of total 48 demonstrations was found as 2.80 quintal per hectare.

The difference in technology gap during different years could be due to more feasibility of recommended technologies during different years. Similarly, the technology index for all the demonstrations during different years were in accordance with technology gap. Higher technology index reflected the inadequate proven technology for transferring to farmers and insufficient extension services for transfer of technology. Technology index was lowest (10.00%) during 2017-18 and was highest (21.26%) during 2014-15. On four years average basis the Technology of total 48 demonstrations was found as 14.84 per cent. Similar findings were also found by Singh *et al.,* (2013) and Kumar *et al.,* (2016).

Economic analysis

Different variables like variety, seed, fertilizers, bio fertilizers and pesticides were considered as cash inputs for the demonstrations as well as farmers practice and on an average an additional investment of Rs. 3188 per ha was made under demonstrations. Economic returns as a function of grain yield and MSP sale price varied during different years. Demonstration maximum returns (Rs. 50380 per ha) during the year 2017-18 was obtained due to higher grain yield. The higher additional returns and effective gain obtained under demonstrations could be due to improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring. The lowest and highest incremental benefit: cost ratio was (2.46 and 3.41 in 2014-15 and 2017-18, respectively (Table 3) depends on produced grain yield and MSP sale rates. Overall average IBCR was found as 2.91, while incremental benefit: A cost ratio farmer practice was found as 2.58. The similar results founding in front line demonstrations on Chickpea crop by Tomar (2010).

These technologies were found to be the main reason for increase in the yield of chickpea and thus it can be said that FLDs were the most successful tools for transfer of technology. The concept of front line demonstration may be applied to all farmer categories including progressive farmers for speedy and wider dissemination of the recommended practices to other members of the farming community so the front line demonstration (FLDs) plays a very important role to disseminate recommended technologies because it shows the potential of technologies resulting in an increase in yield

at farmers' level. Under demonstrations some specific technologies like, improved varieties, seed treatment, seed rate, balance use of fertilizer, intercultural and plant protection measures were undertaken in a proper way the demonstration farmers acted also as primary source of information on the improved practices of chickpea cultivation and also replaced as source of good quality pure seeds in their locality and surrounding area for the next crop.

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