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Research Article

ENHANCEMENT OF CHICKPEA PRODUCTIVITY THROUGH IMPROVED TECHNOLOGY IN FARMING COMMUNITY

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Abstract- Krishi Vigyan Kendra, Sehore (M.P.) during the period from 2011-12 to 2014-15 conducted a total 52 frontline demonstration of Chickpea crop. Cultivation practices comprised under FLD *viz.* use of improve variety (JG -322, JG-16), seed treatment, seed inoculation, spacing 30cm, soil test based nutrient management, irrigation water management and integrated pest management show that percentage increase in the yield of Chick pea ranged from 15.55 % to 27.85 % over farmer's practice. The highest seed yield 19.25 q ha^{-1} was recorded in the year 2014-15 in FLD, which was 15.55% more over the farmer's practice (16.66 q ha^{-1}). The additional cost Rs. 1158 to Rs. 3000 gave additional net return, it was ranged from Rs. 4334 to Rs. 8120 per hectare .The increased benefit: Cost ratio was also calculated, it was ranged from 1:2.18 to 1:2.77 in demonstration &1:2.04 to 1:2.57 in farmers practice.

Keywords- Chickpea, *Cicer arietinum*, Improved cultivars, Improved technologies, Integrated nutrient management, Integrated pest management, Productivity.

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Introduction

Chickpea are also known as Chana or Bengal Gram or Gram and it is grown in throughout India. It is a major pulse crop, which is cultivated in Rabi Season. . So many dishes like pulse, besan, snake, sweet etc can be made by chickpea. Chick pea belongs to Fabaceae" Family and its botanical name is "*Cicer arietinum* L". Gram or Chickpea (*Cicer arietinum* Linn.) is a major winter pulse crop grown in India. Chickpea is major crop among pulses in Madhya Pradesh, occupying 27.22 lakh ha area with 332.11 thousand tonnes production in 2012-13 (http://mpkrishi.mp.gov.in, 2012-13).

Sehore is the main chickpea growing district under Malwa region of Madhya Pradesh. It is cultivated in an area of 97.64 thousand ha with a production of 87.45 thousand tonnes accounting for 3.59 % of area and 2.63 % of total production of pulses in the district (http://mpkrishi.mp.gov.in, 2012-13).

The average productivity of 896 kg/ha is far below the potential expected from improved technologies due to adoption of local cultivar, imbalance of use of fertilizer (9:23:0 NPK kg/ha), scarcity of irrigation water and heavy incidence of diseases & insects. The seed yield of chickpea on farmer fields can be enhanced at least 78% to 100% (1600-1800 Kg/ha) with adoption of improved technologies such as improved cultivar, recommended dose of fertilizer and control of pests. Singh and Bajpai (1992) [1] reported that fertilizer and plant protection are most critical inputs for increasing seed yield of chickpea. Keeping this in view, front line demonstrations of chickpea were conducted, to demonstrate the productivity potential and economic benefit of improved technologies under real farmer's conditions.

Materials and Methods

The present study was carried out by the Krishi Vigyan Kendra, Sehore (M.P.) during *Rabi* season from 2011-12 to 2014-15 in farmer's field of 5 adopted villages *viz.* Amlaramjipura, Ratanpur, Bafapur, Bichhia & Golukhedi. The total number of farmers under this programme was 52. 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 – 16, JG-322) + seed inoculation with Rhizobium & PSB culture + Balanced fertilizers (20:60:20 Kg/ha) as per soil test value + integrated pest management - Summer deep ploughing + seed treatment with fungicide + Seed inoculation with bio fertilizer + Pheromone trap + Bird purcher + Need based spray of insecticide were tested under demonstrations.

Summer deep ploughing was done during the April month. Crop was sown between IInd fortnight of October to Ist fortnight of November with optimum seed rate was 75 kg/ha. As per soil test value, entire dose of Nitrogen, Phosphorus and potash were supplied at the time of sowing in Nitrogen, phosphorus through DAP & potash through muriate of potash. 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. Timely spray of insecticide for the management of gram pod borer. The yield data were collected from both the demonstration and farmer's practice and their technology gap; extension gap and the technology index were worked out (Samui *et al.*, 2000)[2] as given below

Technology gap = Potential yield-demonstration yield

Extension gap = Demonstration yield -farmer's yield

Technology index = $\frac{\{(\text{potential yield-demonstration yield})\}X100}{\text{Potential yield}}$

Result and Discussion

Total 52 frontline demonstrations were conducted at farmer's field in their farming situation. [Table-1] 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 seed rate, fertilizers and plant protection measures. Whereas complete gap (full) was noted for variety, seed treatment, seed inoculation and spacing.

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, Katila	JG-130, JG-16	Full	90	I
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	9" (22.5cm)	30cm	Full	90	VIII
6.	Fertilizers	50 kg DAP ha^{-1}	20:60:20 Kg ha^{-1} N:P:K (As per STV)	Partial	75	II
7.	Irrigation	One pre sown & one irrigation before flowering through flood irrigation	One pre sown & one irrigation before flowering second during pod formation through sprinkler irrigation	Partial	80	VI
8.	Plant Protection	Improper use of insecticide	Application of IPM module – SDP, Pheromone trap, Bird purcher & Need based application of insecticide	Partial Partial	90	VII

Table-2 *Productivity, extension gap, technology gap and technology index of Chick pea as grown under FLD and existing package of practices.*

Year	Area (ha)	No. of Demo	Yield q/ha		% increase over FP	Extension gap q/ha	Technology gap q/ha	Technology index%
			FLD	FP				
2011-12	5	13	17.2	13.8	24.64	3.4	2.8	14
2012-13	5	13	18.53	15.73	17.80	2.8	1.47	7.35
2013-14	5	13	18.82	14.72	27.85	4.1	1.18	5.9
2014-15	5	13	19.25	16.66	15.55	2.59	0.75	3.75
Total	**25**	**64**	-	-	-	-	-	-
Mean	-	-	**18.45**	**15.2275**	**21.46**	**3.22**	**1.55**	**7.75**

[Table-2] revealed that the highest yield of Chick pea (19.25 q ha-1) was obtained during the 2014-15 with the additional amount of Rs. 1165 over farmer's practices, which yield 16.66 q ha-1. The average yield under demonstration fluctuated and ranged from 17.2 q/ha to 19.25qha-1 during the 2011-12 to 2014-15. The results clearly indicated that the yield of Chick pea could be increased by 15.55% to 27.85 % over the yield obtained under farmer's practices of Chick pea cultivation due to adoption of appropriate production technology. Similar findings were also found by Dixit *et al.* (2003) [3], Singh (2002)[4].

The yield attributing parameter of Front Line Demonstration (Farmers Practice as well as Recommended Practice) were timely collected and interpretate the data. They are found the extension gap of technology which ranged from 2.59 q ha-1 to 4.1 q ha-1 during the period of study emphasized the need to educate the farmers for adoption of improved agricultural production technologies to reduce the extension gap.

The technology gap were ranged from 0.75 q ha-1 to 2.8 q ha-1. Hence variety wise location specific recommendation appears to be necessary to minimize the technology gap for yield potential in different situations. Similar findings were found by Kuamr (2014) [5]. The technology index shows that the feasibility of the improved technology at the farmer's fields. The lower value of technology index more is the feasibility of the technology. As such, reduction of technology index from 3.75 % (2014-15) to 14.0 % (2011-12) exhibited the feasibility of demonstrated technology. The variation in yield from location to location can be accounted for varying climatic condition, prevailing microclimatic and variation in agricultural practices followed. More or less similar reasoning was provided by other workers (Sagar and Chandra, 2004)[6].

Table-3 *Economics analysis of demonstration and farmers practice.*

Year	Demonstration			Farmer practices			Additional cost of cultivation Rs ha^{-1}	Additional net return Rs ha^{-1}	Incremental benefit cost ratio	
	Cost of cultivation Rs ha^{-1}	Gross returns Rs ha^{-1}	Net return Rs ha^{-1}	Cost of cultivation Rs ha^{-1}	Gross returns Rs ha^{-1}	Net return Rs ha^{-1}			DP	FP
2011-12	18500	48160	29660	17100	38640	21540	1400	8120	2.6	2.3
2012-13	26000	59296	33279	23000	50336	27336	3000	5943	2.28	2.19
2013-14	23704	51554	27850	22546	46062	23516	1158	4334	2.18	2.04
2014-15	20580	57750	36900	19415	49980	30565	1165	6335	2.77	2.57
Mean	22196	54190	31922	20515	46254	25739	1681	6183	2.46	2.28

[Table-3] showed that the production cost of farmers practice is Rs 20515 per hectare while Rs 22196 per hectare is the average cost of production in demonstrations. The net return from demonstration was Rs. 31922 ha-1, while net return from farmers practice was Rs. 25739 ha-1. It means the net return from demonstration was higher than farmer's practices.

The additional cost Rs.1158 to Rs.3000 gave additional net return, it was ranged Rs. 4334to Rs. 8120 per hectare. The increased benefit: cost ratio was also calculated, it was ranged from 1:2.18to 1:2.77 in demonstration & 1:2.04 to 1:2.57 in farmers practice. Similar finding are reported by Tomar, R.K.S.(2010)[7].

Conclusion

The frontline demonstration (FLDs) plays a very important role to disseminate the recommended technology because it shows the potential of technologies

resulting, which motivate the farmers for adopting theses technology. Many farmers approached the FLD farmers to purchase the high yielding variety seed of Chickpea and now the area under these varieties & package of practices have increased which will spread in the adjoining village as well as other area in the district.

Conflict of Interest: None declared

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