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RESEARCH ARTICLE :

Yield gap analysis for chickpea (*Cicer arietinum* Linn) through front line demonstration in Indore district

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SUMMARY : Enhancing the production potential and socio-economic level of farmers, 138 front line demonstrations on chickpea were laid out during the year 2015-16 and 2016-17. Area under the demonstration was 50.56 hectare comprising 138 farmer's of six villages Ramukhedi, Setkhedi, Khudel, Baroda Doulat, Gariya and Akya of district Indore in Madhya Pradesh. Under the technology dissemination programme recommended intervention *i.e.* suitable variety, integrated nutrient management, integrated pest management were attempted. Recommended practice recorded mean yield of 14.40 q/ha, which was 30.11 per cent higher over the farmers practices (11.06 q/ha). Additional cost under the intervention of Rs. 2740 to 1919 gave additional net return of Rs. 10,917 to Rs. 15,046 per hectare. Higher side benefit: cost ratio (2.4-2.51) was recorded during both the year of study. The extension gap was observed between 3.01 to 3.6 q/ha. The favourable cost benefit ratio exhibited the feasibility of technology demonstrated.

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KEY WORDS :
Chickpea, Yield gap, FLDs

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BACKGROUND AND OBJECTIVES

Oilseeds and pulses are the important part of human diet as they are rich sources of proteins and quality nutrition. Chickpea (*Cicer arietinum* Linn) is a major pulse crop being grown in India occupies 38 per cent area (25.26 million hectares) and 50 per cent of the total pulse production (16.47 million tonnes) Anonymous (2016). It is being grown all-around the country except on high altitude of Northern, north eastern regions and coastal peninsula. Madhya Pradesh, Rajasthan, Maharashtra, Uttar Pradesh, Andhra Pradesh, Karnataka, Gujarat, Chhattisgarh, Haryana, Bihar, Orissa, and West Bengal are the major chickpea producing state sharing over 95 per cent area. The area, production and productivity of the chickpea in the country is 8.35 million hectare, 7.17 million tonnes and 8.59 q/ha, respectively. Similarly area, production and productivity of chickpea in Madhya Pradesh accounting 3.02 million hac, 3.27 million tons and 10.82 q/ha. Area under chick pea in Indore recorded 74.0 thousand

Table 1 : Difference between recommended practices and existing farmer practices under chickpea FLD

Crop operations	Recommended practices	Farmers practice	Gap
Variety	JAKI 9218, JG-16,JG-6, JG-63	Vishal	Full gap
Seed rate (kg/ha)	60-75	110-120	Full gap
Seed Treatment	*Trichoderma viridi* + *Rhizobium* + PSB @ 5 ml/kg	No seed treatment	Full gap
Fertilizer dose (kg/ha)	NPK (12:32:16) 188	SSP 200+DAP 100	Partial gap
Sowing method	30-45 x 8-10 cm row to row and plant to plant	Line sowing	Nil
Plant protection	IPM module (Pheromone trap 10/ha + Bird percher 50/ha + Neem Oil 1500ppm@1.2 lit.+NPV 250 LE/ha	One spray of insecticide	Partial gap

hectare producing 87 thousand tonnes with productivity of 11.83 q/ha (MP Krishi 2015-16). Average productivity of chick pea in Indore district was noticed lower side (11.83 q/ha) than the average potential yield (22.00 q/ha). Through survey, farm diagnostic visit and farmers meeting it was realised that the reason behind the lower productivity was due to lack of improved variety, no seed treatment, imbalance use of inorganic fertilizers, lack of knowledge about IPM practices etc. Among the biotic stress, the gram pod borer is a major pest occurring for 75 per cent pod damage in the crop (Krishan Kant *et al.*, 2007).To combat the causes of yield reduction and technology gap, dissemination of recommended technologies of chickpea through front line demonstration were organised at farmer's field during 2015 -16 and 2016-17.

RESOURCES AND METHODS

The present study was carried out by Krishi Vigyan Kendra, Indore during *Rabi* season from 2015-16 and 2016-17 in the farmers field of six villages namely Ramukhedi, Setkhedi, Khudel, Baroda Doulat, Gariya and Akya of Indore district. Total of 138 front line demonstrations on chickpea were laid out comprising 138 farmers covering the total area of 50.56 ha with each demonstration of 0.40 ha. Under the front line demonstrations improved technologies included improved variety (cv. JAKI-9218 during 2015-16 and JG-6, JG-16, JG-63 and JAKI-9218 during 2016-17), integrated nutrient management (20:60:20 kg N:P:K /ha) + *Rhizobium* + P.S.B. @ 5ml per kg of seed, integrated pest management (Deep ploughing + seed treatment with *Trichoderma viridi* + pheromone trap @ 10/ha + bird percher @ 50/ha + *Neem* oil 1500 ppm @1.2 lt/ha + NPV 250LE/ha) were tested as intervention. Crop was sown between 20 October to first week of November with a spacing of 30-45 cm X 8-10 cm and seed rate 60-75 kg/ha. Entire dose of N, P and K through NPK (12:32:16) was applied as basal dose at the time of sowing. Under the demonstration programme farmer practice was maintain as control. Prior to conducting the front line demonstrations, group meeting and specific skill trainings were conducted. All other steps like farmer selection, site selection, farmer's participation etc was followed as suggested by Kirar *et al.* (2004).

Farmer practice constituted no deep ploughing during summer, use of old variety (Vishal) , - with higher seed rate 110-120 kg/ha, no seed treatment, no bio-fertilizer and indiscriminate use of inorganic fertilizer (18:78:0 NPK kg/ha). All other production and plant protection technologies except the interventions were followed in similar manner in recommended as well in farmer's practices. The yield data were collected from both the demonstration and control plots the selected FLDs farmers by random crop cutting method. The collected data were analyzed using simple tabular analysis like percentage etc. The yield data were collected from both the demonstration and farmer's practices and their technology gap, extension gap, and technology index were a workout as given below (Samui *et al.*, 2000).

Table 2 : Productivity, extension gap, technology gap and technology index of chickpea as grown under FLD and existing package of practices

Year	Area	No. of demo.	Average potential yield	Yield q/ha		Impact%	Extension gap (q/ha)	Technology gap (q/ha)	Tech index (%)
				RP	FP				
2015-16	30.00	80	22	14.00	10.99	27.38	3.01	6.00	36.60
2016-17	20.56	58	22	14.80	11.14	32.85	3.66	5.20	32.72
Mean	50.56	138	22	14.40	11.06	30.11	3.33	5.60	34.50

RP – Recommended practice, FP –Farmer's practice

Table 3 : Economic analysis of demonstration and farmers practices

Year	Cost of cultivation		Gross return		Net return		Additional cost	Additional net return	B:C ratio	
	RP	FP	RP	FP	RP	FP			RP	FP
2015-16	26818	24077	63650	49992	36831	25914	2740	10917	2.40	2.10
2016-17	27600	25681	67872	50373	40272	25225	1919	15046	2.51	2.03
Total Mean	27209	24879	65761	50182	38551	25569	2329	12982	2.45	2.06

RP – Recommended practice, FP –Farmer's practice, B: C Ratio –Benefit cost ratio.

Technology gap =Potential yield-Demonstration yield

Extension gap =Demonstration yield -Farmer's yield

Technology index= {(Potential yield-Demonstration yield)} / Potential yield x 100

OBSERVATIONS AND ANALYSIS

The gap between the recommended practices and exiting farmer practices under chick pea is presented in Table 1. Full gap was observed in case of variety, seed rate, seed treatment and partial gap was observed in fertilizer and plant protection.

Yield:

The yield of chickpea obtained over the year under improved technology as well as local check are presented in Table 2. The productivity of chickpea ranged from 14.00 to 14.8 q/ha with mean yield of 14.4 q/ha under improved technology on farmers field as against a yield ranged from 10.99 to 11.14 q/ha with a mean of 11.06 q/ha recorded under farmers practice. The higher productivity was found in the recommended practices as compared to farmer practice during both the year 2015-16 and 2016-17, which might be due to continuous use of IPNM (Integrated Pest and Nutrient Management) practices. The higher yield of chickpea under recommended practices was due to the use of latest high yielding variety, integrated nutrients management and pest management. Similar results have been reported by Verma (2013).

Economic:

The input and output prices of commodities prevailed during each year of demonstration were taken for calculating cost of cultivation, net return and benefit cost ratio (Table 3). The net return from recommended practices was Rs. 36,831 to Rs. 40,272 while the net return from farmer practices was Rs. 25,914 to Rs. 25,225. It means that net return from demonstration was higher than the farmer practices. The additional cost of Rs. 2,740 to 1919 gave additional net return, it ranged Rs. 10917 to Rs. 15046 per hectare. The increase benefit: cost ratio was also calculated, it ranged from 2.40 to 2.51.Thus, it was clearly showed that the demonstration of chickpea with full package was better than farmer's practices. Similar result has been reported by earlier by Teggelli *et al*. (2015).

Extension gap:

The extension gap showed an increasing trend. The extension gap ranging between 3.01 to 3.66 q/ha (Table 2) during the period of study emphasizes the need to educate the farmers through various means for the adoption of improved agriculture production to reverse the trend of wide extension gap. The trends of technology gap reflected the farmers co-operation in carrying out such demonstration with encouraging results in sequent year. The technology group observed may be attributed to the dissimilarity in soil fertility status and weather conditions.

The technology index showed the feasibility of the evolved technology at the farmer's field. The lower value of technology index more is the feasibility of the technology demonstrated (Sagar and Chandra, 2004). As such reduction in technology index from 36.6 % during 2015-16 to 32.0 % during 2016-17 exhibited the feasibility of the demonstrated technology in this region. These results confirm the findings of crop technology demonstration on oilseed and pulses crops by Yadav *et al*. (2003) and Lathwal (2010).

Conclusion :

From the above findings it can be concluded that use of scientific method of chickpea cultivation can reduce the technology gap to a considerable extent which will lead to increase productivity of chickpea in the district. Moreover extension agencies in the district need to provide proper technical support to the farmers through different educational and extension methods to reduce the extension gap for better pulse production in the district.

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