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Impact of frontline demonstration in adoption of chickpea production technology by the farmers of Balaghat district

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Abstract

The present study was carried out to evaluate the performance of demonstrated technologies like improved varieties of Chickpea (JG 130, JG 14 & RVG 202), optimum seed rate (kg/ha), Seed treatment with Carbendazim + Mancozeb + Rhizobium, Soil application with Trichoderma viridae & PSB, line sowing, RDF as STV, pre-emergence weedicide application, water management at critical stages and application of IPM module for the management of insect-pest & diseases. Cluster frontline demonstrations (CFLD's) were conducted on chickpea in Lalbarra, Balaghat, Katangi, Kirnapur, Waraseoni, block of Balaghat district during 2018-19 to 2022-23 in total of 170 ha area on 364 number of demonstrations. The result revealed that average yield of chickpea under cluster frontline demonstration were 13.46, 9.3, 12.12, 12.23 and 12.03 q/ha as compare to 8.5, 5.5, 7.1, 7.6 and 7.1 q/ha recorded in farmer's practice during 2018-19 to 2022-23 respectively. The Percentage increase in the yield in demonstration over farmers practices were 58.35, 69.09, 70.7, 65.21 and 64.87 percent during the year 2018-19 to 2022-23. The average technology gap was 8.57 q/ha, average extension gap was 4.67 q/ha and average technology index was 42.08% during the year 2018-19 to 2022-23. It was observed that the benefit cost ratio (B:C) of recommended practices (CFLD's) were 2.9, 2.0, 2.7, 2.8 and 2.7 as compared to 1.9, 1.2, 1.6, 1.7 and 1.7 in farmer's practice during the five consecutive years.

Keywords: Chickpea, CFLD

Introduction

Chickpea is a oldest pulse crops which is cultivated throughout the India since ancient time. Chickpea (*Cicer arietinum* L.) is also known as gram which is one of the important pulse crops of our country. Chickpea plays a significant role in improving soil fertility by fixing the atmosphere nitrogen. It leaves substantial amount of residual nitrogen for subsequent crop adds plenty of organic matter to maintain and improve soil health and fertility, because of its deep tap root system. Chickpea withstand drought conditions by extracting water from deeper layer in the soil profile. It is used in many forms as dal, chhole, in sweets and many attractive dishes. Its leaves contain malic acids and citric acids, which are useful for stomach ailments and it is best blood purifier. It contains about 18-22% protein, 62% carbohydrates and good amount of fat, besides being rich Ca, Fe, and vitamin C and vitamin B12. Its feed and straw are highly rich in nutrients. Chickpea can fix up to 140 kg nitrogen per hectare in the growing period. (Poonia, 2011) [12].

Chickpea is also important pulse crop of the world which is grown in 44 countries across five continents. India is the largest producer of chickpea accounting to 75% of world production. Madhya Pradesh is one of the major chickpea producing states in India. The area of chickpea crop was 3482.24 thousand hectares with the production and productivity of 3820 thousand tonnes and 1096 kg/ha, respectively in the year 2013. (Source – Agri. Statistics at Glance 2014). The average productivity in the state is low. This is not because of the unavailability of improved varieties but lack of knowledge and adoption of improved production technologies. The KVK, Balaghat has implemented the programme of pulse improvement under cluster FLD programme.

The main objective of FLD is to demonstrate newly released crop production technologies and its management practices in the farmers field under farming situations and at different agro climatic region (Meena, 2011 and Narsimha Rao *et al*, 2007) [5, 10].The newly & innovative technology having higher production potential under the specific cropping system can be.

popularised through FLD programme. The presents study has been undertaken to evaluate the difference between demonstrated technologies and practices followed by the local farmers in chickpea.

Materials and Methods

The present study was carried out by the Krishi Vigyan Kendra, Badgaon, Balaghat (MP) during rabi season in the farmers field on 2-3 cluster in each year of Balaghat during Rabi 2018-19 to 2022-23. In Rabi 2018-19 demonstration was laid out in 60 haarea with 112 number of demonstrations inDohara cluster of Lalbarra Tehsil, Devtola cluster in Balaghat Tehsil, Katangi cluster of Kirnapur Tehsiland2019-20 demonstration was laid out in 30 ha area with 66 number of demonstrations in Singodi cluster of Katangi Tehsil, Awlajhari cluster in Balaghat Tehsil, Butte Hazari cluster in Lalbarra Tehsiland in 2020-21, demonstration was laid out in 10 ha. area on 20 no. farmers of demonstration in Surjatola cluster of Lalbarra Tehsil and Boda cluster of Balaghat Tehsil. During Rabi 2021-22, demonstration was laid out in 30 ha. area on 66 no. farmers of demonstration in Chhateracluster of Lalbarra Tehsil, Katangi cluster of Kirnapur Tehsil, Kaydi cluster of Waraseoni Tehsil and Hatta cluster of Balaghat Tehsil. In 2022-23, demonstration was laid out in 40 ha. area on 100 no. farmers of demonstration in Mohara cluster of Lanji Tehsil, Dundaseoni cluster of Kirnapur Tehsil, Pounia cluster of Katangi Tehsiland Pendrai cluster of Balaghat Tehsil.

The soil under demonstration plot was medium soil and pH value was ranges from 6.3-7.8. The demonstrated technology was improved variety (JG 130, JG14 & RVG 202), optimum seed rate (75 kg/ha), Seed treated with Carbendazim + Mancozeb (3 g/kg. of seed) + Rhizobium (10 g/kg of seed), Soil application with Trichoderma viridae & PSB 5-5 kg/ha, line sowing, RDF as STV, Pre emergence weedicide-Pendimethalin 38.7 CS @ 1750 ml/ ha, water management at critical stagesand application of IPM module for the management of insect-pest specially gram pod borer – installation of Pheromone trap 10/ha., spray of insecticide-first spray of neem oil @ 5ml/l of water(1500 ppm) at 50% flowering stage and second spray of Emamectine benzoate @ 0.5 gm/l of water at pod formation stage. Control plot was also kept in parallel at every demonstrative plot.

Before conducting the demonstration, Krishi Vigyan Kendra conducted training programme to the selected farmers on sowing and nutrient management, insect-pest management, and post-harvest management aspects. The yield data were collected from both the demonstrated technology and farmers practice by random crop cutting method and analysed by using simple statistical tools. Selection of site and farmers selection were considered as suggested by Choudhary, (1999) [1]. The observation on grain yield (q/ha) and straw yield (q/ha) were recorded. Other parameters like harvest index (%), increasing in yield (%), technology gap (%), extension gap (%) and technology index were worked out as suggested by Kadian *et al*. (1997) [3]. The gross return, net return, cost of cultivation and benefit cost ratio were calculated. The data out put were collected from both RP as well as farmers practices and finally the extension gap, technology gap, technology index along with benefit cost ratio were worked out (Samui *et al*., 2000) [14] as given below:

$$\text{Harvest index (\%)} = \frac{\text{Grain yield}}{\text{Biological yield}} \times 100$$

$$\text{Increasing yield (\%)} = \frac{\text{Demonstrated yield - Farmers Yield}}{\text{Farmers Yield}} \times 100$$

$$\text{Technological gap} = \text{Potential yield} - \text{Demonstration Yield}$$

$$\text{Extension gap} = \text{Demonstration yield} - \text{Farmers Yield}$$

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

Result and Discussion

The result indicates that the Frontline Demonstration has given a good impact over the farming community as they were motivated for adoption of new agricultural technology applied in the FLD plots. Data presented in the Table 1 it is concreted that in frontline demonstration yield of improved varieties (JG 130, JG 14, RVG 202) performed better than traditional farmer practices. The variety JG 130 recorded maximum yield 15.5 q/ha and minimum yield 10.4 q /ha, in the rabi season 2018-19 and 2019-20 with 12.5 q/ha and 6.5 q/ha respectively. Rabi season 2020-21, RVG 202 recorded maximum yield 14.9 q/ha minimum 7.5 q/ha and Season 2021-22, RVG 202 recorded maximum yield 14.8 q/ha minimum 7.4 q/ha and in the year rabi 2022-23, RVG 202 recorded maximum yield 14.3 q/ha minimum 7.4 q/ha

Table 1: Grain yield, harvest index, technology gap, extension gap and technology index of chickpea

Year	Crop	Variety	Area (ha)	No. of Demonstration	Grain yield (q/ha)			% increase over FP	Straw Yield (q/ha)		Harvest index		Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
					Potential	Demo	FP		Demo	FP	Demo	FP			
Rabi 2018-19	Chickpea	JG 130	60	112	22	13.46	8.5	58.35	22.21	14.51	60.60	58.58	8.54	4.96	38.82
Rabi 2019-20	Chickpea	JG 14	30	66	20	9.3	5.5	69.09	15.32	9.37	60.70	58.70	10.7	3.8	53.50
Rabi 2020-21	Chickpea	RVG 202	10	20	20	12.12	7.1	70.7	19.93	12.07	60.81	58.82	7.88	5.02	39.40
Rabi 2021-22	Chickpea	RVG 202	30	66	20	12.23	7.6	65.21	20.32	13.06	60.19	58.19	7.77	4.63	38.85
Rabi 2022-23	Chickpea	RVG 202	40	100	20	12.03	7.1	64.87	19.88	12.14	60.51	58.48	7.97	4.93	39.85
Total/Average			170	364	20.4	11.83	7.2	65.64	19.53	12.23	60.56	58.56	8.57	4.67	42.08

The data presented in Table 1 indicated that the average yield of chickpea under package demonstration was 11.83 q/ha whereas the yield under farmers practice was 7.2 q/ha. This indicates that use of improved technology for chickpea production contributed 65.64 percent higher production than the local practice. The above findings were also similar to the findings of Pooniaand Pithia (2011) [12], Patel *et al*. (2013) [11]) and Kumar *et al*. (2019) [4].

Technology Gap

The technology gap is the difference between demonstration yield over potential yield. The technology gap was 8.54 q/ha in 2018-19, 10.7 q/ha in 2019-20, 7.88 q/ha in 2020-21, 7.88 q/ha in 2021-22, 7.97 q/ha in 2022-23 and average technological gap during the period of study is 8.57 q/ha. The technology gap may be attributed to the dissimilarity in the soil fertility status and weather conditions and similar finding were found by Mukherjee (2003) [9], Mitra and Samjdar (2020) [7] and Kumar *et al*. (2019). [4]

Extension Gap

The yield gap presently ranging between 3.8 t 05.02 q/ha and it was ranges from 4.96 q/ha in 2018-19, 3.8 q/ha in 2019-20, 5.02 q/ha in 2020-21, 4.63 q/ha in 2021-22 and 4.93 q/ha in 2022-23. The average extension gap during the period of study was 4.67 q/ha. This emphasized the need to educate the farmers through various means for adoption of improved agricultural production technologies to reverse this trend of wide extension gap. More and more use of latest production technologies with high yielding variety will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinue the old technology and to adopt new technology (Table 2). This finding was in corroboration with the findings of Kumar *et al*. (2019) [4].

Technology Index

The technology index shows the feasibility of the technology at the farmer's field. The lower value of technology index more is the feasible. As such, fluctuation in the technology index was ranged from 38.82 percent in 2018-19 to 53.5 percent in 2019-20, 39.4 percent in 2020-21, 38.85 in 2021-22, 39.85 percent in 2022-23 and average technology index during the period of study is 42.08 percent (Table 2). The above findings were also similar to the findings of Mokidue *et al* (2011) [8], Kumar *et al*; (2019) [4].

Table 1: Grain yield, harvest index, technology gap, extension gap and technology index of chickpea

Year	Yield (q/ha)		% increase over FP	Gross Expenditure (Rs./ha)		Gross Return (Rs./ha)		Net Return (Rs./ha)		B:C Ratio	
	Demo	FP		Demo	FP	Demo	FP	Demo	FP	Demo	FP
Rabi 2018-19	13.46	8.5	58.35	21500	20500	61928	39100	40356	18600	2.9: 1	1.9: 1
Rabi 2019-20	9.3	5.5	69.09	22350	21500	44640	26400	22290	4900	2.0:1	1.2:1
Rabi 2020-21	12.12	7.1	70.7	22500	22000	61787	36210	39287	14210	2.7:1	1.6:1
Rabi 2021-22	12.23	7.6	65.21	22500	21500	62385	36720	39885	15220	2.8:1	1.7:1
Rabi 2022-23	12.03	7.1	64.87	23500	22000	63767	37630	40267	15630	2.7:1	1.7:1
Average	11.83	7.2	65.64	22470	21500	58901	35212	36417	13712	2.6:1	1.6:1

Economics evaluation of the demonstrated package revealed that its adoption involved an additional cost of Rs. 970/- per ha over farmer's practice. The input and outputs prices of commodities prevailed during the study of demonstrations were taken for calculating gross return, net return and benefit cost ratio (Table 3). The additional cost of cultivation during the period of study ranged from Rs. 500/-per ha in 2018-19 to 850/-per ha in 2019-20, 500/- per ha in 2020-21, 1000/- per ha in 2021-22, 1500/-per ha in 2022-23 and average additional cost was Rs. 970/- per ha.

The gross return from demonstrated technology (CFLD's) ranged from Rs. 61928/- per ha in 2018-19 to Rs. 44640/- per ha in 2019-20, Rs. 61787/- per ha in 2020-21, Rs. 62385/- per ha in 2021-22, Rs. 63767/- per ha in 2022-23 and average gross return during the period of study was Rs. 58901/-per ha where as in farmers practice, it ranged from Rs. 39100/- per ha in 2018-19 to Rs 26400/- per ha in 2019-20, Rs. 36210/- in 2020-21, Rs. 36720/- per ha in 2021-22, Rs. 37630/- per ha in 2022-23 and average gross return during the period of study was Rs. 35212/-per ha (Table 2)

The net return from demonstrated technology ranged from Rs. 40356/- per ha in 2018-19 to Rs. 22290/- per ha in 2019-20, Rs. 39287/- per ha in 2020-21, Rs. 39885/- per ha in 2021-22, Rs. 40267/- per ha in 2022-23 where as in farmers practice, it ranged from Rs. 18600/- per ha in 2018-19 to Rs 4900/- per ha in 2019-20, Rs. 14210/- in 2020-21, Rs. 15220/- per ha in 2021-22, Rs. 15630/- per ha in 2022-23. The average additional cost during the period of study was Rs. 970/- per ha and additional net return was Rs. 22750/-per ha.

The benefit cost ratio of under recommended practices (CFLD's) were higher (2.9, 2.0, 2.7, 2.8, 2.7 and 2.6) as compared to farmers practice (1.9, 1.2, 1.6, 1.7 and 1.7). This may be due to higher yield obtained under recommended practices (CFLD's) compared to farmer's practices. Similarly result have earlier being reported on chickpea by Tomar; (2010) [17], Mokidue *et al*; (2011) [8] and Kumar *et al*. (2019) [4].

Conclusion

The result of CFLD's on recommended production technology of chickpea brought out that by its adoption, the farmers can realize higher yields and net profit in chickpea under demonstration over local check. This technology may be popularize through enhancing awareness among the farming community by regular campaigning of the technology, conduct large number of CFLD's, distribution of literature in local language, develop success stories, use of ICT media like – video conferencing, Kisan Mobile Sandesh, WhatsApp etc.

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