International Journal of Science, Environment and Technology, Vol. 9, No 6, 2020, 947 – 954

ISSN 2278-3687 (O)
2277-663X (P)

YIELD POTENTIAL OF CHICKPEA THROUGH CLUSTER FRONTLINE DEMONSTRATIONS IN DEOGHAR DISTRICT OF JHARKHAND

Rajan Kumar Ojha and Harshita Bisht*
Krishi Vigyan Kendra, Sujani, Deoghar – 814152 (Jharkhand)
E-mail: bisht.h2204@gmail.com (**Corresponding Author*)

Abstract: In Jharkhand, an average productivity of chickpea is 1066 kg ha^{-1}, due to its cultivation under rainfed ecosystem and particularly in maize & rice - fallows system, there is an urgent need of such varieties having adoptability towards such type of harsh situations. Krishi Vigyan Kendra has an innovative science–based institution, plays an important role in bringing the research scientists face to face with farmers. The main aim of Krishi Vigyan Kendra is to reduce the time lag between generation of technology at the research institution and its transfer to the farmers for increasing productivity and income from the agriculture and allied sectors on sustained basis. Hence, Krishi Vigyan Kendra, Deoghar conducted 298 demonstrations during the year 2015-16, 2016-17, 2017-18 and 2018-19 through improved production technology under Cluster Frontline Demonstration programme. Results revealed that variation in yield due to variation in agro-climatic parameters under rain-fed condition. The average yield of demonstration plots of chick pea achieved by improved production technology was 13.28 q ha^{-1} compared to farmers' practice 9.65 q ha^{-1}. Adoption of improved production technology increased yield by 37.70 per cent over farmers' practices. Average technological gap, extension gap and technological index were calculated i.e, 4.72 q ha^{-1}, 4.31 q ha^{-1} and 26.2 per cent, respectively. When economics viability was taken into consideration it was found that net return was Rs. 32,336/- per ha was recorded under CFLDs plot over farmer practices of Rs 21,086/- per ha which is highly encouraging and it is suggested to adopt these technologies for sustainable production of chickpea in Jharkhand.
Keywords: Chickpea, Extension gap, Yield, CFLDs, technology index, Economics.

INTRODUCTION

Among the various pulses Chickpea (Cicer arietinum L.) is the most important pulse crop, grown in an area of 9.19 million hectares with the annual production of 8.22 million tones, reflected very low productivity (895 kg ha^{-1}). But, in Jharkhand Being a rich source of protein energy coupled with the unique ability to restore/improve soil health and minimal reliance on external inputs, pulses under crop diversification have assumed the role of panacea for sustainable farming system, thereby, arresting deleterious effects on natural resources due to continuous cultivation of high water and input intensive cereal crops (Johnson et al. 2012).

In the past five decades, pulses production could not keep pace with burgeoning population and consequently, per capita availability has progressively declined from 60 g in 1950-51 to

*Received Dec 17, 2020 * Published Dec 25, 2020 * www.ijset.net*

32 g at present. As a result, the annual import has increased from 0.50 million tonnes to 1.80 million tonnes during the last five years and contribution of pulses in the national food basket reduced from 17% to 7%.

Pulses are generally grown on marginal and sub-marginal lands under rainfed conditions with low inputs and suffer heavily due to biotic and abiotic stresses, resulting into low productivity. Resulting in non-appreciable dissemination of improved production technology and synergy among production, marketing, processing and policy related issues. The existing production technology is capable of increasing productivity at least by 30% as amply demonstrated by on-farm trials. This coupled with technological interventions and operational synergy among planners, administrators, researchers, extension workers and developmental agencies in mission mode to translate the vision into reality.

Keeping this in view, cluster front line demonstrations of chickpea were conducted in order to demonstrate the productivity potential and economic benefit of improved technologies under farmers' conditions.

The main objective of the Cluster Demonstration was to:

- Demonstration of Plant nutrient and Plant protection centric improved technologies and management practices in a compact block covering large areas.
- Enhance productivity of Pulses.
- Area expansion of Pulses crops.
- Stimulate other farmers of the adjoining area to adopt these technologies.
- Bring fallow / barren land under Pulses cultivation with low inputs.

MATERIALS AND METHODS

Deogarh district is located in the western portion of Santhal paraganas. It is bounded by Bhagalpur district in north, Dumka in south and east and Giridhi in west. The district extends from $24^0$03' and $23^0$38' N latitude and $86^0$28' and $87^0$04' E longitude and comprises 2481 sq. km area belonging to Central and North Eastern Plateau of Jharkhand with red lateritic soil type.

The Cluster frontline demonstrations (CFLD) were organized on farmers' field to demonstrate the impact of integrated crop management technology on chickpea productivity over the years during 2015 to 2018. Every plot was laid by 0.4 ha area and adjacent 0.4 ha was considered as control (farmer's practice). Integrated crop management technology comprised by improved variety, land preparation, lime application, seed rate, seed treatment,

sowing method, use of pre-emergence herbicide, nutrient and pest management, Bioagent and Biopesticides need based to control insect – pest infestation (Table 1).

Under farmer's variety Radhey chana was used. Sowing was done in the 1st fortnight of November at 30 cms row to row spacing. The CFLD was conducted to study the technological gap between the potential yield and demonstrated yield, extension gap between demonstrated yield and yield under existing practice and technology index. Yield data was collected from both demonstrated and farmers practice by random crop cutting method and analyzed by statistical tools. Technology gap, extension gap and technological index were calculated by following formula (Samui et al, 2000).

Technology gap = Potential yield – Demonstration

Yield Extension gap = Demonstration yield – Farmers yield

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

RESULTS AND DISCUSSION

It was observed during the study that demonstration trials have increased the yield over the farmers' practices (Table 2). It was also observed that full gap in most of the production technology was also reason of not achieving potential yield.

Yield (q ha^{-1})

During the period of study, it was observed that in cluster front line demonstrations of improved technologies increased productivity over respective farmer's practice (Table 2). Result revealed that an average yield was recorded 14.05 q ha^{-1} under demonstrated plots as compared to farmers' practice 9.92 q ha^{-1}. The highest yield of CFLD plot was 14.65 q ha^{-1} during the year 2016 - 17 and in farmers' practice 10.45 q ha^{-1} in the same year and lowest yield was recorded in the year 2015-16. Average yield of chick pea increased by 41.50 per cent. The results clearly indicate that higher average yield in demonstration plots over the years compared to local check was due to knowledge and adoption of full package of practices i.e. improved varieties such as JAKI - 9218, timely sowing, seed treatment with *Rhizobium* spp and phosphate solubalizing bacteria (PSB), use of balance fertilize, method and time of sowing with proper spacing, weed management, water management, need based plant protection. The above findings were support with the findings of Singh et al (2014). Higher yield of chickpea under improved technology was due to use of latest high yielding varieties, integrated nutrient management and integrated pest management.

Technology gap (q ha^{-1})

It means the differences between potential yield and demonstration plot yield. The demonstration plot yield was 6.40, 5.35 and 6.10 q ha^{-1} during 2015 - 16, 2016 – 17 & 2017 - 18, respectively (Table 2). An average on technology gap of three years CFLD programme was 5.65 q ha^{-1}. The observed technology gap was mainly attributed to rainfed conditions prevailing in the district. The other reasons include dissimilarity in soil fertility status, soil conditions, crop production practices, local climatic situation and marginal land holdings (Balail, et al. 2013).

Extension gap (q ha^{-1})

Extension gap means the differences between demonstration plot yield and farmers practice yield. Extension gap 3.74, 4.20 and 4.40 q ha^{-1} was observed during the year 2015 - 16, 2016 - 17 and 2017 - 18, respectively (Table 2). An average of extension gap under CFLD programme was 4.31 q ha^{-1} which is need to educate the farmers through various extension i.e. cluster front line demonstration for adoption of improved production and protection technologies, to revert the trend of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of full - fill the extension gap (Raju, et al., 2017).

Technology Index (%)

Technology index indicates the feasibility of the involved technology on farmers' fields. Lower the value of technology index, higher is the feasibility of the improved technology. The technology index varied from 26.75 to 32.00 per cent (Table 2). An average technology index was observed 29.75 per cent during the CFLD programme, which showed the efficacy of good performance of technical interventions. This will accelerate the adoption of demonstrated technical intervention to increase the yield performance of chick pea. Technology index shows the feasibility of evolved technology at the farmer's field and lower the value of technology index more is the feasibility of the technology (Jeengar et al. 2006).

Economic return (Rs/Re)

The economic analysis of the data over three years revealed that chickpea under cluster front line demonstrations recorded higher gross returns. Cost involves in adoption of improved technology in chick pea varies and was more profitable. The cultivation of chick pea under improved technologies gave higher net return of Rs. 38,760/-, 43,325/- and 40,795/- ha^{-1}, respectively, as compared to farmers practices Rs 26,250/-; 29,108/- and 24,725/- per ha^{-1} in the year 2015 - 16, 2016 - 17 and 2017 - 18, respectively (Table 3). An average cost of

cultivation, gross return, net return and B: C ratio of demonstration field was Rs. 15,240/-, 56,200/-, 40,960/- ha and 3.68, respectively as compared to farmers practice (Rs. 13,039/-, 39,680/-, 26,641/- ha and 3.04). These results were in accordance with the earlier findings of Mauria et al (2017). The benefit cost ratio of chick pea cultivation under improved practices has higher than farmers' practices in all the years and this may be due to higher yield obtained under improved technologies compared to farmers' practice. This finding was in collaboration with the findings of Mokidue *et al* (2011).

Through technological agent close monitoring of demonstration was constituted in the pragramme under the guidance of experts help to harvest good crop of Chickpea. In comparison to base year (2014 - 15) the Productivity of chickpea enhanced 19.75% during 2015 - 16 and 23.2% during 2016 – 17 and 20.10 % during 2017-18 respectively.

Experience about cluster demonstration conducted on Chickpea:

- Through the feedback from different sources eg. Progressive farmers, Extension workers and monitoring reports it reveals that the cluster demonstration conducted on chickpea produced about 14.05 q ha^{-1} grain yield which is about 41.50 % higher than farmers practice.
- The farmers were provided inputs like improved seed, INM, IPM as per norms of the programme resulted with increase in productivity under CFLD.
- The improved crop variety of Chickpea under cluster demonstration was JAKI – 9218 respectively are resistant to diseases and recommended for the state.
- It has observed as per the feedback from farmers the mono crop medium land rice field was covered with chickpea resulting in the horizontal expansion of area under Pulses in district is being visible.

Farmers' feedback:

- Use of INM (Lime/Dolomite, *Rhizobium* culture, PSB) enhanced the productivity at low cost.
- After harvest of the early/medium duration rice varieties most of the land remained fallow, which were brought under the cultivation of chickpea as second crops mostly on residual moisture during rabi.
- Most of farmers have started taking Pulses in their meal resulting in improvement in their health.
- Return/rupee spent in chickpea cultivation is higher than other rabi season cereals.

- It builds up soil fertility; hence succeeding crop can be grown with minimum use of fertilizers.

CONCLUSION

Thus, the cultivation of chickpea crops with improved technologies including suitable varieties, Nutrients and Pest Management has been found more productive. The productivity gain under programme over existing practices of chickpea cultivation created greater awareness and motivated the other farmers to adopt suitable production technology. It is concluded from the study that there exists a wide gap between the potential and demonstration yield in wilt tolerant chick pea mainly due to technology and extension gaps and also due to the lack of awareness about newer technology. CFLD produced a significant positive result and provided the researcher an opportunity to demonstrate the productivity potential and profitability of the latest technology (Intervention) under real farming situation, which they have been advocating for long time. Hence, it is suggested that farmers of district may follow the improved agronomic practices adopted under CFLD programme both for higher production and better economic return for the sustainable cultivation of chickpea in district. Technological and extension gaps existed which can be bridged by popularizing package of practices with emphasis on the seed of improved crop varieties, use of proper seed rate, balanced nutrient application and proper use of plant protection measures. Replacement of local varieties with the released varieties of maize, paddy and wheat would increase the production and net income of these crops. The overall findings of present study were in concurrence with the earlier findings of Kaur et al (2019) who reported 16.28 per cent increase in yield of chickpea demonstration plots over farmer's practice, and also similarly found technology gap of 125kg/ha, extension gap of 264 kg/ha and technology index of 6.23 per cent.

REFERENCES

[1] Balai1 C. M., Bairwa R. K., Verma L. N., Roat B. L. and Jalwania R. (2013) Economic impact of front line demonstrations on cereal crops in Tribal Belt of Rajasthan. International Journal of Agricultural Sciences. 3 (7), 566-570

[2] Jeengar KL, Panwar P, Pareek OP (2006). Front line demonstration on maize in bhilwara District of Rajasthan. Current. Agric. 30. (1-2). 115-116.

[3] Johnson, P. L.; Chandrakar, H. K.; Khare, N.; Nair, S.K.; Sharma, R.N. and Nanda, H.C. (2012). Yield potential and varietals performance of chickpea (*Cicer arietinum* L.) under raifed climatic condition in Chhattisgarh, *Souvenir & Abstract*, 3rd National Symposium on

Agriculture Production in Context of Climatic Change, 03-05 Nov., 2012, Birsa Agricultural University, Ranchi & The Society of Agricultural Professionals, CSAUA&T, Kanpur (U.P.). 6.

[4] Mokidue I, Mohanty A K and Sanjay K. (2011). Corelating growth, yield and adoption of urd bean technologies. *Indian J Ex Edu* 11(2): 20-24.

[5] Raju G., Teggelli S., Suresh S. M. and Zaheer Ahamed B. (2017) Increasing Yield of Chickpea (*Cicer arietinum* Linn.) through Improved Production Technology in Kalaburagi District of Karnataka J. Krishi Vigyan, 5(2): 83-86.

[6] Samui S K, Mitra S, Roy D K, Mandal A K and Saha D (2000). Evaluation of front line demonstration on groundnut. *J Indian Soc Csostal Agril Res* 18 (2): 180-183

[7] 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 Agri Search* 1(1): 22-25.

[8] Mauriya A K, Kumar V, Kumari A, Kumar P, Kumari M and Hoda M Z (2017). Impact of cluster front line demonstrations on productivity and profitability of chickpea (Cicer arietinum L.). J Food Leg 30(1): 57-60.

[9] Kaur J, Singh V, Aulakh G S and Raina D (2019). Assessment of front line demonstrations on chickpea in Ferozepur district of Punjab. J Food Leg 32(1): 49-52.

Table: 1. Improved production technology and Farmers practices of chick pea under CFLD

Sl. No.	Technology	Improved technology	Farmers practice	GAP (%)
1.	Variety	JAKI – 9218	Radhey	Full gap
2.	Land Type	Medium land	No proper choice	Nil
3.	Land preparation	Ploughing & harrowing	Ploughing & harrowing	Nil
4.	Lime application	3.0 q ha^{-1}	No lime application	Full gap
5.	Sowing method	Line sowing	Improper	Full gap
6.	Seed rate	50 kg ha^{-1}	60 kg ha^{-1}	Higher seed rate
7.	Seed treatment	Rhizobium & PSB	No seed treatment	Full gap
8.	Fertilizer dose (NPKS kg ha^{-1})	25:50:25:20	20:50:10:0	Partial Gap
9.	Pre - emergence herbicide	Pendimethalein @3.3 lha^{-1}	No application	Full gap
10.	Plant protection	Integrated pest management	Indiscriminate application	Full gap

Table 2. Performance of chick pea (JAKI - 9218) through demonstration of Integrated Crop management.

Year	No. of Demon.	Area (ha)	Yield (q ha^{-1})			% increase in yield	Technology gap (q ha^{-1})	Extension gap (q ha^{-1})	Technology index (%)
			Potential yield	Demon yield	Farmers practice				
2015 – 16	58	20.0	18.0	12.8	9.1	40.65	5.2	3.7	28.8
2016 – 17	91	30.0	18.0	13.7	9.6	42.71	4.3	4.1	23.8
2017 – 18	87	30.0	18.0	13.4	10.2	31.34	4.6	3.2	25.5
2018 – 19	62	20.0	18.0	13.2	9.7	36.08	4.8	3.5	26.6
Average	-	-	18.0	13.28	9.65	37.70	4.72	3.63	26.2

Table- 3: Economics of Chickpea under Cluster Frontline Demonstration.

Year	Cost of Production (Rs./ha)		Gross return (Rs./ha)		Net return (Rs./ha)		Return/rupee spent (Rs./Re)	
	Demon.	Farmers practice	Demon.	Farmers practice	Demon.	Farmers practice	Demon.	Farmers practice
2015 – 16	20800	17600	44800	31850	24000	14250	2.15	1.81
2016 – 17	21700	18500	54800	38400	33100	19900	2.52	2.07
2017 – 18	23200	19400	58960	44880	35760	25480	2.54	2.31
2018 – 19	24500	20100	60984	44814	36484	24714	2.49	2.22
Average	22550	18900	54886	39986	32336	21086	2.43	2.10

Note:- MSP of chickpea @ Rs. 3500 q^{-1} in 2015 – 16, Rs. 4000 q^{-1} in 2016 – 17, Rs. 4400 q^{-1} in 2017 – 18 and Rs. 4620 q^{-1} in 2018 – 19.