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Economic Impact of Cluster Front Line Demonstration (CFLD) on Pulse Crops in Chatra District of Jharkhand in India

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Abstract Pulse crop is one of the most important crop of Jharkhand. It is grown in about 591.138 thousand hactare area and its production is 590.948 thousand million to in *kharif* and *rabi* season in the state. It is also an important crop of Chatra District of Jharkhand. It occupies about 17600 ha in *kharif* and 26000 ha in *rabi* season. The cluster front line demonstration (CFLD) was conducted among 160 farmers field in 2016-17 and 2017-18 respectively, covering 92 ha and 165 ha crop area of different pulse crops like pigeon pea, lentil, pea, gram and summer moong, respectively. The demonstration was conducted in randomized block design with 0.5 acre plot size each. The productivity and economic return of pigeon pea, lentil, pea, gram and summer moong, in improved technologies were calculated and compared with the corresponding farmers practices (Local checks). All pulse crops recorded higher gross return, net return and benefit cost ratio with improved technologies as compared to the farmers practice, demonstration also minimized extension and technological gap among the farmers. Result shows that the grain yield of different pulse crops i.e. pigeon pea, pea and gram under Cluster From Line Demonstration (CFLD) increased up to 51.27, 64.77 and 49.69% respectively as compare to control farmers practice. It is due to demonstration of improved and high yielding varieties with full package of practices. A technological and extension gap was also minimized due to combination of appropriate technological and extension strategy with extension services. Net income and cost benefit ratio was also increased in demonstration plot due to improved package of practices and reduced cost of cultivation of pulse crops.

Keywords KVK, CFLD, *Kharif*, *Rabi*, Technology index.

Introduction

A technical invention and innovation continuum in all facets of agriculture and allied activities with its effective diffusion is key to sustainable increase the agricultural production and productivity with environment sustainability. With half of the workforce engaged in agricultural sector in India, the role of science and technology in agriculture is pertinent not only to ensure food security of the country, but also to provide farmers a competitive edge and to maintain affordability of the food items for the public at large. To realize their true potential, farmers must have access to the state of the art technologies, necessary inputs and related information. In this context, the Government of India through Indian Council for Agricultural Research (ICAR) has established a large network of over 640 Krishi Vigyan Kendra's

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(KVKs) across the country with an aim to conduct technology assessment, knowledge dissemination and provide critical input support for the farmers with a multidisciplinary approach.

Pulses are the good source of protein and commonly called the poor man's meat (Reddy 2009). At the world level pulse are grown in an area of 78 million hectors with an annual production at 70 million tons (MT) and productivity of 908 kg/ha (FAO Agricultural org 2012). In India pulse are grown on 22.23 million hectors of area with an annual productivity of 13.15 million tons (MT). India accuse 33% of the worlds are under pulses and 22% of the world production of pulses. Pulses are grown across the country with the highest share coming from Madhya Pradesh (24%), Uttar Pradesh (16%), Maharashtra (14%), Andhra Pradesh (10%), Karnataka (7%) and Rajasthan (6%) with greater share about 77% of the total pulse production. While the remaining 23% is contributed by Gujarat, Chhattisgarh, Bihar, Orissa and Jharkhand. Area, production and productivity of pulses in India were 23.47 million hectare, 18.34 million tones and 781 kg/ha respectively (National council of applied economic research, New Delhi 2012-13).

In Jharkhand it is grown in 591.14 thousand ha area with total production 590.95 thousand million ton. Pulse is also an important crop of Chatra District in *kharif* and *rabi* season. It is grown in about 2600 ha area in *rabi* and 17600 ha area in *kharif*. The district agro climate is very favorable for production of pulse crops in both seasons.

Indian Government imports large quantity of pulse to fulfill domestic requirement. In this regards, to balance the gap of production and consumption of edible pulse, the department of agriculture, cooperation and farmers welfare government of India had sanctioned the project, Cluster Front Line Demonstration (CFLD) on oilseed and pulses in every KVKs of India. Similarly this project was implemented by KVK Chatra with objective to boost the production and productivity of pulse through appropriate improved varieties and location specific tested technologies.

Table 1. Area production and productivity of pulse crops cultivated in the district 2017-18.

Sl. No.	Crop	Area (ha)	Production (quintals)	Productivity (q/ha)
	Kharif			
1	Pigeon pea	12069	85207.14	7.06
	Rabi			
2	Pea	3115	34691	12.16
3	Gram	15120	211680	14.00

Materials and Methods

There are 3 major pulse crops grown in the district in *kharif* and *rabi* season of Chatra District in Jharkhand.

Table 1 show the area total production and productivity of pulse crops in the district during 2017-18. The study was under taken in Chatra District of Jharkhand. The district was purposively selected for the study because Cluster Front Line Demonstration (CFLD) conducted by the Krishi Vigyan Kendra to transfer improved production technologies in farmers field. The study was conducted in 4 purposively selected blocks (Chatra, Gidhour, Simariya and Pratappur) where Cluster Front Line Demonstration on pulse was conducted in the 2 consecutive years 2016-17 and 2017-18. Covering 2 villages in each blocks i.e. 8 villages in the district. In demonstrating farmers, 150 numbered of farmers i.e. 50 farmers for each crops pigeon pea, gram and pea were selected as a respondent in the study.

The data on production cost and monetary returns was collected for 2 years (2016-17 and 2017-18) from Cluster Front Line Demonstration (CFLD) plots to work out the economic feasibility of improved and scientific cultivation of pulses crops over the local checks. The technology gap extension gaps and technology index were calculated as given by Samui et al. (2000) as:

1. Technology gap=Potential yield-Demonstration yield
2. Extension gap = Demonstration yield–Yield from farmers practice (Local check)

Table 2. Detail area coverage and number of farmers covered under Cluster Front Line Demonstration within 2 years under pulse crops.

			2016-17		2017-18		Total	
Crop	Farmers practice	Technology demonstrated	Area (ha)	No. of farmers	Area (ha)	No. of farmers	Area (ha)	No. of farmers
Pigeon pea	Local variety–(Arhar) with ($N_{10}P_{15}K_0$)	Improved variety-(NDA-2), seed treatment with rhizobium culture, line sowing (60 × 20 cm) IPM (Bird perches @50 perches / ha and neem soap @ 10 g / l spray FYM @ 2-3 ton / acre. ($N_{25}P_{50}K_{25}S_{20}$) kg/ha with 2 weeding 1st 25–30 DAS and 2nd 40–45 DAS of sowing	10	18	25	50	35	68
Pea	Local variety–(Matar) with ($N_{10}P_{15}K_{10}$)	Improved variety (G-10) with seed treatment with Bavistin ($N_{25}P_{50}K_{25}S_{20}$) weeding 1st 25 DAS and 2nd 40 DAS of sowing, 2 irrigation	10	25	25	50	35	75
Gram	Local variety –(Chana) with ($N_{10}P_{15}K_0$)	Improved variety–(Jaki-9218), seed treatment with rhizobium culture, line sowing (30 × 10 cm) ($N_{25}P_{50}K_{25}S_{20}$), (IPM Bird perches @ 10 perches/ha and need based insecticide spray	10	25	25	50	35	75
		Total	30	68	75	150	105	218

$$\text{3. Teechnology index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$$

Results and Discussion

Cluster Front line Demonstration on pulses crops conducted by KVK, Chatra is given in Table 2.

In each crops under Cluster Front line Demonstration (CFLD), the improved varieties which are found suitable and given better results under on farm trails (OFT) in local bio physical and socio economic condition in Chatra District will be considered for demonstration with recommended package of practices. Technologies which have demonstrated under Cluster Front Line Demonstration (CFLD) are given in Table 2.

Economic impact of front line demonstrated

Table 3 revealed that in cluster front line demon-

Table 3. Productivity of pulse crops, yield gaps and technology index (Average over year).

Crop	Number of demonstration	Area	Yield (q/ha) Potential	Demonstration	Local check	Percentage increase over local	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
Pigeon pea	68	35	20	17.14	11.33	51.27	2.86	5.81	14.30
Pea	75	35	19	14.50	8.80	64.77	4.60	5.70	24.21
Gram	75	35	120	17.17	11.47	49.69	2.83	5.70	14.15

Table 4. Economics of pulse crops production under Cluster Front Line Demonstration and farmers practices. DP=Demonstrated, FP=Farmers Practices, DP=Demonstrated Practices.

Sl. No.	Particular		2016-17			2017-18			Over all		
			Pige-on pea	Pea	Gram	Pige-on pea	Pea	Gram	Pige-on pea	Pea	Gram
1	Yield	DP	16.67	14	16.50	17.61	15	17.85	17.14	14.5	17.17
		FP	10.50	8.50	11.45	11.67	9.10	11.50	11.33	8.8	11.47
2	Cost of cultivation	DP	22000	17500	26000	22000	17000	26500	22000	17250	26250
	(Rs/ha)	FP	17000	14000	22000	17000	14000	22000	17000	14000	22000
3	Additional cost of cultivation over local (Rs/ ha)	DP	5000	3500	4000	5000	3000	4500	5000	3250	4250
4	Gross return	DP	50010	35000	49500	52830	37500	53550	51420	36250	51525
	(Rs / ha)	FP	31500	21250	34350	35610	22750	34500	33255	22000	34425
5	Net returns	DP	28010	17500	23500	30830	20500	27050	29420	19000	25275
	(Rs / ha)	FP	14500	7250	12350	18010	8750	12500	16255	8000	12425
6	Additional net return over local										
	(Rs / ha)	DP	13510	10250	11150	12820	11750	14550	13165	11000	12850
7	BC ratio	DP	2.27	2.0	1.90	2.40	2.20	2.02	2.33	2.10	1.96
		FP	1.85	1.51	1.56	2.05	1.62	1.56	1.95	1.57	1.56

stratiounder improved technologies found higher productivity of gram, pigeon pea and pea 17.17 q/ha, 17.14 q/ha and 14.50 q/ha respectively as compared to farmers practices (Local check) 11.47 q/ha, 11.33 q/ha and 8.80 q/ha respectively. The increasing in productivity of pegion pea, pea and gram, over respectively local checks were 51.27%, 64.77% and 49.69% respectively. Higher productivity of different pulses crops was found in Cluster Front Line Demonstration (CFLD) due to demonstration of improved varieties with full package of practices ; similar finding was also reported by Haque (2000), Jeengar et al. (2006), ,Balai et al. (2013). The year wise slight fluctuation in yield on demonstration was observed only due to farmers wise variation on skill and management practices.

Yield of the Cluster Frontline Demonstration and potential yield of the pulse crops was compared to estimate the yield gaps which were further categorized into technology and extension on gaps. The technology gap shows the gap in the demonstration yield over potential yield and it was highest in pea (4.60 q/ha) comparison to pigeon pea and gram (2.86 q/ha) and (2.83 q/ha) respectively. The technology gap was observed due to uncontrolled condition in demonstration plot. Farmers are not followed the same practices which are recommended even sowing time, application of nutrient, irrigation schedule, weeding. Further higher extension gap 5.81 q/ha was recorded in pegion pea, after pea and gram both (5.70 q/ha), respectively. It is also due to unawareness of improved technology of pulse crops of farmers, it is also observed that the improved varieties, micronutrient, are not available in local market. Table 3 indicated that the technology index was minimum (14.15%) of gram compared to pigeon pea (14.30%) and pea (24.21%), respectively. Technology index shows the suitability of technologies in farmer's micro farming and economic situation and lower value of technology index shows more suitability of the technologies (Jeengar et al. 2006).

The input and outputs phases of commodities prevailed during each year of demonstrations were taken for calculating cost of cultivation.

Table 4 shows that average yield of 2 years

of different pulse crops under Cluster Front Line Demonstration is pigeon pea (17.14 q/ha), pea (14.50 q/ha) and gram (17.17 q/ha) compared to farmers practices (Local check) 11.33 q/ha, 8.8 q/ha and 11.47 q/ha respectively.

Table 4 further shows that economic analysis of the data cover 2 years gram under frontline demonstration recorded higher gross returns (Rs 515,225.00/ha) net return (Rs 25,275.00/ha) and BC ratio (1.96) as compare to the local check where farmers got gross returns (Rs 34,425.00/ha) and net returns (Rs 12,425/ha) with 1.56 BC ratio respectively. Pigeon pea also recorded gross returns (Rs 51,420/ha), net return (Rs 29,420/ha) and BC ratio (2.33) as compare to the local check where farmers got gross return (Rs 33,255.00/ha), net return (Rs 16,250/ha) and BC ratio (1.95) respectively. Where pea also recorded higher gross return (Rs 36,250/ha), net return (Rs 19,000/ha) and BC ratio of 2.10 in improved technologies in demonstration plot as compare to local check where farmers get gross return, net return and BC ratio of Rs 22,000, Rs 8,000 and 1.57 respectively. This finding supported with the finding of Tomar (2010) and Mokidue et al. (2011).

Conclusion

Result shows that the grain yield of different pulse crops i.e. pigeon pea, pea and gram under Cluster Front Line Demonstration (CFLD) increased up to 51.27, 64.77 and 49.69% respectively as compare to control farmers practice. It is due to demonstration of improved and high yielding varieties with full package of practices. A technological and extension gap was also minimized due to combination of appropriate technological strategy and extension services. Net income and cost benefit ratio was also increased in demonstration plot due to improved package of practices and reduced cost of cultivation of pulse crops.

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