Journal of Scientific Research & Reports

27(5): 104-110, 2021; Article no.JSRR.69844
ISS: 2320-0227

Impact of Cluster Frontline Demonstrations (CFLD) on Oilseeds Productivity and Profitability

Rinku Moni Phukon[1*], Rizwanul Helim[2] , Bipul Kr. Das[3] , Manoj Kr. Chauhan[4] and Pabitra Kumar Bordoloi[5]

[1]Horticultural Research Station, Assam Agricultural University, Kahikuchi- 781017, Assam, India.
[2]Krishi Vigyan Kendra, Assam Agricultural University,Kamrup - 781017, Assam, , India.
[3]Krishi Vigyan Kendra, Assam Agricultural , Dhubri -783348, Assam, India.
[4]Krishi Vigyan Kendra, Assam Agricultural University, Darrang -784125, Assam, India.
[5]Regional Agricultural Research Station, Assam Agricultural University,Shillongani-782002, Assam, India.

Authors' contributions

This work was carried out in collaboration among all authors. Author RMP designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Author RH wrote the protocol and the final draft of the manuscript and authors BKD and MKC managed the analyses of the study. Author PKB managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JSRR/2021/v27i530395
Editor(s):
(1) Dr. Prinya Chindaprasirt, Khon Kaen University, Thailand.
Reviewers:
(1) Ogoudele Simon Codjo, University of Florida, United States.
(2) Viktor Fedorovich Stukach, Omsk State Agrarian University, Russia.
Complete Peer review History: http://www.sdiarticle4.com/review-history/69844

Original Research Article

Received 20 April 2021
Accepted 30 June 2021
Published 05 July 2021

ABSTRACT

The Cluster Front Line Demonstration (CFLD) programmes on oilseeds were carried out with respect to yield, extension gap, technological gap and economic returns in oilseed crops in Darrang district of Assam, India during 2016-17 and 2017-18 under NMOOP, Ministry of Agriculture and Farmers welfare, GoI. The fields were selected from different villages/clusters of the district. The observations on selected parameters of demonstration plots as well as control plots were recorded through experimental designs ('Control-Treatment') of social research. The results reflected that the average grain yield in demonstration plots of the selected oilseed crops namely; Rapeseed & Mustard, Sesamum and Groundnut was more compared to farmers practice. The crop sesamum recorded with the lowest extension gap (1.9q/ha), technology gap (0.90 q/ha) and technology index (11.25%) followed by rapeseed & mustard with 2.95q/ha, 0.31 q/ha and 3.42% and groundnut with 5.7q/ha, 15.6q/ha and 42.3% respectively. The highest additional income (Rs. 31307/ha) in demonstration plot over control was recorded in cultivation of groundnut followed by sesamum (Rs.

**Corresponding author: E-mail: rinkumoniphukon@gmail.com;*

13134/ha) and rapeseed & mustard (Rs. 11019/ha). The results revealed that the use of improved varieties, scientific cultivation practices in cluster mode facilitates to boost the productivity and profitability scenario of oilseed crops in the district by minimizing the yield and technology gaps.

Keywords: Oilseed, yield gap; technology gap; extension gap; potential yield.

1. INTRODUCTION

India is one of the major oilseeds producer and importer of edible oils. With regards to vegetable oil economy, India ranks fourth in the world after USA, China & Brazil. The oilseed holds a pivotal position in terms of Gross Cropped Area (13%), Gross National Product (3%) and value of all agricultural commodities (10%). During the period from 1999 to 2009, it is observed that the oilseed sector has recorded an annual growth rate of 2.44 % in area, 5.47% in production and 2.96% in yield, respectively. A total of 9 annual oilseed crops, which include 7 edible oilseeds (groundnut, rapeseed & mustard, soybean, sunflower, sesame, safflower and niger) and two non-edible oilseeds (linseed and castor) are grown in the country based on the favourable diversified agro ecological conditions in the country. Oilseed cultivation is mainly confined to rainfed condition (72%) and is grown mainly on marginal lands across the country in about 27 million hectares. The domestic consumption of edible oils during the last few years has substantially increased and has touched the level of 18.90 million tonnes during 2011-12 which is expected to increase further. Based on the per capita consumption of vegetable oils at the rate of 16 kg/year/head for a estimated population of 1276 million, the total vegetable oils requirement is likely to touch 20.4 MT in 2017. Import of palm oil from Indonesia and Malayasia aids in our requirement of edible oils substantially. Therefore, it is the need of the hour to harness the local resources to boost up production of oilseeds and ensure nutritional security in the country.

Due attention has always been paid to oilseed both in terms of consumer demand and ample programmatic aid from the government at the production front. Addressing the importance of Oilseed production, the Ministry of Agriculture and Farmers Welfare, GoI had initiated cluster frontline demonstration (CFLD) programme nation-wide on oilseed under National Mission on Oilseed and Oilpalm (NMOOP) since 2015-16. Promoting and extending improved technologies, *viz.,* seed, micro-nutrients, soil amendments, integrated pest management, farm machinery and implements, irrigation devices along with capacity building of farmers is the basic strategy of the Mission on Oilseeds. The ICAR has been implementing this CFLD programme on different oilseed crops through its Krishi Vigyan Kendras (KVKs) across the country to enhance the production and productivity scenario of oilseed crops with improved varieties and location specific technologies.

In India, rape seed mustard is an important source of edible oil followed by ground nut [1]. By conducting cluster frontline demonstrations in a methodical manner to accelerate the dissemination of new & proven technologies at farmer's fields in a participatory mode with an objective to find out the possible locally available resources of crop production and also to minimize the productivity gaps by enhancing the production and income security of rural farmers. Therefore, KVK in this particular district is being emphasized to organize large scale CFLD programs on oilseed crops for harnessing its productivity potential.

2. MATERIALS AND METHODS

Krishi Vigyan Kendra (KVK), Darrang has conducted 149 number of Cluster Front Line Demonstrations on rapeseed & mustard, 50 on sesemum and 15 on groundnut in farmer’s field in different blocks of the district during 2016-17 and 2017-18. For conducting CFLDs, farmers were identified/ selected following the survey suggested by Choudhary [2] The required inputs were supplied and regular visits to the demonstration fields by the KVK scientists ensured with proper guidance to the farmers. Field days and group meetings were also organized to provide the opportunities for other farmers to witness the benefits of demonstrated technologies. However, the practices followed by farmers in general are use of local cultivar, high seed rate, no seed treatment, delay sowing, indiscriminate use of fertilizer, no irrigation facilitity and plant protection measures .All the technological interventions were taken as per prescribed packages of practices of Assam Agricultural University for selected varieties of rapeseed & mustard, sesamum and groundnut

(Table 1). However in rapeseed & mustard, bee hives boxes were placed @ 5 nos./ha in all demonstrated plots to enhance productivity. The KVK scientists used to visit to the cluster frontline demonstrations fields and farmer's field (control) on regular basis for close supervision and data collection during the entire process of demonstration programme. The study was conducted in experimental designs ('Control-Treatment') of social research.

2.1 Data Collection and Analysis

The data on selected parameters of demonstration plots as well as control plots were collected on regular basis and continued till harvesting of crops to assess the overall performance of CFLDs on selected oilseed crops. The triangulation of data was made with the interaction of state agriculture officials and secondary data available with the departments. The data outputs were also collected from CFLD plots as well as control plots and finally the extension gap, technology gap, technology index, additional return along with the benefits-cost ratio were worked out (Table 3 & 4) as per the formula adopted by [3] as given below:

Extension Gap = Demonstrated yield-Farmers' practice yield

Technology Gap= Potential yield- Demonstration yield

$$\text{Technology Index} = \frac{\text{Potential yield- Demonstration yield}}{\text{Potential yield}} \times 100$$

Additional Return = Demonstration return – Farmers practice return

$$\text{Benefit: cost} = \frac{\text{Gross return}}{\text{Gross cost}}$$

The basic information from the farmer's field as well as feedback information were systematically recorded and analyzed to see the comparative performance of cluster frontline demonstrations (CFLDs) and farmer's practice (control).

3. RESULTS AND DISCUSSION

The year-wise outcome of the demonstrations conducted by KVK, Darrang, Assam is furnished in Table 2. One suitable variety of each oilseed crop namely; *TS-46* (rapeseed & mustard), *Nagaon Local* (sesamum) and *JL-24* (groundnut) were taken up along with their recommended package of practices against locally available old variety with traditional cultivation practices adopted by the farmers in their local situations. A total of 149, 50 and 15 demonstrations on improved varieties of rapeseed & mustard, sesamum and groundnut respectively covering 95.0 ha of area were conducted at farmers' field during 2016-17 and 2017-18 (Table 2 & 3).

3.1 Yield and Gap Analysis

Yield and gap analysis in demonstrated plots under CFLD and farmer's practice (check) is presented in Table 3. Performances of all the three crops were considerably found to be higher under the demonstration plots compared to control during the period of demonstration. The results showed that average yield of rapeseed & mustard under cluster front line demonstration was 8.75 q/ha compared to 5.8 q/ha in farmer's practice with 50.8 % average increase over farmer's practice. With regards to sesamum average yield of 7.1 q/ha in CFLD plot was recorded against 5.2 q/ha in farmer's practice with 36.5 % average increase over local check. While in groundnut average yield of 21.3 q/ha in CFLD plot was recorded against 15.6 q/ha in farmer's practice with 36.5 % average increase over local check. The result is in compliance with the observations of Tiwari and Saxena [4] and Tiwari et al. [5] and Chaudhary et al [6]. The outcome during the study clearly reflected the positive effect of CFLDs over the existing practices toward enhancing the productivity of oilseeds in the study area due to use of high yielding variety, timely sowing, balance doses of fertilizers, proper irrigation, need based plant protection etc. and inclusion of honey bee colonies in rapeseed & mustard.

The results presented in Table 3 also indicate that *Nagaon local* variety of sesamum was found with the lowest extension gap (1.9 q/ha), technology gap (0.90 q/ha) and technology index (11.25%) compared to other oilseed crops under investigation. It was followed by rapeseed & mustard with 2.95q/ha, 0.31 q/ha and 3.42% and groundnut with 5.7q/ha, 15.6q/ha and 42.3% respectively. The outcome thus emphasizes the need of KVKs to educate the farmers more particularly those non participating farmers through various extension means for the adoption of improved scientific practices in cultivation of all the oilseed crops. These varieties may be popularized in this area by the extension agencies to bridge the higher extension gap.

Table 1. Details of recommended package of practices for rapeseed & mustard, sesamum and groundnut followed by farmers under CFLD and in farmer's practice (FP)

Particulars	Rapeseed & Mustard		Sesame		Groundnut	
	Technological intervention	FP	**Technological intervention**	FP	**Technological intervention**	FP
Variety	*TS-46*	*M-27*	*Nagaon Local*	Local	*JL-24*	Local
Seed rate	7.5 kg/ha	10-12kg/ha	4.0 kg/ha	>5.0 kg/ha	65.0 kg/ha	70.0 kg/ha
Seed treatment	Seed treatment with metalaxyl 35 WS @ 6 g/kg of seed or Trichoderma @ 810 gm/kg seed	No use	Seed treatment with Carbendazim @2 g/kg or Trichoderma @ 5gm/kg seed	No use	Seed treatment with 3g Thiram or Captan/kg of Kernel	No use
Sowing method/Spacing	Broadcasting East west direction of sowing	Broadcasting, no direction of sowing methods	30cm between rows, 15cm between plants	Broadcasting	35cm between rows, 15cm between plants	Broadcasting
Time of Sowing	Mid October- mid November	Last week of October to last week of November	July –mid August	Last week of August	June-July	July-August
Nutrient management	40:35:15 (N:P:K) kg/ha Borax @ 7.5 kg/ha	No proper dose	30:20:20(N:P:K) kg/ha	No proper dose	20:40:30 (N:P:K) kg/ha	High doses of NPK
Weed management	Application of glyphosate @ 5 ml/litre water at least 10 days prior to sowing	No weed management	2-3 intercultural operation or hand weeding at 20 days after sowing. The crop should be thinned out to maintain required spacing.	No weed management	One weeding 30-35 days after sowing or use of weedicide (Pendimethalin @1.0 kg/ha) immediately after sowing helps in controlling weeds.	No weed management

Insect-pests and disease management.	Need based application of imidacloprid @ 0.5 ml/lit of water for the management of aphid control.	Indiscriminate use of pesticides	Seed treatment with Carbendazim @2 g/kg of seed against *Phytophthora blight* . Alternatively Trichoderma @ 5gm/kg of seed against stem rot and *Phytophthora blight* .Spraying with Chlorpyriphos 20 EC against infestation of leaf eating caterpillar.	Indiscriminate use of pesticides	Spray Carbendazim @0.5 g/lit of water against leaf spot followed by a second spray after 20 days. Spray phosphamidon 100EC@ 0.5ml /lit of water against aphid, leaf miner etc.	Indiscriminate use of pesticides
Inclusion of Bee hive	5 honey bee colonies/ha	No use of honeybee colonies	-	-	-	-

Table 2. Particulars of oilseed grown under Cluster frontline demonstrations (CFLDs) and farmers practices

Oilseed	Variety		2016-17		2017-18	
	CFLD	Farmers practice	Area (ha.)	No. of farmers	Area (ha.)	No. of farmers
Rapeseed & Mustard	*TS-46*	M-27	20.0	24	50.0	125
Sesamum	*Nagaon Local*	Local	10.0	25	10.0	25
Groundnut	*JL-24*	Local	-	-	05.0	15
Total	-	-	30.0	49	65.0	165

Table 3. Productivity (Yield), extension gap, technology gap and technology index of oilseeds under CFLDs (average over years)

Oilseed	No. of demo	Average Yield (q/ha)			% increase over FP (check)	Extension gap (q/ha)	Technology gap (q/ha)	Technology Index (%)
		Potential	CFLD	FP				
Rapeseed & Mustard	149	9.06	8.75	5.8	50.8	2.95	0.31	3.42
Sesame	50	8.0	7.1	5.2	36.5	1.9	0.9	11.25
Groundnut	15	36.9	21.3	15.6	36.5	5.7	15.6	42.3
Average	71	17.98	12.38	8.86	41.26	3.52	16.81	18.99

FP= farmer's practice

Table 4. Economics of cluster frontline demonstrations on oilseeds under CFLDs (average over years)

Oilseed	Gross returns(Rs./ ha)		Gross cost (Rs./ ha)		Net return (Rs./ha)		Additional gain (Rs./ha) in FLD's	B:C ratio	
	CFLD	FP	CFLD	FP	CFLD	FP		CFLD	FP
Rapeseed & Mustard	43750/-	29000/-	25700/	21969/-	18050/-	7031/-	11019/-	1.7	1.32
Sesame	56800/-	36000/-	26666/-	19000/-	30134/-	17000/-	13134/-	2.13	1.89
Groundnut	83700/-	46628/-	37702/-	31937/-	45998/-	14691/-	31307/-	2.22	1.46
Average	61417/-	37209/-	28101/-	24302/-	31394/-	12907/-	18487/-	2.02	1.57

3.2 Economic Analysis of Oilseed Crops

The economic aspect of cluster frontline demonstration on oilseed crops under study is depicted in Table 4. It is evident from the table that the net return from demonstration plots under CFLD's was Rs. 18050 /ha as compared to Rs.7031 /ha in farmers practice in case of rapeseed & mustard (var. TS 46) during the study period with additional net profit of Rs. 11019. While average net return of Rs. 30134/ha was recorded in sesamum (var. *Nagaon local*) in demonstration field against Rs. 17000/ha in farmers practice accounting Rs. 13134 as additional gain due to CFLD in farmers' field. While Rs. 45998/ha was the net return of groundnut (var. *JL24)* in demonstration plot (CFLD0 by using improved cultivation practices compared to Rs. 31307/ha in farmers' field (check) with traditional cultivation practices. The findings are in compliance with different workers those of Meena et al. [7]. Samui et al [3] and Singh et al [8] in their study on yield gap analysis of oilseeds through front line demonstrations also found that the improved production technology resulted higher gross return, net return with higher benefit cost ratio over farmer's practices. Similar finding was recorded by Singha et al. [9] in pulses.

The results in Table 4 also reflected higher benefit cost ratio (B:C ratio) of recommended practices in demonstration plots under CFLD as compared to control plot in all the oilseed crops under the study. This might be due to higher yields obtained under improved technologies (demonstrations) compared to local check (farmers practice). Singh et al. [10] also reported similar findings. Higher B:C ratio was recorded in recommended practice with 2.22, 2.13 and 1.7 in groundnut, sesamum and rapeseed & mustard as compared to 1.46, 1.89 and 1.32 in farmer's practice respectively. These results correspond with the findings of Katare et al. [11]. The dominance of findings under recommended package of practices in cluster frontline demonstration plots over farmers' practice was also reported by Singh et al. [8]. Hence, the result of benefit cost ratios convincingly proved the economic feasibility of the better technological interventions. The adoption of improved production technologies will substantially aid the income as well as the livelihood of small and marginal to attain self sufficiency in oilseed production in the region.

CONCLUSION

The present findings reflected that all the chosen improved high varieties of oilseeds namely; *TS-46* (rapeseed & mustard), *Nagaon Local* (sesamum) and JL-*24* (groundnut) resulted in higher yield with regards to recommended practice (CFLD's) than farmers practice (check) in all locations. During the study period, it was found that there is a wide gap between potential yield and farmers' yield most likely due to Technology and Extension gap. Use of latest technologies can minimize the technology gap to a substantial extent resulting in to increased productivity of oilseeds in the district. It requires collaborative extension efforts to enhance adoption of location and crop specific technologies among of the farmers for bridging these gaps. Economic scrutiny on different parameters also showed that net returns and additional income in recommended practice (CFLD's), which implies that the CFLD programme is an efficient tool for escalating the production and productivity of oilseeds. Therefore, it is suggested that policy maker may provide adequate financial support to frontline extension system for organizing CFLDs under the close supervision of agricultural scientists and extension professionals. It can be also concluded that oilseed productivity can be increased by adopting the improved technologies by changing the farmers' attitude towards new technology and thereby doubled their income.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Panday ID, Basudeo Singh, Sachan JN. Brassica Hybrid research in India: status and prospects. Proceedings of the tenth international rape seed congress. Canberra, Australia; 1999.
2. Choudhary BN. Krishi Vigyan Kendra-guide for KVK managers. Publication, Division of Agril. Extn., ICAR. 1999;73-78.
3. Samui SK, Maitra S, Roy DK, Mandal AK, Saha D. Evaluation of front line demonstration on groundnut. J Indian Soc. Coastal Agri Res. 2000;18(2):80-183.
4. Tiwari KB, Saxena A. Economic analysis of FLD of oilseed in Chhindwara. Bhartya Krishi Anusandhan Patrika. 2001;16(3&4): 185189.
5. Tiwari KB, Singh, Vinay, Parihar P. Role of FLD in transfer of gram production Technology. Maharastra J.Extn. Edu.2003; 22 (1):19.
6. Chaudhary RP, Choudhary Govind Kumar, Prasad R, Singh Rekha, Chaturvedi AK. Impact Assessment of Front Line Demonstration on Mustard Crop. Int. J. Curr. Microbiology App. Sci . 2018; Special Issue-7:4737-4742.
7. Meena BL, Meena RP, Meena RH, Balai CM. Yield gap analysis of Rapeseed-mustard through front line demonstrations in agroclimatic zone IV of Rajasthan. J Oilseed Brassica. 2012;3(1):51-55.
8. Singh AK, Singh KC, Singh YP, Singh DK. Impact of front line demonstrations on adoption of improved practices of oilseed crops. Indian research Journal of Extension Education. 2014;14(3):75-77.
9. Singha AK, Deka Bidyut C, Parisa Divya, Nongrum C and Singha Amrit. Yield gap and economic analysis of cluster frontline demonstrations (CFLDs) on pulses in Eastern Himalayan Region of India. Journal of Pharmacognosy and Phytochemistry. 2020;9(3):606-610.
10. Singh JB, Singh N Kand Tripathy CK. Impact Assessment of Cluster Front Line Demonstration on mustard crop in Sultanpur district of UP. Agricultural Sciences. 2019;8(1):2277-8160.
11. Katare S, Pandey S. K and Mustaafa M.Yield gap analysis of Rapeseed-mustard through front line demonstrations. Agric Update. 2011;6:5-7.

© 2021 Phukon et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/69844