Indian Research Journal of Extension Education

RESEARCH ARTICLE

Impact Assessment of Cluster Frontline Demonstrations (CFLDs) Programme on Oilseed Crops in Golaghat District of Assam

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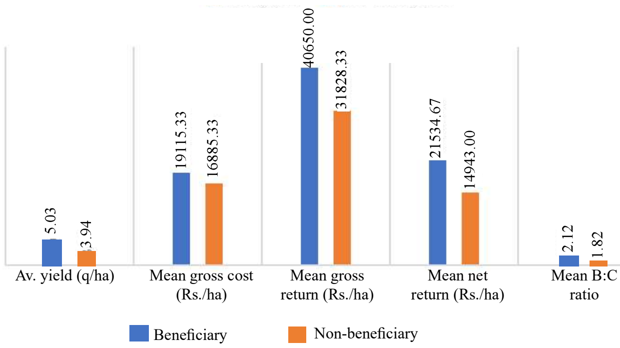
HIGHLIGHTS

- Cluster Front Line Demonstration (CFLD) was initiated by Ministry of Agriculture and Farmer's Welfare, Govt. of India, New Delhi.
- The core objective of the programme is to demonstrate newly released crop, production, protection technologies etc at farmer's field in cluster approach.
- Krishi Vigyan Kendra, Golaghat conducted CFLD on Sesamum crop to increase the productivity of oilseeds throughout the district since 2016-17.

GRAPHICAL ABSTRACT



ARTICLE INFO

Editor:
Dr. Pallabi Bora

Key words:
Cluster front line demonstration; Sesamum; impact; Technology index.

Received : 14.01.2024
Accepted : 02.03.2024
Online published : 01.04.2024

doi: 10.54986/irjee/2024/apr_jun/80-85

ABSTRACT

Introduction: Oilseeds are considered the second most important crop next to cereals, but still there is a gap in demand and supply. The production of oilseeds is considered to be of great importance. The programme Cluster Front Line Demonstration (CFLD) was launched by Ministry of Agriculture and Farmer's Welfare, GOI with the aim of on-site demonstration of newly introduced cropping, production and protection techniques under cluster approach at farmer's field.

Context: In this context, KVK, Golaghat, Assam had started conducting CFLDs on Sesamum (variety: Bohuabheti Local) from the year 2016-17 in few sesamum growing pockets of the district.

Objective: Therefore, the present study was conducted to analyze the impact of CFLD programme on Sesamum in Golghat district of Assam

Method: The impact of CFLD was studied with the parameters i.e changes of yield, income, extension gap, technology gap, technology index with 175 beneficiary and 175 non-beneficiary farmers across 70 ha of area covering 12 villages of the district which were selected purposively during 2016-17 to 2021-22. Sample survey and PRA technique was followed for data collection. Proper statistical tools were used to analyze the data.

Results & Discussion: The results revealed that there is an increase in average yield of beneficiaries over the years upto 5.58 q/ha as compared to 4.34 q/ha of non-beneficiaries with mean yield of 5.03 q/ha (beneficiaries) and 3.94 q/ha (non-beneficiaries). The mean technology gap, extension gap and technology index were 4.96 q/ha, 1.08 q/ha and 49.60 percent respectively which indicates need for improvement in extension services for better dissemination and adoption of improved technologies. The mean gross return, net return and B: C ratio was found higher in beneficiaries as compared to non-beneficiaries. Thus, higher B: C ratio proved economic feasibility of the improved technology demonstrated in the district.

The agricultural land of India is blessed with a variety of soils enabling the cultivation of a variety of oilseed crops. In terms of area, production and value, oilseeds are second to food grains in India's agricultural sector. They form an essential part of human diet. Groundnut, rapeseed and mustard, soybean, sunflower, safflower and niger are the major source of edible oils and out of these, Sesamum (*Sesamum indicum L.)* is an ancient oilseed crop with a long history of cultivation. It has both nutritional and medicinal value. It is known for its high oil content, aroma, flavor and thereby, earning its name as the queen of oilseeds (*Johnson et al, 1979).* It is having the highest oil content (46- 64%) and dietary energy (6355 kcal/ kg) its oil unlike other fats is highly stable and does not develop rancidity leading to loss of flavor and vitamin *(Sing et al, 2018).* The world harvested about seven million metric tons of Sesamum seeds in 2020. With 746 million tons of production, it plays a substantial role by contributing to 12.40 percent of the world's production (*FAOSTAT, 2020-21*).

In Assam, Sesamum crop occupied an area of 12128 ha with production of 8355 million tons and productivity of 697 kg/ha *(Directorate of Economics and Statistics, Govt. of Assam 2020).* It is well adapted to harsh environmental conditions and constitutes an alternative cash crop for small and marginal farmers. Despite its economic and nutritional importance, Sesamum is considered as an orphan crop because it has received a very little attention in the field of research. Thus, it lags behind the other major oilseed crops like rapeseed and mustard. Sesamum seeds are also used for preparation of various traditional Assamese snacks viz. pitha, laddu, and a few other curry recipes. Some of the common varieties of Sesamum are *Bohuabheti Local, Koliabor Local, ST- 1683* and *Punjab Til No.1* etc.

In the year 2015-16, the programme 'Cluster Front Line Demonstrations' (CFLDs) on Oilseeds was initiated by the Ministry of Agriculture and Farmer's welfare, Government of India, New Delhi under National Mission on Oilseeds and Oil Palm (NMOOP). The division of Agricultural Extension, Indian Council Agricultural Research (ICAR), New Delhi put responsibility to lay out CFLDs on important oilseed crops such as sesamum, rapeseed and linseed through Krishi Vigyan Kendras (KVK) through eleven ICAR-Agricultural Technology Application Research Institutes (ATARI) all over India with an aim to increase the productivity of oilseeds throughout the country as the production of edible oil in India is still deficit as per requirement. CFLDs are appropriate tool to demonstrate recommended technologies among the farmers in a cluster approach and a powerful tool of extension because farmers in a group in general are driven by the perception that 'seeing is believing'. Hence, KVK, Golaghat, Assam had started conducting CFLDs on Sesamum (variety*: Bohuabheti Local*) from the year 2016-17.

Keeping in view of this effective extension approach for dissemination of Oilseed production technology, it was thought that impact of CFLDs conducted by KVK, Golaghat is to be assessed. Therefore, the present study was undertaken with a specific objective to evaluate the impact of CFLD programme on Sesamum with the parameters like changes of yield, economic analysis, extension gap, technology gap, technology index and B: C ratio.

METHODOLOGY

The study was carried out by Krishi Vigyan Kendra, Golaghat, Assam. The district Golaghat is situated at Upper Brahmaputra Valley zone of Assam having the latitude of 26.5239°N and the longitude of 93.9623°E. The data of CFLDs on Sesamum crop were collected for consecutive 6 (six) years during kharif season from 2016- 2017 to 2021-2022. Out of the eight blocks in Golaghat district, six blocks *viz. Dergaon, Bokakhat, Podumani, Sarupathar, Morongi* and *Gomariguri* were selected purposefully where Sesamum crop is cultivated in large scale. From each block, two villages were selected which makes a total of 12 villages with 350 nos. of farmers including 175

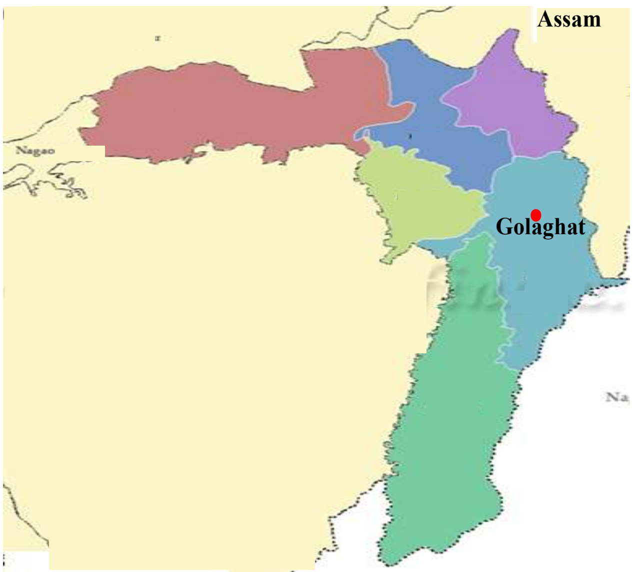


Fig.1. Location of study area

nos. of beneficiary and 175 nos. of non-beneficiary farmers covering an area of 70 ha of land. To analyze the impact of CFLD programme, parameters like changes of yield, economic analysis, extension gap, technology gap, technology index and B:C ratio were used. Schedule was prepared and tested prior to data collection. Both sample survey and PRA technique was followed for data collection. Proper statistical tools were used to analyze the data *viz.*

Percentage increase in yield (%) = {Yield gain in assessment year (q/ha) - Yield gain in base Year (q/ha)}/Yield gain in base year (q/ha) x 100.

The Extension gap (Eg), Technology gap (Tg) and Technology index (Ti) were calculated as suggested by (*Kadian et al, 1997), (Samui et al.2000)* and *(Dayanand et al.2012).*

Extension gap (Eg) = Demonstrated yield (Dy) - Farmers' practice yield (Fpy).

Technology gap (Tg) = Potential yield (Py) - Demonstrated yield (Dy).

Technology index (Ti in %) = Potential yield (Py) - Demonstrated yield (Dy) / Potential yield (Py) x100.

Benefit cost ratio (BCR) = Gross monetary returns (GMR) in Rs. per ha / Gross Monetary expenditure (GME) in Rs. per ha.

RESULTS

The impact of CFLD programme on Sesamum in Golaghat district of Assam in terms of changes of yield, extension gap, technology gap, technology index, economic analysis and B: C ratio are displayed as below in Table 1.

Yield performance: From the analysis of the data presented in Table 1, it was depicted that the yield of Sesamum crop increases successively over the years in demonstration plot of beneficiary farmers in all the selected villages. The maximum seed yield of sesamum was obtained under demonstrated plots was 5.58 q/ha during 2021-22 followed by 5.38 q/ha (2020-21), 5.20 q/ha (2019-20), 4.95 q/ha (2018-19), 4.60 q/ha (2017-18) and 4.50 q/ha during 2016-17 respectively with an average of 5.03 q/ha for six years as compared to non-beneficiary farmer practices with 4.34 q/ha during 2021-22 followed by 4.20 q/ha (2020-21), 4.00 q/ha (2019-20), 3.95 q/ha (2018-19), 3.80 q/ha (2017-18) and 3.40 q/ha during 2016-17 respectively with an average of 3.94 q/ha. The yield was increased with an average value of 27.56 percent over the control. The similar findings have been found in the study done by (*Yadav et al, 2022), (Raghav et al, 2022), (Kirar et al, 2006), (Balai et al, 2012), (Kumar et al, 2021)* and *(Deka et al, 2021)*

Extension gap: The Extensions gap is the difference between yield of demonstration plot and yield under existing farmer's practice. It was predicted from table that the extension gap in the yield of Sesamum crop was 1.1 q/ha in 2016-17 followed by 0.8 q/ha in 2017-18, 1.0 q/ha (2018-19), 1.2 q/ha (2019-20), 1.18 q/ha (2020-21) and finally 1.24 q/ha recorded in 2021-22. Similar findings have been reported by (*Balai et al, 2012) and (Kumar et al, 2021).*

Technology gap: The technology gap refers to the difference between the potential yield of the variety and demonstration plot yield. It was evident from table that the technology gap recorded in Sesamum was 5.5 q/ha in the year 2016-17 followed by 5.4 q/ha in 2017-18, 5.05 q/ha (2018-19), 4.8 q/ha (2019-20), 4.62 q/ha (2020-21) and 4.42 q/ha in the year 2021-22 with the average technology gap of 4.96 q/ha in six years. The results are in line with the results achieved by (*Rachhoya et al, 2018)*.

Table 1. Effect of CFLDs on Sesamum crop (*Bohuabheti Local*) on Yield, Extension Gap, Technology Gap and Technology Index (N=350)

Year	Total No. of Farmer	Total area (ha)	Potential Yield (q/ha)	Average Yield (q/ha)		% increase over control	EG q/ha	TG q/ha	TI (%)
				NBF (n=175)	BF (n=175)				
2016-17	50	10	10	3.4	4.5	32.35	1.1	5.5	55.00
2017-18	50	10	10	3.8	4.60	21.05	0.8	5.4	54.00
2018-19	50	10	10	3.95	4.95	25.31	1.0	5.05	50.50
2019-20	50	10	10	4.00	5.20	30.00	1.2	4.8	48.00
2020-21	100	20	10	4.2	5.38	28.09	1.18	4.62	46.20
2021-22	50	10	10	4.34	5.58	28.57	1.24	4.42	44.20
Average				3.94	5.03	27.56	1.08	4.96	49.65

**EG: Extension Gap, TG: Technology Gap, TI: Technology Index, NBF:* Non-Beneficiary Farmers, BF: Beneficiary Farmers

Technology index: The Technology Index is another important tool for judging the adoption and impact of different technologies. It is derived as the ratio between technology gap and potential yield in terms of percentage. It shows the feasibility of the technology demonstrated at farmer's field and the achievability of the evolved technology at the farmer's field. The lower value of technology index more is the feasibility of the technology demonstrated. The data presented in Table 1 showed that the Technology Index varied from 55.00 percent in 2016-17 to 54.00 per cent (2017-18), 50.50 percent (2018-19), 48.00 per cent (2019-20), 46.20 per cent (2020-21) and 44.2 per cent in the 2021-22 respectively. On an average, the Technology Index was observed as 49.65 per cent during six experimental years of Sesamum cultivation in the district. It shows the efficacy of good performance of technical interventions and accelerates the adoption of them to increase the yield performance of Sesamum in farmer's field.

*Economic analysis***:** The economic analysis of demonstration plot of beneficiaries and control plot of non-beneficiaries are presented through gross cost, gross return, net return and benefit cost ratio (B:C) in Table 2 and fig. 2. It was found that in case of beneficiary farmers during the initial year 2016-17, the gross cost was 15055.00 with gross return of 29950.00 and net return of 14895.00 per hectare and the B:C ratio of 1.9 which were gradually increased over the six years with the gross cost was 26500.00 with gross return of 61380.00 and net return of 34880.00 per hectare with the B: C ratio of 2.3 in the year 2021-22.

While in case of non-beneficiary farmers, in the year 2021-22, the gross cost was 23400.00 with gross return of 47740.00 and net return of 24340.00 per hectare and the B:C ratio of 2.04 as compare to 2016-17 where the values were even lesser with the gross cost was 13500.00 with gross return of 22610.00 and net return of 9110.00 per hectare and B:C ratio of 1.67.These result are in accordance with the findings of (*Yadav et al, 2022),* (*Rachhoya et al, 2018),* (*Raghav et al, 2022),* (*Balai et al, 2012),* (*Singh et al, 2014)* and (*Deka et al, 2020).*

Table 2 also revealed that the CFLDs recorded higher average gross returns (Rs. 40650.00/ha) and net return (Rs. 21584.67/ ha) with a mean B: C ratio of 2.1 as compared to farmers practice with average gross returns of Rs. 31828.33/ha and net return (Rs. 16028.83/ ha) with a mean B: C ratio of 1.9 which indicates the economic feasibility of the technology demonstrated for Sesamum crop. There is an increasing trend of average net return increase with 36.97 per cent over the six years from 2016-17 to 2021-22. Similar results were found in the study done by (*Singh et al, 2020).*

Table 2. Economic Analysis on Demonstration plot of beneficiaries and farmer's plot of non-beneficiaries (N=350)

Year	Non-beneficiary farmer (n=175)				Beneficiary farmer (n=175)				Net Return increase %
	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C ratio	
2016-17	13500.00	22610.00	9110.00	1.67	15055.00	29950.00	14895.00	1.9	63.5
2017-18	14360.00	25270.00	10910.00	1.75	15500.00	30590.00	15090.00	1.9	38.31
2018-19	15250.00	27650.00	12400.00	1.8	16842.00	34650.00	17808.00	2.05	43.61
2019-20	16842.00	32000.00	15158.00	1.9	19845.00	41600.00	21755.00	2.1	43.52
2020-21	17960.00	35700.00	17740.00	1.98	20950.00	45730.00	24780.00	2.2	39.68
2021-22	23400.00	47740.00	24340.00	2.04	26500.00	61380.00	34880.00	2.3	43.3
Mean	16885.33	31828.33	14943.00	1.8	19115.3	40650.00	21534.67	2.12	45.32

Fig. 2, Technology Index

DISCUSSION

In case of yield performance, it was better in CFLD's field and it may be due to awareness and adoption of package of practices, seed treatment, recommended fertilizer doses, plant protection measures which were recommended by the demonstrators and scientists in the demonstration's plots. Raghav *et al, (2021)* in their study also concluded that yield performance is good in demonstration plots due to use of recommended high yielding varieties, integrated nutrient management and integrated pest management practices.

Moreover, the value of extension gap can be reduced when more emphasize will be given on the educating the farmers through various extension means like training and awareness programmes, demonstrations, timely dissemination of information etc. The increased awareness created by the extension functionaries would motivate the farmers to adopt improved production and protection technologies and thereby can revert the trend of wide extension gap. Higher yield of demonstration plots not only reduced extension gap but it also creates interest of farmers in demonstration technology ultimately it bridged technology gap.

It was observed that the trends of technology gap were decreasing to a considerable extent which indicates the farmer's co-operation in carrying out demonstration and adopting the proper cultivation practices resulting in encouraging yield in sequent years. But the findings produced by (*Yadav et al, 2022)* and (*Kumar et al, 2021)*, where the trend of technology gap was increasing which means the farmers had adopted the given variety but didn't adopt or follow the proper scientific package of practices of the said variety as a result of which the potential yield of the improved practices could not be reaped by the farmers. The gap may also be observed due to attributes like dissimilarity in the soil fertility status, local climatic situation and socio-economic conditions of farmers. Sometimes the constraints like non availability of assured irrigation, erratic supply of electricity etc. also act as the bottle necks for technology adoption *(Kumar et al, 2005).* It can be improved using various extension tools like educating the farmers through frequent training on improved cultivation practices, conducting some awareness programmes, demonstration etc.

If we look at the economic part, beneficiary farmers were more profit making as compared to the non-beneficiaries which indicates that incorporation of scientific farm technology practices along with active participation of farmers had positive effect on increasing the yield and economic return which in turn will help to motivate the other farmers towards adoption of technologies demonstrated at farmer's field.

CONCLUSION

Based on the analysis of six years data on CFLDs conducted by KVK, Golaghat, the results indicated that the CFLDs has given a positive and significant impact over the farming community as they were motivated by the new agricultural technologies applied in the demonstrations which were superior in every aspect compared to existing practices. There was a significant increase in crop yield but still there were some extension and technological gap between the farmers practice and demonstrated interventions which directly effect on yield of the crop as well as the economy of the farmers. Therefore, additional extension work is required to decrease the gap between demand and supply of sesamum crop and the factors like soil moisture availability and other climatic observations are also responsible for disparity in the crop yield. The gross returns, net returns and B: C ratio was higher in demonstrations as compared to the farmers' practice. Thus, technologies demonstrated under CFLDs were helpful to improve the production, productivity, farmer's income as well as increase in area under Sesamum crop at micro, meso and macro level in the district.

Funding: There was no funding support for conducting this research.

Declaration of competing interest: Authors have no competing interests.

Data availability: Data would be made available on request

Authors' contribution: The first author confirms the sole responsibility for the planning and designing the research concept, the second author was having the contribution for field work and data collection and the third author did analysis, interpretation of results and preparation of the research paper.

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