

RESEARCH ARTICLE

ESTIMATION OF GAP AND ECONOMIC ANALYSIS OF CLUSTER FRONTLINE DEMONSTRATION ON SESAME CROP

Vikash Hooda¹ and Pooja Jangra^{2*}^{1 & 2}DES, Krishi Vigyan Kendra, Sadalpur-125052, CCSHAU, Hisar

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Abstract: The most crucial factor for supporting an increase in agricultural productivity is the degree of acceptance of improved agricultural technology in the innovation diffusion process. Comparing the yield differences between farmers' practises and the improved package of sesame practises under Cluster Front Line Demonstrations (CFLD) on sesame (*Sesamum indicum* L.) crop was the main objective of the current study. Sesame which is commonly known as 'Til' is one of the earliest domesticated plants of India. Due to the presence of a strong antioxidant, the seeds of plants produce valuable edible oil, which is why sesame seeds are referred to as the seeds of immortality. There are two types of recognised seeds: black and white. The goal of the project was to determine how frontline demonstration technologies might affect the productivity of sesame crops in the Hisar district of Haryana. In the year 2018, field demonstrations of sesame improved variety RT-351 was carried out across 20 hectare area. In comparison to local farmers' practices, the technologies that have been exhibited have resulted in an average production increase of 26.29%. The 1.12 q ha⁻¹ average extension gap highlighted the necessity for proper demonstration of improved package and practices for farmers to obtain instruction through a variety of extension initiatives in order to embrace better agricultural technology. The aforementioned data indicate that cluster demonstrations, which encourage farmers to utilise the kinds of scientific production techniques that were on display in the CFLD plots, may boost sesame crop yield.

Keywords: Sesame, Frontline demonstration, technology gap, Farmers practice

INTRODUCTION

In many parts of the world, oilseeds have a large economic impact on agriculture. With 82% of global output, the top five producers of oilseeds are the United States, Brazil, Argentina, China, and India. Due to their high fat content, oilseed crops, the second-largest group of agricultural goods after grains, are essential to the Indian agricultural economy. In sesame crop India ranks first in the world with 19.50 lakh ha sown area and 8.50 lakh tones production. It is a versatile crop and the average yield of sesame (436 kg/ha) in India is low as compared with other countries in the world. The main reasons for low productivity of sesame are its rainfed cultivation in marginal and submarginal lands under poor management and input starved conditions. A small amount of sesame is cultivated under irrigated condition. In India sesame is grown in all states with major area in Rajasthan, Gujarat, Haryana, West Bengal, Maharashtra, Uttar Pradesh, Madhya Pradesh and Andhra Pradesh are the major sesame growing states.

Sesame (*Sesamum indicum* L.) is the oldest indigenous oilseed crop, with longest history of cultivation in India. Sesame seed contain 50% oil, 25% protein and 15% carbohydrate and is used in baking, candy making and other food industries. It is an integral part of rituals, religion and culture. The oil

is used in cooking, salad oils and margarine (contains about 40% oleic and 40% linoleic acid). Its oil has excellent nutritional, medicinal, cosmetic and cooking qualities for which it is known as the "queen of oils". Due to the antioxidant sesamol that the oil contains, sesame oil and foods fried in it have a long shelf life. The oil may be used to make soap, paint, fragrances, medicines, and pesticides. For poultry and livestock, sesame meal, which contains 40% high-quality protein, is an excellent feed. The Indian proverbs "Til se dil" and "Til - dil" refer to the value of sesame for the heart. Sesame oil is considered as anti-cholesterol and highly beneficial for heart ailments.

Sesame seeds are known as the "seed of immortality" because they are a storehouse of energy, rich in vitamins E, A, and B complex, as well as minerals such as calcium, phosphorus, iron, copper, magnesium, zinc, and potassium. It is a best substitute for mother's milk especially in case of milk allergies. Sesame seed contains extraordinary quantities of methionine, tryptophan, amino acids with innumerable benefits. Sesame is an energy-rich crop that, unfortunately, is cultivated under conditions of energy deprivation. Sesame cultivars still have a considerably greater potential output than they actually produce in farmer's fields. This low yield might be brought on by pests and diseases, poor or non-existent weed control, or a lack of mechanisation. Keeping this in view, frontline demonstrations on

*Corresponding Author

Sesame have been conducted to demonstrate the production potential and economic benefits of latest improved technologies at farmer's field.

MATERIALS AND METHODS

Cluster Frontline Demonstration (CFLD) is a novel strategy used by the Indian Council of Agricultural Research on Oilseed crops to create a direct interface between scientists and farmers. During demonstrations, farmers are assisted by the scientists from Krishi Vigyan Kendras (KVKs) in implementing improved technologies such as seed treatment, IPM, INM, land preparation, etc. The demonstrated fields are also regularly monitored by the KVK scientists. Before conducting CFLD, a list of farmers was prepared by selection of farmers through group meetings and specific skill training was imparted to the selected farmers regarding different aspect of cultivation as suggested by Chaudhary (1999), Venkatta Kumar *et al.*, (2010) and Kushahwah *et al.*, (2018). The recommended package of practices for sesame by CCS Haryana Agricultural University, Hisar, Haryana were followed in all the demonstration plots. The 50 frontline demonstration were conducted in 50 different farmer's locations at farmer's field in the villages of Charmond, Talwandiuruka, Bandaheeri, Sadalpur, Kutiyawali, Talanwal, Kalwas, Chirod, Gangwa, Balawas, and Nalwa Hisar district of Haryana. The demonstrations were conducted in kharif season during 2018 in rainfed to semi-irrigated condition on light to medium soils under sesame-mustard/wheat cropping system. The improved variety RT-351 (yield 7.5ha⁻¹, duration 82-86days, oil content 48-50%, tolerant to macrophomina, leaf curl, and cercospora) has been included in the demonstration. Seed treatment was done with Bavistin@2g kg⁻¹seed to prevent the seed bornediseases. The crop was sown during onset of Monsoon (1 July to 15 July, 2018) with a seed rate of

5 kg ha⁻¹. Weed control was done by following integrated weed management practices (pre-emergence herbicide pendimethiline @ 1 kg a.i. ha⁻¹ followed by one hand weeding at 20-25 DAS if needed). The crop was harvested during last week of September to first fortnight of October after the leaves turn yellow and start dropping while the capsules are still greenish yellow. The demonstrations at growers' fields were regularly visited. The yield data and economics of demonstration and check plots were recorded and analysed for different parameters like extension gap, technology gap and technology index as suggested by Dayanand *et al.*, (2012) were used for calculating gap analysis, costs and returns. CFLDs were conducted at the farmer's field, so that maximum farmers can observe the demonstrated fields and interest for cultivation of sesame crop can be generated among the growers as the main idea of FLD is seeing is believing.

The logical tool used for assessing the performance of the FLD is as under:

Extension Gap = Demonstration yield – Check Plot (Farmers' practice) yield

Technology Gap = Potential yield – Demonstration yield

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

RESULTS AND DISCUSSION

The sesame variety RT-351, which has a production potential of 7-8 q ha⁻¹, was used for demonstrations whereas local sesame varieties were used as checks. Farmers have been provided complete package of practices as per recommendation of CCS HAU, Hisar in form of inputs and advisory. The sesame technologies and input materials given to farmers to demonstrate are shown in Table 1.

Table 1. Particulars of sesame grown under frontline demonstrations and farmer's practices

Particulars	Farmers' practice (Local check)	Front Line Demonstrations (Improved technology)
Variety	Local	RT-351
Seed rate (Kg Acre ⁻¹)	1-1.5kg	2.0kg
Seed treatment	No Treatment	Bavistin@2g kg ⁻¹ seed
Line spacing	30 cm	30 cm
Weed Control	-	Pendimethalin @1 litre
Sowing time	Full month of July	First fortnight of July
Nutrient management (N:P:K)	No fertilizer use	33kg Urea +10 kg ZnSO ₄
Pest and Disease management	As suggested by Dealers/Farmers	Mencozeb-500g and Profenofos-500 ml

Yield analysis

According to the findings of the farmers' field cluster frontline demonstrations, sesame yield was significantly higher under demonstration plots than check plots in all three clusters as shown in Table 2.

In comparison to check plots, Cluster-I had the highest yield increase (36%), followed by Cluster-II (24.02%), and Cluster-III (18.85%). In demonstration plots a yield of 26.29 per cent more than in check plots was observed. Singh *et al.*, (2014) and Meena *et*

al., (2018) also suggested that the use of high yielding improved variety under FLD programmes leads to increase in the production as well as productivity also. The increased in seed yield of sesame over farmers practice was 61 per cent by whole package,

23 per cent by improved varieties, 14 per cent by fertilizers management, 35 per cent by plant protection and 92 per cent intercropping (Annual report AICRP on Sesame and Niger, 2012).

Table 2. Yield and gap analysis of front line demonstrations on sesame crop

Clusters	Demo (no.)	Yield (q ha ⁻¹)		Yield Increase (%)	Extension gap (q ha ⁻¹)	Technology gap (q ha ⁻¹)	Technology index (%)
		Demo	Farmer's practice				
I	28	6.46	4.75	36.00	1.71	1.04	13.88
II	15	5.12	4.12	24.02	1.00	2.38	31.73
III	7	4.16	3.5	18.85	0.66	3.34	44.53
Mean	50	5.25	4.125	26.29	1.12	2.25	30.04

This might be because of many factors: with high yielding varieties, higher fertilizer rates are needed and also in case of lower soil fertility. The reasons for this could be the interplant competition for the moisture and nutrients which could be more severe in farmer's practice. Higher weed infestation under farmer's practice might be one of the major reason low yield because the heavy weed infestation reduced the amount of nutrient and water availability to the crop. The similar findings also reported by Singh *et al.*, (2014) who found that FLDs programme had a positive impact over existing practices. Afjal *et al.*, (2013) reported on over all basis 14.80 per cent increase in yield over local check in case of front line demonstration technologies of Mustard.

a) Gap analysis

Gap analysis was calculated to assess the extension gap and technology gap. The perusal of the data in Table 2 reveals that extension gap in Cluster-I was higher (1.71q ha⁻¹) followed by cluster-II (1.00 q ha⁻¹) and cluster-III (0.66q ha⁻¹). Shailesh Kumar *et al.*, (2020) evaluated performance analysis of improved varieties of sesame in terms of gap analysis, yield enhancement and economic viability through front-line demonstrations and similar finding in mustard crop by Shivran *et al.*, (2020). The average yield gaps for technology, extension and technology index were significant and resulted in realizing higher benefit: cost ratio compared to the Farmers' practice. The overall extension gap was observed 1.12 q ha⁻¹, which emphasized the need to educate the farmers through various extension means for adoption of improved sesame production technologies, to bridge the wide extension gap.

The technology gap showed the feasibility of the technology at farmers' field. The lower the value of technology gap, more will be the feasibility of technology distributed. The data in Table 2 reveals that technology index range from 13.88 to 44.53 per cent in three clusters. The average technology index of three clusters were 30.04 per cent. Low value of technology index reflects adequacy of technology. This means that technology demonstrated through CFLDs was feasible in that region and needs to popularize through various extension function aries

for the benefits of farmers.

b) Economic analysis

Data regarding economic indicators *i.e.* cost of cultivation, gross returns, net return and benefit cost ratio are depicted in Table 3. Economic return was observed to be a function of grain yield and sale price or Minimum Support Price. The data in Table 3 clearly shows that net return of demonstration plots was Rs. 43.56 Thousand ha⁻¹ as compared to check plots (farmers' practice) which was Rs. 22.25 Thousand ha⁻¹. The higher additional returns obtained under demonstrations due to better quality of produce (selling price of demonstration plot produce was Rs. 11000 q⁻¹ while selling price of the farmer plot produce Rs. 9000 q⁻¹ given by the private purchaser) improved technology, nonmonetary factors, timely operations of crop cultivation and scientific monitoring. Favorable benefit cost ratio proved the economic viability of intervention. The B: C ratio was 2.58 under demonstration, while it was 2.08 under control plots. Singh *et al.*, (2014) and Bamboriya & Singh (2020) also concluded that the FLD programme was found to be useful in imparting knowledge and adoption level of farmers in various aspects of sesame production technologies.

The cost of production of crop under frontline demonstration technologies was varied from Rs. 27500 ha⁻¹, while in case of farmer's practice it was Rs. 20500 ha⁻¹. In frontline demonstration technologies an additional cost of production per ha was Rs.7000 ha⁻¹. This additional cost of production in frontline demonstration technologies was mainly due to more cost involved in quality seed, integrated nutrient management and integrated weed management practices. Cultivation of sesame crop under frontline demonstration gave higher net return. Singh *et al.*, (2014), Kumar *et al.*, (2014) and Kothiyari *et al.*, (2018) reported that the higher net returns as well as higher BCR in case of frontline demonstration technologies as compared to farmer's practices. In case of benefit cost (B: C) ratio it was higher under demonstrated technologies 2.58, 2.04 and 1.66 as compared to farmer's practice *i.e.* 2.08, 1.81 and 1.53. The overall average benefit cost ratio was 2.09 in frontline demonstration as compared to

1.81 in farmer's practice. The results from the study clearly showed that the potential of improved production technologies in sesame crop.

Table 3. Economic analysis of Demo and Farmer's plots in front line demonstrations on sesame crop.

Yield (Q/ha)		Gross Cost (Rs./ha)		Gross return (Rs./ha)		Net return (Rs./ha)		B:C Ratio	
Demo	Farmer	Demo	Farmer	Demo	Farmer	Demo	Farmer	Demo	Farmer
6.46	4.75	27500	20500	71060	42750	43560	22250	2.58	2.08
5.12	4.12	27500	20500	56320	37125	28820	16625	2.04	1.81
4.16	3.5	27500	20500	45760	31500	18260	11000	1.66	1.53
5.25	4.12	27500	20500	57713	37125	30123	16625	2.09	1.81

CONCLUSION

The district's farmers were encouraged to use a better package of sesame crop-related practices as a result of the productivity improvement under frontline demonstration over farmer's practices. The demonstration plots of sesame crop being cultivated utilizing upgraded technology boosted farmers' ability and knowledge. Farmers may be persuaded to use the cutting-edge production methods that were proven successful in the CFLD plots by holding cluster demonstrations. This will boost sesame crop yield and output. When compared to traditional farming methods, the use of specific technology, such as improved varieties, seed treatment, proper spacing, integrated nutrient management, plant protection measures, and herbicide application, has been shown to increase yield and net economic return. It has been discovered that sharing scientific information, offering high-quality, need-based inputs, and applying those inputs correctly may all boost potential production. All farmer types, especially progressive farmers, may use the front line demonstration idea to propagate the recommended practices among other farms more quickly and widely. Differences in agricultural output are also caused by the availability of soil moisture, rainfall levels, climate anomalies, and disease infestation. It was also discovered that farmers in the research region had no idea how to treat sesame seeds, which resulted in huge losses. Furthermore, it is advised that farmers learn about seed treatment. The methods introduced under CFLDs therefore contributed to an increase in sesame crop area, production, and productivity. Therefore, it might be argued that frontline demonstrations were the most effective means of transferring technology for increasing sesame crop output.

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