AATCC Review

25 March 2023: Received
18 July 2023: Revised
20 September 2023: Accepted
23 November 2023: Available Online

www.aatcc.peerjournals.net

Research Article | Open Access

Improved Production, Economics and Adoption of Integrated Crop Management Practices in Sesame (*Sesamum indicum* L.) as influenced by Cluster Front Line Demonstrations in Northern Telangana Agroclimatic Zone, India

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ABSTRACT

Despite being an indigenous oilseed crop with a long history of cultivation in India, sesame (Sesamum indicum L.), is potentially underutilized due to gap in the outreach of technology which ultimately led to less production and productivity gradually over the years. Cluster Front Line Demonstration (CFLD) is a suitable vehicle for disseminating advanced agricultural technology to the farming population through demonstration in a cluster. Krishi Vigyan Kendra, Ramagirikhilla, Peddapalli district has held front line Integrated Crop Management demonstrations in sesame during Rabi seasons from 2019-20 to 2021-22 in Northern Telangana agro-climatic region. A total of 129 demonstrations totaling 60 hectares were held on farmers' fields under National Food Security Mission on Oil seeds programme. The results revealed that the demonstrated technology with an improved variety Swetha Til did better with an average growth of 17.49 % in yield over the farmers practice. The average values over three seasons for extension gap, technology gap and technology index were obtained was 1.22 quintals per hectare, 1.63 quintals per hectare and 16.30 %, respectively. As an overall effect, the demonstrated technology resulted in higher gross return (Rupees 47201 per hectare) and net return (Rupees 27937 per hectare) with a greater B: C ratio (2.47) when compared with farmers practice and the adoption rate of the demonstrated technology by the gap farmers after demonstration is 100%.

Keywords: *CFLD, ICM, Swetha Til, KVK, B:C Ratio*

1. INTRODUCTION

Sesame or gingelli is commonly known as til (Hindi), tila/pitratarpana (Sanskrit) and nuvvulu (Telugu). Sesame is known as the "Queen of Oilseed Crops" because of its high oil quality [1] and the fact that it contains 50% oil, 25% protein, and 15% carbohydrate. Baking, confectionery manufacturing, and other culinary businesses use it as well [2].

India is the world's top producer, with 16.73 million hectares and 6.5 million tons production. In comparison to the global average, India's sesame yield is low (391 kg/ha). Sesame's low productivity is mostly due to its widespread production in marginal and sub-marginal soils under rainfed conditions with inadequate management and few inputs. To improve the current situation, the government has created high yielding sesame varieties with appropriate production technology to boost sesame productivity levels in various agro-climatic circumstances. In irrigated circumstances, a well-managed sesame crop may yield 1200 to 1500 kg per hectare, whereas in rainfed situations, it can yield 800 to 1000 kg per hectare [2]. From 1965 to 2013, the sesame crop was dispersed throughout the country, with a declining tendency in cultivating area but consistent output and productivity.

Despite being the largest producer and exporter of sesame in the world, India's productivity is only 250 kilograms per hectare [3], which is caused by low yielding indigenous cultivars, poor soil fertility, and nutritional imbalances [4]. *Rabi* crop has a larger production potential than *Kharif* since the crop is drought resilient yet not water logged. It implies that there is a significant chance to boost sesame production in India by cultivating in *Rabi* in irrigated conditions with a high yielding variety and using a location-specific technology with an Integrated Crop Management approach. Despite the fact that the better technology package, if offered is considered to be commercially appealing, acceptance levels for certain elements of the upgraded technology are minimal. As a result, it underlines the importance of improved distribution through an effective extension method [5]. To address these shortfalls, the Indian government has established a scheme to encourage oil seed growing in cluster style through KVKs as a part of National Food Security Mission-Cluster Front Line Demonstrations (CFLDs) (Oil Seeds). CFLD's major goal is to showcase production technologies and management strategies on farmers' fields in a variety of agricultural scenarios. Agricultural scientists will oversee the execution of these demonstrations in order to collect data and feedback from practicing farmers in order to improve the technology that has been exhibited. KVK, Ramagirikhilla has performed sesame demonstrations at farmers' fields, keeping in mind the relevance of CFLD. The goal

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DOI: https://doi.org/10.58321/AATCCReview.2023.11.04.377

of this study is to increase the per capita availability of oilseed and spread awareness of innovative sesame crop production techniques among farmers. The data collected from the study conducted has been analyzed using statistical tools mentioned inSamui et al. [6].

2. MATERIALS AND METHODS

The Cluster Front Line Demonstration (CFLD) is a suitable vehicle for disseminating advanced agricultural technology to the farming population through demonstration in a cluster. CFLD in sesame under National Mission on Oilseeds and Oilpalm scheme were conducted by the Krishi Vigyan Kendra, Ramagirikhilla in order to assess the production and economics of a particular sesame variety, farmers actively participated in three *Rabi* seasons in the Northern Telangana agroclimatic region from 2019-20 to 2021-22. KVK provided this certified seed to selected farmers after an awareness training programme. A total of 129 demonstrations were conducted (32 in 2019-20, 47 in 2020-21 and 50 in 2021-22) by covering 60 hectares with improved practices (Integrated Crop Management). The existing variety, Hima with the practices as followed by the farmer earlier was kept as check (Farmers practice). The chosen farmers participated in pre-sowing training on sesame Integrated Crop Management techniques. The chosen farmers in the field were given essential inputs, technologies to be exhibited at every stage of the crop, and frequent training (Table 1). The technology shown in CFLDs, and the practices being used by farmers were presented in (Table 2).

2.1 Statistical Analysis

The crop was properly harvested at the ideal maturity level. Random crop cuts were used to obtain the yield data from the demonstration and check plots, and then the data was evaluated using the appropriate statistical methods *viz.,* gap analysis, extension gap, technology gap and technology index which were calculated by following formula elaborated in Samui et al. [6] is as follows.

Extension gap (kg per hectare) = Demonstration yield – Farmers yield

Technology gap (kg per hectare) = Potential yield – Demonstration yield

$$\text{Technology index (\%)} = \left\{\frac{\text{Potential Yield} - \text{Demostration yield}}{\text{Potential yield}}\right\} \times 100$$

$$\text{Percent increase in yield} = \left\{\frac{\text{Potential Yield} - \text{farmers practice yield}}{\text{Farmers practice yield}}\right\} \times 100$$

While the economic information, such as the gross cost, gross returns, net returns, and B: C ratio, was calculated using the inputs' current market prices and the produce's minimum support price prevailed at that time.

3. RESULTS AND DISCUSSION

3.1 Sesame seed yield

Data from CFLD demonstrations (2019-20, 2020-21 and 2021-22) resulted a mean yield of 8.37 quintals per hectare, which is 17.49 percent greater than current farmers' practice (7.15 quintals per hectare) (Table 3). The findings indicated that adopting suggested integrated crop management technology might boost sesame yields above farmer practices, as demonstrated. In the Northern Telangana agroclimatic region, the Swetha Til variety outperformed the local variety with higher productivity.

Farmers were inspired to use new technology with 100% adoption rate as a result of the innovative demonstration displayed by CFLDs. These results are in accordance with those of Meena et al. [7], who discovered that using a high-yielding cultivar increased sesame production in front-line demonstrations compared to the control.

Technology gap

In the Northern Telangana agroclimatic region, average sesame yield statistics over three years revealed a technology gap of 1.63 quintals per hectare (Table 3). The technological gap has been calculated at 2.19, 1.35, and 1.35 quintals per hectare for the years 2019, 2020 and 2021, respectively. A huge technological gap highlights the need for adequate tools to be developed through fine-tuning of technology for greater adoption of improved technologies to close the gap.

3.2 Extension gap

The discrepancy in productivity between farmers' practice and demonstration may be explained by the extension gap. The extension gap was 1.38 quintals per hectare in 2019-20, however it was reduced to 1.14 quintals per hectare in 2019-20 and 2021-22 (Table 3). Farmers' ignorance of better technology may have contributed to the greatest extension gap in 2019-20. As seen by the deployment of upgraded technology, the extension gap may have narrowed in the years 2020-21 and 2021-22. The findings of Singh et al. [8] provide support for the findings of this investigation. As more advanced production technology are combined with high-yielding varieties, extension gap will narrow.

3.3 Technology Index

The technology index's value reflects how viable new technology is for the farm. The likelihood of a technology being accepted increases with a lower technology index.

In the Northern Telangana agro-climatic zone, the mean technology index for spread of Integrated Crop Management techniques in sesame was 16.30 percent (Table 3). The technology index was lower in 2020-21 and 2021-22 than in 2019-20, showing that the demonstration had an impact. The findings of this investigation are consistent with those of Naik et al. [9].

In this study, it was discovered that the FLD program helped farmers learn about and embrace various aspects of sesame production technology. The outcomes are also consistent with the findings of Rohit and Jitendra [10].

3.4 Economic returns of sesame under CFLD

In comparison to farmers' practice, sesame CFLDs produced greater average gross returns (Rupees 47203 per hectare) and net returns (Rupees 27937 per hectare) with a greater Benefit Cost ratio (2.47) [Table 4]. This might be owing to the adoption of high-yielding varieties, timely crop cultivation operations, and enhanced technologies under scientific supervision, as opposed to current farmers' practices. Both Singh et al. [11] and Bhargav et al. [12] found similar result that demonstration plots produced greater returns than farmer practices.

4. CONCLUSION

Farmers may obtain improved yields and net profit in sesame farming by implementing innovative techniques, according to the findings of the frontline demonstration programme. Extension organizations can bridge technological and extension gaps through popularizing package of practices, advising services, field visits, and conducting exhibits and field days. One of the potential alternatives for increasing sesame crop output and net returns in India is to replace indigenous varieties with an appropriate high yielding variety and area tailored ICM package on a wide scale using cluster strategy. This study can pave a way for sustainable achieving the target of edible oil production in land in India as desired by the common people and Government.

FUTURE SCOPE OF STUDY

This study paves a way for disseminating technology for increased production in other oil seeds and also there is need of refining the extension techniques in disseminating technologies like this which will be understand and apprehended by this study.

Table 1. Details of need-based input under CFLD in Sesame

Year	No. of Demos	Variety	Technology demonstrated	Need based input
2019-20	32	Swetha Til	ICM	Improved Seed, Seed Treatment Chemicals, Need Based Pesticides and Herbicides, Group meetings and Trainings
2020-21	47	Swetha Til	ICM	Improved Seed, Seed Treatment Chemicals, Need Based Pesticides and Herbicides, Group meetings and Trainings
2021-22	50	Swetha Til	ICM	Improved Seed, Seed Treatment Chemicals, Need Based Pesticides and Herbicides, Group meetings and Trainings

Table 2. Differences between demonstration and farmers practice under CFLD on Sesame

Practices	Demonstrated practice (CFLD)	Farmers practice	Gap
Seed Variety	Swetha Til	Hima	Full gap
Seed Treatment	With Imidacloprid @ 2ml/kg seed	No seed treatment	Full gap
Seed Rate	5 kg per hectare	7.5 kg per hectare	Partial gap
Sowing Method	Line Sowing	Broadcasting	Full gap
Dose of Fertilizer	40:20:20 NPK per hectare	58:0:0 NPK per hectare	Full gap
Weed Management	With Pendimethalin @ 2.5 liter/ha	No weeding	Full gap
Plant Protection Measures	Need based chemicals (Chlorpyrifos, Neem oil etc.,)	Indiscriminate usage of chemicals	Partial gap

Table 3. Increase in yield, technology gap, extension gap and technology index of Sesame as influenced by CFLD in Peddapalli District

Crop	Year	Area (hectare)	Yield (quintals per hectare)			% Increase in yield	Quintals per hectare		TI (%)
			Potential	Demonstration	FP		TG	EG	
Sesame	2019-20	20	10	7.81	6.43	21.87	2.19	1.38	21.90
	2020-21	20	10	8.65	7.51	15.30	1.35	1.14	13.50
	2021-22	20	10	8.65	7.51	15.30	1.35	1.14	13.50
Average			10	8.37	7.15	17.49	1.63	1.22	16.30

Table 4. Cost of cultivation, gross returns, net returns and B:C ratio of Sesame under CFLD compared to the farmers practice in Peddapalli District

Crop	Year	Treatments	Cost of cultivation (Rupees per hectare)	Gross return (Rupees per hectare)	Net return (Rupees per hectare)	B:C Ratio
Sesame	2019-20	Demonstration	17600	49920	32320	2.84
		Farmers practice	16300	40960	24660	2.51
	2020-21	Demonstration	20100	45845	25745	2.28
		Farmers practice	19500	39750	20250	2.03
	2021-22	Demonstration	20100	45845	25745	2.28
		Farmers practice	19500	39750	20250	2.03
	Average	Demonstration	19267	47203	27937	2.47
		Farmers practice	18433	40153	21720	2.19

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Acknowledgements: Funding received from ICAR-Agricultural Technology Application Research Institute (Zone-X), Hyderabad under NFSM-Cluster Frontline Line Demonstration (Oilseeds) programme, Ministry of Agriculture and Farmers Welfare, Government of India is duly acknowledged. Authors also thank Dr. (Smt.) B. Neeraja Prabhakar, Hon'ble Vice-Chancellor and Dr. Adapa Kiran Kumar, Director of Extension, SKLTSHU for their constant support and guidance in smooth conducting of this study.

Conflict of interest: The authors declare that there is no conflict of interest exist (both financial and non-financial).

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