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Enhancing Sesame Productivity and Profitability with Cluster Front Line Demonstrations in Andhra Pradesh's Nellore District, India

G. L. Siva Jyothi [a], M. Mallikarjun [a*], K. Kiran Kumar Reddy [a], S. Lokesh Babu [a], V. Tejaswini [a] and D. Vijay Kumar Naik [a]

[a] *Krishi Vigyan Kendra, ANGRAU, Nellore, Andhra Pradesh-524004, India.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Sesame (*Sesamum indicum* L.) is one of the most important oil crops grown in the Nellore district of Andhra Pradesh along with groundnut. Sesame productivity in the district is low and efforts have been made to increase productivity and area by using high-yielding varieties along with integrated crop management (ICM) practices. In the farmer's field, ICM practices like sowing of improved variety (YLM 66), seed treatment, providing sticky traps to monitor sucking pest vectors, application of neem oil at flowering, spraying of monocrotophos at capsule development stage are used. Insect control and carbendazim spray for leaf spot control have been demonstrated. The results showed that in 2021-22 and 2022-23, seed yield improved by 9.9 and 11.2 percent compared to farmers' practices. Economically, demonstration practices have been found to produce higher net profit per

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

hectare over the years compared to farmer practices. In 2021-2022 and 2022-2023, the B:C ratio was 2.76 and 3.08. To increase oilseed production, farmers in Nellore should adopt economically viable techniques based on the technology rate percentage, which ranges from 21.0% to 27.0%.

Keywords: Demonstration; extension gap; technology gap; technology index.

1. INTRODUCTION

Sesame (*Sesamum indicum* L) is designated as the queen of oil seed crop with a diverse utility to human kind. It is one of the oldest crop cultivated. However, this crop is not widely cultivated due to its low yield [1]. The average yield of sesame in India (405 kg/ha) is low compared to other countries in the world. In Andhra Pradesh, sesame is grown on 0.39 lakh ha yielding 0.14 lakh tonnes with an average yield of 343 kg/ha [2]. The low productivity of sesame is mainly due to rainfed cultivation in marginal and peripheral fields under conditions of inadequate management and insufficient production inputs. However, improved varieties and agricultural production techniques are currently being developed for the different agro-ecological conditions of the country, which can increase the productivity of sesame. A well-managed sesame crop can yield 1200-1500 kg/ha irrigated and 800-1000 kg/ha rain-fed [3]. Sesame productivity in the Nellore region is quite low mainly due to lack of quality seeds or improved varieties, inadequate nutrient management and lack of understanding of pest and disease control. The best way to bridge the gap for farmers in Nellore district, Andhra Pradesh and increase sesame production and profitability is to use quality seeds of recommended variety, use recommended fertilizer at the right time and adopt required plant protection measures. against pests and diseases. The main objective of the study was to show and spread awareness about advanced agricultural technologies used by farmers in their fields in various current agricultural scenarios.

2. MATERIALS AND METHODS

In the Nellore district of Andhra Pradesh, 100 front-line demonstrations were organised in irrigated conditions of Podalakur and Varikuntapadu villages in the years 2021-22 and 2022-23. A 0.4-hectare area was used for each demonstration. The ICM practice included sowing of the improved variety (YLM-66), seed treatment with mancozeb, neem oil application at 25-30 DAS, placement of sticky traps to monitor sucking pest vectors, spraying of monocrotophos for insect management and spraying of carbendazim for the control of leaf spot (Table 1). For the demonstrations, red sandy loam soils with low to medium fertility status were used. The pH of the soil varied from 6.5 to 7.4 [4]. At the time of threshing, statistics were recorded for both the farmer's practice and the improved practice in terms of yields The details of sowing and harvesting were displayed in Table 1. Using the method suggested by Yadav et al. [5], the yield gain in demonstrations over farmer's practice was calculated.

2.1 Technology Gap, Extension Gap and Technology Index Estimation

Using the following formula suggested by Samui et al. [6], the technology gap, extension gap, and technology index were estimated.

Technology gap = Potential yield-Demonstration yield

Extension gap = Demonstration yield-Farmers yield

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

2.2 Economic Analysis

Input costs for sesame cultivation include the price of seeds, fertilizer, and pesticides that farmers purchase or get from the KVK, as well as labour costs and other operational expenses that farmers must bear. By translating the produce into money at the time of the demonstration at the going market rate, gross returns were computed. The difference between gross returns and cultivation costs was used to compute net returns. By dividing gross returns by cultivation costs, the Benefit: cost ratio was calculated.

3. RESULTS AND DISCUSSION

3.1 Comparing Production Methods

Farmers evidently did not adopt suggested and upgraded technology, which led to a significant variation in sesame production (Table 1).

Farmers used more seed than the recommended optimal seed rate, which increased the cost of seed input. Farmers also neglected to treat their seeds, which shields emerging seedlings from sucking insect pests that hinder crop emergence and early growth [7] and safeguards seeds against soil- and seed-borne illnesses. Many farmers in the nation are unfamiliar with the practice and do not adhere to it, despite the efforts of Agriculture Scientists and Officials from the line agencies. The findings (Table 1) showed that farmers either did not apply any fertilizers recommended by soil tests or, if they did, applied fertilizer at either a greater or lower dose without top dressing, leading to reduced yields. Sing and Bisen [8] and Singh et al. [9] both reported similar results.

3.2 Yield

Sesame yields in demonstration plots were higher than in farmer's plots. From 9.9 to 11.2% more yield was produced on demonstration plots than on farmer plots. The increased seed output of the demonstration plots was mostly caused by the University's updated set of recommendations, which were implemented under the supervision of KVK, Nellore scientists. YLM-66 use not only increased sesame production but also reduced the incidence of phyllody disease. Sesame output was greatly boosted by the adoption of plant protection methods for vector control of phyllody under CFLDs, the introduction of seed treatment, the best time for sowing, fertilizer application based on soil test results, and the use of fertilizer in comparison to farmers' practices. The yield of the demonstration was obviously higher than that of the farmer's practice under similar climatic conditions. The outcomes of the demonstrations and agro-technologies used in the CFLDs inspired farmers who did not adopt these technologies, and they were willing to apply these cutting-edge technologies in their fields in the future (Table 2). These results supported those by Ratan et al. [10] and Anuratha et al. [11].

3.3 Technology Gap

The technology gap was 338 kg/ha in 2021–22 and 268 kg/ha in 2022–23, respectively (Table 2). The observed technological gap may be attributed to various constraints, including differences in soil fertility levels, moisture availability, the management of insect pests and diseases, and the diverse weather patterns experienced in different locations throughout the crop season. The technology gap reflects the farmers' collaboration in carrying out the CFLDs, therefore the outcomes were favourable. Meena and Singh [12] and Kumar et al. [13] reported similar findings.

3.4 Extension Gap

The difference in yield between the farmer's plot and the demonstration plot is known as the "extension gap." An extension gap of 82 and 98 kg/ha was observed in the years 2021–2022 and 2022–2023, respectively (Table 2). The ANGR Agricultural University's recommended set of practices, along with high yielding cultivars, helped increase yield in demonstration plots. Through the use of various extension methods, farmers must be instructed on the existing extension gaps. The findings of this investigation were in agreement with those of prior studies by Bezbaruah and Deka [14].

3.5 Technology Index

The viability of advanced technology in the fields of farmers is shown by the technology index. The likelihood that technology may cross farmer's land increases with the value of the technology index falling. The technology index reached its highest value of 27.0 percent in 2021–2022 and its lowest value of 21.0 percent in 2022–2023 (Table 2). As many farmers rely on canal irrigation, the area's irrigation potential as well as the erratic weather patterns in the demonstration area throughout the research years contributed to this discrepancy in the technology index. The fact that the technology index fell over the course of the study's years further demonstrated the viability of the technologies shown in frontline demonstrations. Identical results in lowering the technology index were also noticed by Mishra et al. [15].

3.6 Economics

Gross returns, net returns and benefit: cost ratio were higher in demonstrated plots compared to farmer's practice for both years of the demonstration, indicating higher profitability, according to the economic research. The benefit-cost ratio of demonstration plots was 2.89 in 2021–2022 and 3.34 in 2022–2023, respectively (Table 3). Therefore, by using improved sesame production techniques, the agricultural community in the Nellore district can raise its potential output and financial gains. These findings concurred with those made earlier by Rao et al. [16] and Kaur et al. [17].

Table 1. Production techniques used in the sesame crop under the cluster front line demonstration and farmers' practices in Andhra Pradesh's Nellore district

Parameter	Demo Practice	Farmers Practice
Variety used	Sarada (YLM 66)	Varaha (YLM 11)
Land Preparation	Two Ploughings	One or two ploughings
Seed Rate adopted	5-6 kg/ha	8-10 kg/ha
Seed Treatment followed	Mancozeb @ 3.0 g/kg seed	No seed Treatment
Sowing Method adopted	Line sowing	Line sowing
Optimum time of sowing	I FN of December to 1FN of January	II FN of December to 1FN of January
Fertilizer Applied	40:20:20 (Based on soil test values)	High dose or low dose of fertilizers
Fertilizer application method	Line	Line
Weed management practices adopted	Pre emergence application of pendimethalin along with one need-based hand weeding	Pre emergence application of pendimethalin along with one need-based hand weeding
Plant protection measure adopted	Application of neem oil during flowering + Sticky trap placement to detect sucking pest vectors + Spraying Monocrotophos at 1.6 ml per litre of water during the pod development stage for insect control + Carbendazim @ 2 g/lit spraying for leaf spot control.	There will be no pesticide application for YMV vector control, and chemical management will be based on necessity.

Table 2. Technology gap, extension gap and technology index of sesame crop in Nellore district of Andhra Pradesh

Year	Area (ha)	No of FLDs	Variety	Yield (kg/ha)			Percent increase over Farmers practice (%)	Technology Gap (kg/ha)	Extension Gap (kg/ha)	Technology Index (%)
				Potential Yield	Demonstrated Practice	Farmer's Practice				
2019-20	20	50	YLM-66	1250	912	830	9.9	338	82	27.0
2020-21	20	50	YLM-66	1250	982	884	11.2	268	98	21.0

Table 3. Economic analysis of CFLD's on sesame crop in Nellore district of Andhra Pradesh

Year	Cost of cultivation (Rs/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		Additional cost of cultivation (Rs/ha)	Additional net returns (Rs/ha)	Benefit: cost Ratio	
	Farmers Practice	Demo Practice	Farmers Practice	Demo Practice	Farmers Practice	Demo Practice			Farmers Practice	Demo Practice
2021-22	25800	24600	74784	68060	48984	43460	1200	5524	2.89	2.76
2022-23	26480	25830	88380	79560	61900	53730	650	8170	3.34	3.08

4. CONCLUSION

By applying suggested practices and advanced technologies, the output of sesame seeds in Andhra Pradesh's Nellore area can be increased. The use of recently released and improved varieties, the application of recommended seed rates for the best plant stand, fertilizer management based on soil test results, and plant protection practices carried out in accordance with the approved package of practices can all be attributed to increases in the production of sesame. Farmers were urged to adopt the remedies offered since the demonstrations were financially viable. Thus, it can be concluded that scientific interventions in the farmer's field can decrease technological and extension gaps, leading to an improvement in sesame production and productivity in the Nellore district of Andhra Pradesh.

DISCLAIMER

This paper is an extended version of previously published article of the same author in the J Krishi Vigyan 2022,10(2):125-130. This document is available in this link: http://iskv.in/wp-content/themes/iskv/volume-pdfs/975b1775e7e6b0b6b31f38ac4f6ca4bcpages_127-132.pdf

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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