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Research Article

STUDY ON PRODUCTIVITY AND PROFITABILITY OF SUNFLOWER THROUGH CLUSTER FRONT LINE DEMONSTRATION UNDER IRRIGATED CONDITIONS OF PRAKASAM DISTRICT, ANDHRA PRADESH

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Abstract: Cluster Front Line demonstrations (CFLDs) is a unique approach where, the scientists are directly involved in planning, execution, and monitoring the demonstrations, so there is a direct connection between researchers and farmers. The present study was conducted to assess the impact of frontline demonstrations of sunflower crop in the Prakasam district of Andhra Pradesh state. Sunflower is a highly nutritious oil seed crop and is widely appreciated as health food as well as high return crop. The production potential of demonstration and economic benefit can judge by conducting the cluster Front line demonstrations (CFLDs) at farmers fields. Study revealed that improved cultivation practices comprised under CFLDs *viz*., recommended hybrids, seed rate, timely sowing and plant protection technology resulted in increase in yield in gram crop over the check plots. The improved technologies gave higher yields and recorded a yield of 1452 and 1380 kg ha-1 sunflower yield during 2019-20 and 2020-21, respectively which was 38.28 and 45.26 percent higher compared to prevailing farmers practice. Average seed yield under improved practice (IP) (1416 kg ha-1) was 41.60% higher over farmer's practice (FP). The technology gap and extension gap were in the range of 48 to 120 kg ha-1 and 402 to 430 kg ha-1 respectively. Technology index value varied from 3.2 % to 8.0% during the study period. The benefit cost (B: C) ratio was 2.23 to 2.84under demonstration, while it was 1.62 to 1.51 under control plots. The average B: C ratio under IP (2.53) was 40.5% higher over FP.

Keywords: *Frontline demonstration, Sunflower, Technology Gap, Extension Gap, Technology Index, B:C Ratio*

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Introduction

Sunflower is an important versatile oilseed crop which can be grown in any season of the year and it is rich in poly unsaturated fatty acid (PUFA) as well as high vitamin E content. In India, it is cultivated over an area of about 2.8 lakh hectares with a production of 2.5 lakh tonnes and productivity of 905 kg per hectare (Agricultural Statistics at a glance-2022) [1]. The cultivation of sunflower is largely confined to southern parts of the country comprising the states of Karnataka, Maharashtra, Tamil Nadu, and Andhra Pradesh. In Andhra Pradesh, it is cultivated in 2.0 lakh hectares with a production of 1.0 lakh tonnes and productivity of 602 kg ha^{-1}. The high quality of sunflower oil makes it a promising edible oilseed crops and Due to its short duration, higher yield potential, and wide adaptability to different agro-climatic regions, it is well-suited for cropping systems [2]. It is an exhaustive crop and responds well to the fertilizers. The crop gain good popularity among the growers because of its attractive price and demand for its oils. It is an energy rich oilseed crop, so nutrient management play important role that greatly affect the growth and yield of sunflower. At present, the oilseeds production in India is not meeting the domestic demands and now dependent on imports. The continued rise of oil seed imports is a major concern today. The use of available techniques and their actual adopting technology by farmers is a significant gap in sunflower production and its actual application by farmers and the higher incidence of pest attacks result in a further decrease in yield, which can be seen in the poor yield of sunflower crops on the farmer's field [3]. There is a tremendous opportunity for increasing the productivity of sunflower crop by adopting the improved technologies. To demonstrate the scientific cultivation of sunflower front-line demonstrations should be laid out at farmer's field.

The basic objective of FLDs is to demonstrate the proven technology at farmer's field [4]. In order to promote oilseed cultivation, the Government of India has devised a programme in cluster mode under National Food Security Mission through KVKs [5]. The main objective of CFLD is to demonstrate production technology and its management practices on farmer's field under different farming situations. These demonstrations are carried out under the supervision of agricultural scientists and feedbacks from the different farmers must be generated on the demonstrated technology. Krishi Vigyan Kendra, a science-based institution, plays a vital role in bringing research scientists and farmers together. The main aim of Krishi Vigyan Kendra is to reduce the time lag between generations of technology at the research institution and its transfer to the farmers for increasing productivity and income from the agriculture and allied sectors on sustained basis [6]. Krishi Vigyan Kendra's are grass root level organizations meant for application of technology through assessment, refinement and demonstration of proven produce technologies under different micro farming situations in a district. Keeping the importance of CFLD the KVK, Darsi, Prakasam district conducted demonstrations on sunflower at farmer's field. The purpose of this study is to increase the per capita availability of oilseeds and to popularize new production technologies in the agricultural community by promoting the production of sunflower crops through improved practices in the Prakasam district of Andhra Pradesh.

Materials and Methods

Cluster frontline demonstrations were conducted by the Krishi Vigyan Kendra, Darsi, Prakasam district of Andhra Pradesh in *rabi* season in the farmer's fields

Table-1 Comparison between demonstration packages and existing practice under sunflower CFLDs

SN		Sunflower	
	Particulars	Demonstration package	Farmers practice
1	Farming situation	Irrigated	Irrigated
2	Hybrid	NDSH-1012	KBSH-44
3	Time of sowing	First week of November	First week of November
4	Spacing	60 cm x 30 cm	60 cm x 30 cm
5	Seed treatment	Imidacloprid @ 5.0 ml /kg seed	Not adopting
6	Fertilizer dose	75:90:30 kg N:P:K ha^{-1} + Sulphur @ 20 kg/ha (N in form Urea and P inform of SSP)	Farmers are using DAP only
7	Biofertilizers application	Seed inoculation with Rhizobium 5 g and soil application of biofertilizer consortium @ 12.5 kg ha^{-1}at time of sowing	Not adopting
8	Weed management	Pre-emergence application of Pendimethalin @ 1.5 lit ha^{-1} at 2 DAS	Manual weeding
9	Plant protection	Need based application	Non judicious use of pesticides

Table-2 Seed yield, technology gap, extension gap, technology index and B: C ratio of sunflower under CFLD

Year	Seed yield (kg/ha)			% increase over control	Technology gap	Extension gap	Technology index	B:C ratio	
	Potential	Demo	Control		(kg/ha)	(kg/ha)	(%)	Demo	Check
2019-20	1500	1452	1050	38.28	48	402	3.20	2.84	1.62
2020-21	1500	1380	950	45.26	120	430	8.00	2.23	1.51
Mean	1500	1416	1000	41.60	84	416	5.60	2.53	1.80

during 2019-20 and 2020-21 with evaluation the performance of new varieties and package of practices on production and productivity of sunflower. A group of farmers were identified based on their participation and feedback received during the preliminary survey and interactive meeting. All 50 farmers from Giddaluru village were selected under Cluster front line demonstration. All 50 demonstrations in 20 ha area were conducted by the active participation of farmers with the objective to demonstrate the improved technologies of pulses production potential in the village. A total area of 20 hectare in every year was fixed for the demonstration of technologies in sunflower along with farmers practice as control plot. Before presenting the cluster frontline demonstrations (CFLD's), a personal discussion with selected farmers is conducted to assess the gap in adoption of recommended technology. The awareness programme (preseason training) was designed to select farmers and provide skilled development in understanding detailed technological interventions with improved packages and practices for successful cultivation. Critical inputs for the technologies to be demonstrated [Table-1, 2] were distributed to the farmers after the training like improved high yielding variety, recommended chemicals and the KVK scientist manages literature, regular visits, monitoring, and pest and disease advisory services for demo farmers. At the end, a field day was held that involved demonstrations from farmers, other farmers in the village, scientists from universities, ATARI Hyderabad and officials from Department of Agriculture and local extension functionaries to demonstrate the superiority of the technology for each crop. Crop yield was recorded from the demonstration and control plots for the crops at the time of harvest. The most effective way to achieve this is to demonstrate the recommended improved technology on the farmer's fields through front-line demonstrations with aim is to determine the cost of input and monetary returns for front-line demonstration and farmer methods and by examining farmers' methods, we can determine the difference in yield between farmer practices and front-line demonstrations. The basic information were recorded from the farmer's field and analyzed to comparative performance of cluster frontline demonstrations (CFLD's) and farmer's practice.

The present study was carried out by Krishi Vigyan Kendra, Darsi, Prakasam district and All 50 farmers from two Adopted villages were selected under Cluster front line demonstration. The soil of FLD's field was light soil and the PH of soil is near about 7.0- 7.5. The improved technology such as improved varieties, treatment of seed, Plant Protection measures was maintained during period of research study. Seed treatment is done with Imidachlropid 5 ml/kg of seed. The seed rate of sunflower is kept 5 kg ha^{-1} in demonstration plots. The sowing of sunflower crop seed was done during last week of October to first of week November. The rows were weeded by two hands at 30-35 and 55-60 days after sowing. Through personal contact with farmers at the farmer's field, the data was collected and then tabulated and analyzed to discover the findings and conclusions. The statistical tool as the percentage used in the present study for the data analyzed. The formulas were used to calculate the extension gap, technology gap, and technology index [7] as mentioned below:

Percent increase yield = Demonstration yield - Farmers yield x 100 / Farmers yield
Technology gap = Potential yield - Demonstration yield
Extension gap = demonstration yield-farmer's practice yield
Technology index = Potential Yield-Demonstration yield x 100 / Potential yield

Results and Discussion

The difference between the demonstration package and existing farmers practices are given in [Table-1].

Seed Yield

The data of [Table-2] revealed that the yield of the hybrids ndsh-1012 performed well at the farmer's field in demonstrated plot as compared to farmer's practices (check). It is evident from [Table-1] that indicated that the cluster front line demonstration has given a good impact over the farming community of Prakasam district as they were motivated by the new agricultural technologies applied in the demonstrations. Results of cluster frontline demonstrations indicated that the cultivation practices comprised under CFLD viz., use of improved hybrid (NDSH-1012), balanced application of fertilizers (N: P: K @ 75:90:30:25 kg NPKS ha^{-1}, line sowing, timely weed management and control wilt and head borer through fungicide and insecticide, produced on an average 1452 and 1380 kg ha^{-1} sunflower yield during 2019-20 and 2020-21, respectively which was 38.28 and 45.26 percent higher compared to prevailing farmers practice [Table-2]. Average seed yield in the demonstration plot (1416 kg ha^{-1}) was 41.60 per cent higher over control plot (1000 kg ha^{-1}). Highest increase in seed yield in the demonstration plot was recorded during 2020-21 (45.26%), while the lowest yield increase (38.28%) was observed in 2019-20. The results indicated that the front-line demonstrations have given a good impact over the farming community of Prakasam district as they were motivated by the new agricultural technologies applied in the CFLD plots [Table-1]. This finding is in corroboration with the findings of Singh, *et al*., (2014) [2], Bharati, *et al*., (2018) [8], Arora (2015) [9], Solanki and Nagar (2020) [10] and Ajrawat, *et al*., (2013[11].

Technology gap

The technology gap in the demonstration ranged from 48 to 120 kg ha^{-1} yields over potential yield [Table-2]. The observed technology gap may be due to the difference in soil fertility, salinity, erratic rainfall, and other weather conditions in the area. In order to minimize the technology gap for yield level in different situations, hybrid-wise location-specific recommendations seem to be necessary. Similar findings were recorded by Bharati, *et al*., (2018) [8], Arora (2015)[9] and Singh, *et al*., (2000)[12].

Extension gap

The extension gaps ranged from 402 to 430 kg ha^{-1} during the period of demonstration emphasized the need to educate the farmers through various means for the adoption of improved agricultural production technologies to reverse

this trend of wide extension gap. More and more use of latest production technologies with high yielding variety will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinue the old technology and to adopt new technology [Table-1]. This finding is in corroboration with the findings of Bharati, *et al*., (2018) [8], Arora (2015)[9] and Sowmya, *et al*., (2022)[13].

Technology Index

The technology index shows the feasibility of the evolved technology at the farmer's fields and the lower the value of technology index more is the feasibility of the technology [13, 14]. The average technology index was 5.60 %, while 8.00 % maximum technology index was during 2020-21 but lowest 3.20 % was during 2019-20 [Table-2].

B: C ratio

The finding clearly indicates the positive effects of CFLDS over the existing farmer's practices towards the yield enhancement of sunflower. Benefit- cost ratio was recorded to be higher under demonstration against control during all the years of study. The average B: C ratio under demonstration (2.53) was 40.5% higher over farmer's practices [15] and [16].

Conclusion

The findings of front-line demonstrations showed that the yield of sunflower can be enhanced by 38.28 % to 45.26% with the use of improved technologies in Prakasam district. Higher benefit cost ratio has confirmed the economic viability of the demonstration and the adoption of improved technologies by the farmers. These demonstrations create a confidence and friendly relationship between farmers and scientists. The participated farmers in CFLDs act as source of information and improved seeds for larger spreading of the improved hybrid of sunflower for other adjoining areas of farmers. The improved technologies are very important for increasing the yield of sunflower crop and other crops. It will also help in disseminating other technical information by extension agencies for the benefit of the farmers.

Application of research: The current study was conducted to increase sunflower productivity and determine the effect of CFLDs on closing the yield gap in terms of the technology gap, extension gap, and technology index considering the aforementioned problems.

Research Category: Cluster Frontline Demonstrations

Abbreviations: CFLD-Cluster Frontline Demonstrations

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Study area / Sample Collection: ICAR-Krishi Vigyan Kendra, Drasi, 523247, Andhra Pradesh

Cultivar / Variety / Breed name: NDSH-1012

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
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