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Impact of Frontline Demonstration on Adoption of Improved Practices of Safflower (*Carthamus tinctorius* L.)

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ABSTRACT
The safflower crop is usually grown in the rabi season from October to November, generally as an intercrop with cereals such as wheat and sorghum. It is one of the most important crops for marginal farmers. Traditionally it is grown as a rain-fed crop on residual soil moisture. To convince benefit of improved technologies released by Agricultural Universities, Frontline demonstrations (FLD) were conducted during 2016-17 at AEEC, Lingsugur in Raichur district, Karnataka state. Twenty five farmers were selected and demonstration being done in 0.4 ha each, totally 10 ha was covered with local control. The improved technologies consisting of use of modern variety (PBNS 12), seed treatment with Azospirillum, PSB and Trichoderma, balanced nutrient application and integrated pest management. The demonstration plot was compared with local control. Demonstration results revealed that there was 13.68 per cent increase in grain yield over local which resulted in higher economic returns of Rs 23,005 per ha.
Key words: *Safflower, ICM, FLD*

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INTRODUCTION

The extent of adoption of improved agricultural technologies is a crucial aspect under innovation diffusion process and the most important for enhancing agricultural production at a faster rate. Large number of technologies evolved in the field of agriculture is not being accepted and adopted to its fullest extent by the farmers. The gap between recommendations made by the scientists and actual use by farmers is frequently encountered. With the start of technology mission on oilseeds, frontline demonstration on oilseed crops using new crop production technology was started with the objectives of showing the production potential of the new technologies under real farm situation over the locally cultivated oilseed crops. The main objective of FLD is to demonstrate the crop production technologies and management practices in the farmers' fields under different agro-climatic regions and farming situations. The Agriculture Extension Education Centre has followed the concept of FLD in true spirit and conducted large number of demonstrations in different villages of Raichur district in collaboration with ICAR- IIOR, Telengana. Oilseeds are next only to food grains in acreage, production and value & form an essential part of human diet. Groundnut, rapeseed and mustard, soybean, sunflower, sesame, safflower and niger are the major source of edible oils [5].

Safflower (*Carthamus tinctorius* L.) is an important oilseed multipurpose rabi crop [4] in semi arid areas of India, Iran, Egypt, Pakistan and Mediterranean. It is used mainly as a source of dye and oil. Safflower is now mainly grown in India for its much-valued edible oil. Safflower produces oil rich in polyunsaturated fatty acids (linoleic acid 78 per cent), which play an important role in reducing blood cholesterol level and is considered as a healthy cooking medium. Safflower oil is suitable where high level of stability at low temperature is required as in frozen desserts. It is also used in infant foods and liquid nutrition formulations. Safflower is a drought tolerant oil seed crop and has high adaptability to low moisture conditions. Therefore, its production all over the world is mainly confined to areas with limited water. India is the largest producer of safflower (2.0 lakh tonnes) in the world with highest acreage (4.3 lakh hectares) but with an average productivity of only 465 kg/ha. Poor crop management under input-starved conditions is the most important reason for such low yields per hectare. It is mainly grown in Maharashtra, Karnataka and parts of Andhra Pradesh, Madhya Pradesh, Orissa, Bihar, etc. Maharashtra

and Karnataka are the two most important safflower growing states accounting for 72 and 23 per cent of area and 63 and 35 per cent of production, respectively [4]. With these keeping in view frontline demonstration was conducted with objective is to enhance the productivity of safflower in farmers field through front line demonstrations.

MATERIALS AND METHODS

The study was conducted at AEEC, Lingsugur in Raichur district in Karnataka state in farmers fields during 2016 – 17 with objective to popularize improved technologies for productivity enhancement of safflower through FLDs. Twenty five FLDs were conducted in farmer's field. To diffuse safflower productivity enhancement technologies on campus and off campus trainings were conducted. Then improved practices were demonstrated with the following technologies

1. Improved variety- PBNS-12
2. Seed treatment with PSB (500 g), *Azospirillum* (500 g) and *Trichoderma* (5 g per kg of seeds)
3. Balanced nutrient application (FYM 10 t/ha, Vermicompost 1 t/ha, 30 kg N, 30 kg P_2O_5, 16 kg K_2O, 12 S and 6 kg Zinc sulphate)
4. Integrated pest management(Timely spray of insecticides)

In check plot, farmers were applied in their regular practices (local variety, 25 Kg N and 58-60 kg P_2O_5). The safflower crop was sown during rabi 2016-17 in an adequate soil moisture condition. The crop was harvested at maturity stage. For the study, technology gap, extension gap and technology index were calculated as follow:

Technology gap= Potential yield – Demonstration yield

Extension gap = Demonstration yield – Farmers yield

Technology index (%) = (Technology/Potential yield) * 100

RESULT AND DISCUSSION

The data were subjected to analysis, technology gap, extension gap and technology index was calculated as per the formula and economic analysis was done as per procedure and data were presented in the table 1 and 2.

Table 1: Grain yield of Safflower , technology gap, extension gap and Technology index as influenced by improved practices

Farmer No.	Yield (Kg/ha)		% increase in yield over FP	Technology gap (Kg/ha)	Extension gap (Kg/ha)	Technology index (%)
	Demo lot	FP				
1	747	650	14.92	103	97	12.12
2	789	658	19.91	61	131	7.18
3	698	590	18.31	152	108	17.88
4	754	670	12.54	96	84	11.29
5	745	690	07.97	105	55	12.35
6	731	658	11.09	119	73	14.00
7	659	580	13.62	191	79	22.47
8	736	650	13.23	114	86	13.41
9	758	650	16.62	92	108	10.82
10	752	684	09.94	98	68	11.53
11	679	597	13.74	171	82	20.12
12	697	587	18.74	153	110	18.00
13	668	586	13.99	182	82	21.41
14	679	620	09.52	171	59	20.12
15	692	583	18.70	158	109	18.59
16	656	590	11.19	194	66	22.82
17	747	640	16.72	103	107	12.12
18	795	695	14.39	55	100	6.47
19	729	657	10.96	121	72	14.24
20	739	650	13.69	111	89	13.06
21	674	620	08.71	176	54	20.71
22	691	620	11.45	159	71	18.71
23	683	580	17.76	167	103	19.65
24	718	635	13.07	132	83	15.53
25	757	680	11.32	93	77	10.94
Average	**719**	**633**	**13.68**	**131**	**86**	**15.42**

The average safflower yield in FLD plot was 13.68 per cent higher than the farmers practice field. The higher yield of safflower in FLD was mainly attributed to the adoption of improved technologies. Safflower variety PBNS-12 is potential yielder than local control and having moderate resistance to pests. Seed treatment with bio-inputs enabled to mobalise nutrients from native soil nutrients. Seed treatment with Trichoderma helped the crop to resist against diseases. The technology gap in the demonstration yield over potential yield was 131 kg per ha. The technological gap may be attributed to the dissimilarity in the soil fertility status and weather conditions. The extension gap of 86.12 kg per ha was noticed. This emphasized the need to educate the farmers through various means for the adoption of improved agricultural 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. The technology index shows the feasibility of the evolved technology at the farmer's fields and lower value of technology index more is the feasibility of the technology. In this demonstration noticed 15.42 per cent technologies index, which indicates proper adoption of improved technologies. Similar results were also recorded by Anuja *et al.* [1] in different oilseeds crops, Balai *et al.* [2] in rapeseed mustard and Berjesha *et al.* [3] in Brassica.

The inputs and outputs prices of commodities prevailed during the study demonstrations were taken for calculating gross return, cost of cultivation, net return and benefit cost ratio (Table 2). The cultivation of safflower with improved technologies gave higher net return of Rs 10955 as compared to farmer's practices. The benefit cost ratio of safflower in FLD was 1.81. This may be due to attributed higher yields obtained under improved technologies compared to local check. The finding is in corroboration with the findings.

Table 2: Gross return, cost of cultivation, net return and B : C ratio

Sl.No	Gross return (Rs/ha)		Cost of cultivation (Rs/ha)		Net Return (Rs/ha)		B:C	
	Demo	FP	Demo	FP	Demo	FP	Demo	FP
1	23904	20800	12050	11200	11854	9600	1.98	1.86
2	25248	21056	12050	11200	13198	9856	2.10	1.88
3	22336	18880	12050	11200	10286	7680	1.85	1.69
4	24128	21440	12050	11200	12078	10240	2.00	1.91
5	23840	22080	12050	11200	11790	10880	1.98	1.97
6	23392	21056	12050	11200	11342	9856	1.94	1.88
7	21088	18560	12050	11200	9038	7360	1.75	1.66
8	23552	20800	12050	11200	11502	9600	1.95	1.86
9	24256	20800	12050	11200	12206	9600	2.01	1.86
10	24064	21888	12050	11200	12014	10688	2.00	1.95
11	21728	19104	12050	11200	9678	7904	1.80	1.71
12	22304	18784	12050	11200	10254	7584	1.85	1.68
13	21376	18752	12050	11200	9326	7552	1.77	1.67
14	21728	19840	12050	11200	9678	8640	1.80	1.77
15	22144	18656	12050	11200	10094	7456	1.84	1.67
16	20992	18880	12050	11200	8942	7680	1.74	1.69
17	23904	20480	12050	11200	11854	9280	1.98	1.83
18	25440	22240	12050	11200	13390	11040	2.11	1.99
19	23328	21024	12050	11200	11278	9824	1.94	1.88
20	23648	20800	12050	11200	11598	9600	1.96	1.86
21	21568	19840	12050	11200	9518	8640	1.79	1.77
22	22112	19840	12050	11200	10062	8640	1.84	1.77
23	21856	18560	12050	11200	9806	7360	1.81	1.66
24	22976	20320	12050	11200	10926	9120	1.91	1.81
25	24224	21760	12050	11200	12174	10560	2.01	1.94
Average	**23005**	**20250**	**12050**	**11200**	**10955**	**9050**	**1.91**	**1.81**

CONCLUSION

The study has shown that the FLD programme was found useful in enhancing the knowledge and adoption level of farmers in various aspects of safflower production technologies. FLD practices created great awareness and motivated the other farmers to adopt appropriate safflower production technologies. The area of high yielding variety of safflower has increased which will spread in the whole taluk including the adjoining area. The selection of critical input and participatory approach in planning and conducting the demonstration definitely help in the transfer of technology to the farmers.

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