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Impact of Sunflower Frontline Demonstrations in Akola District of Maharashtra

R. Venkattakumar[1], M.Padmaiah[2], C.Sarada[3], A.M.Mahajan[4], M.K.Moon[5] and S.N.Deshmukh[6]

ABSTRACT

To assess the determinants of technology adoption by sunflower *(Helianthus annuus L.)* farmers towards improved sunflower production technologies, a study was conducted in Akola district of Maharashtra during September 2009. The assessment was done on a comparative basis between 60 farmers who participated in the Front Line Demonstrations (FLDs) organized by Crop Research Unit of Dr. Panjabrao Deshmukh Krishi Vidyapeeth (PDKV), Akola, Maharashtra (FLD farmers) and farmers who did not participate in the FLD programme but belong to the same villages wherein FLDs were organized (non-FLD farmers). The respondents were selected through multi-stage random sampling procedure. There was highly significant difference between FLD and non-FLD respondents with respect to their adoption behaviour and sunflower productivity. There was significant difference among non-FLD farmers with small, medium and large size of land holdings with respect to their adoption behaviour and sunflower productivity, while there was no such difference among the FLD farmers. Most of the non-FLD farmers had low to medium level of sunflower productivity, while most of the FLD farmers had medium to high level of sunflower productivity. Overall, there was 11% mean seed yield increase obtained by the FLD farmers over that of non-FLD farmers with Rs.2254/ha additional net returns. The personal, socio-economical, biotic and abiotic determinants of sunflower production and perceived information needs were assessed and the strategies were suggested for improving the sunflower production scenario in the study area.

INTRODUCTION

Sunflower (*Helianthus annuus* L.) has been grown worldwide, in an area of 23.7 million ha, with a production of 31.3 million tonnes and productivity of 1,322 kg/ha (Hegde and Damodaram, 2007). In India, the crop has been cultivated in an area of 1.9 million ha, with a production of 1.5 million tonnes and productivity of 765 kg/ha (DES, Ministry of Agriculture 2008-09). Sunflower cultivation in India has mainly been confined to Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu. Sunflower cultivation in marginal and sub-marginal lands with poor management practices, monocropping, poor nutritional supplementation, vulnerability of the crop to fungal and viral pathogens, lack of availability of quality seed materials were the factors that contributed for stagnation of area, production and productivity of the crop in India. AICRP (Sunflower) researches have been working for harnessing the productivity potential of sunflower, which can be easily replicated under real farm situations.

Crop research unit at Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, is one of such AICRP centres that have been involved in developing eco-region specific improved sunflower production technologies and transferring such technologies to the sunflower farmers from 1990-91 onwards, the centre had organized 398 out of the 469 FLDs allotted with 85% implementation rate. The concurrent results of such FLDs showed that there exists a huge gap between potential yields of the crop when improved technologies were adopted and the actual yield obtained by general sunflower farmers whose adoption towards improved technologies was generally low (Venkattakumar and Hegde, 2009). Hence, an *ex-post-facto* impact study was conducted to assess the impact of sunflower FLDs with an improved production technologies on enhancing productivity and profitability of sunflower as a long-term effect and in turn on increasing the area and production of the crop in Akola district of Maharashtra, with the following objectives:

1. To assess the adoption behaviour of FLD and non FLD sunflower farmers and the resultant sunflower productivity in Akola district.
2. To delineate the demographic, biotic and abiotic determinants affecting the adoption behaviour and the resultant sunflower productivity.
3. To suggest strategies for improving sunflower production scenario in Akola district.

METHODOLOGY

The *ex-post-facto* impact study was conducted in Akola district of Maharashtra in September 2009. The impact assessment was done on comparative basis between FLD farmers and non-FLD farmers. A total of 60 each FLD and non-FLD farmers were selected as respondents based on simple random sampling procedure. The respondents were belonging to villages of Akola (60), Buldana (30) and Amaravathi (30) divisions,

[1, 2 & 3] Directorate of Oilseeds Research, Rajendranagar, Hyderabad, Andhra Pradesh, [4, 5 & 6] Crop Research Unit (OS), PDKV, Akola, Maharashtra Corresponding author's email: Kumar_4173@rediffmail.com

wherein the FLDs were organized. The respondents were selected based on the criteria that they had involved in sunflower FLDs or cultivation during last 4-5 years, so that they can recall the production constraints they encountered. Post-survey stratification was one to categorize the farmers into small (with farm size of ≤ 2 ha), medium (with farm size of 2-5 ha) and large (with farm size of ≥ 5 ha) using percentage analysis. Information pertaining to the demographic variables of the respondents; their adoption behaviour towards improved sunflower production technology, cost of sunflower cultivation and resultant sunflower productivity pertaining to the previous year; perceived production constraints and training needs of the respondents based on their overall experience were collected through personal interview method in a structured data collection tool. Apart from these primary data, secondary data on area ('000 ha), production ('000 t) and productivity (kg/ha) of sunflower in Akola district during 1994-95 to 2007-08 were compiled (Damodaram and Hegde, 2007, Department of Agriculture, Maharashtra 2009) to measure the temporal and spatial spread of the crop in the study area as an overall impact. The collected data were coded, tabulated and analyzed. The adoption behaviour of the respondents was measured by assigning unit score towards adoption of each recommended technology. Mean and standard deviation (SD) measures were used to assess the level of adoption behaviour and sunflower productivity. Significance of difference between FLD and non-FLD farmers with respect to their adoption behaviour and sunflower productivity was assessed through Mann-Whitney U (M-W U) test. Kruskal Wallis (K-W) test was done to find out the significance of difference between three categories of FLD and non-FLD farmers with respect to their adoption behaviour. Rank based quotient (RBQ) analysis (Shenoy *et al.*, 2006) was used to ascertain and prioritize the perceived production constraints and training needs of the respondents.

RESULTS AND DISCUSSION

Comparative assessment of adoption behaviour and sunflower productivity

The M-W U test implied that there was highly significant difference between FLD and non-FLD respondents for their adoption behaviour (Table 1). Similar difference was observed between the respondents from irrigated and rainfed situations. Better awareness and experience of the FLD farmers over the non-FLD farmers with respect to improved sunflower production technologies were occurs perhaps due to frequent contact of FLD farmers with researchers and development departmental officials and specialized on-campus and on-farm training on sunflower production technology received by the FLD farmers. A rainfed situation bring uncertainly with certain amount of risk factors like severe incidences of insect-pests and diseases, failure of monsoon and unseasonably heavy rains etc. to cultivation of any crop and to sunflower also. Hence the usual tendency of sunflower farmers to invest comparatively less under rainfed situations resulted in significant difference between adoption behaviour of respondents from rainfed and irrigated situations. The highly significant difference between FLD and non-FLD farmers as well as between respondents from irrigated and rainfed situations resulted in highly significant difference in the resultant sunflower productivity also.

The results of K-W test revealed that most of the FLD (85%) and non-FLD farmers (90.0%) had medium to large size land holdings (Table 2). There was no significant difference among FLD farmers with small, medium and large size of land holdings with respect to their adoption behaviour towards improved sunflower production technologies. Again, the better awareness and experience of the FLD farmers for improved sunflower production technologies irrespective of size of land holdings brought such results. This non-significant difference observed among FLD farmers with small, medium and large size of land holdings with respect to their adoption behaviour resulted in non-significant difference in sunflower productivity also. However, it could be witnessed from Table 2 that there was highly significant difference among non-FLD farmers with small, medium and large size of land holdings for their adoption behaviour towards improved sunflower production technologies. This kind of difference had resulted in significant difference in the sunflower productivity also. Difference among the three categories of farmers in awareness and lack of conviction towards the recommended sunflower production technologies might have brought such results.

Most of the FLD farmers with small, medium and large size of land holdings had medium to high level of sunflower productivity (Table 3). However, most of the non-FLD farmers with small, medium and large size of land holdings had low to medium level of sunflower productivity. The better adoption behaviour of the FLD farmers over the non-FLD farmers with respect to improved sunflower production technologies irrespective of their size of land holdings might have brought the resultant medium to high level of sunflower productivity. The seed yield increase experienced by the FLD farmers was 5 and 7% over that of non-FLD farmers at rainfed and irrigated situations respectively, at Akola division (Table 4). The additional net returns accrued were Rs.1486/ha

and 1,522/ha respectively, at rainfed and irrigated situations of the division. Here, the overall mean seed yield increase of FLD farmers over that of non-FLD farmers was 6% with Rs. 1,519/ha additional net returns. Under rainfed situations of Buldana division, the seed yield increase was 19% with Rs. 3,510/ha additional net returns. In Amaravathi division, the seed yield increase experienced by FLD farmers was ranged from 4 and 13% at irrigated and rainfed situations respectively, with corresponding additional net returns of Rs. 2,418/ha and Rs. 1,734/ha. Here, the overall mean seed yield obtained was 9%, and the additional net returns achieved Rs.1734/ha. Across the divisions and situations, an increase of 11% mean seed yield increase was obtained by the FLD farmers over that of non-FLD farmers with Rs.2254/ha additional net returns.

Demographic, biotic and abiotic determinants of sunflower production and perceived training needs

Correlation between demographic variables of the overall respondents and dependent variables implied that the 'number of training programmes' attended by the respondents, 'contact with researchers' and 'contact with extension agency' had highly significant and positive relationship with both adoption and sunflower productivity experienced by the respondents. However, the variable 'age' had negative and highly significant relationship with sunflower productivity experienced by the respondents. These results implied that transfer of technology programmes of extension agencies and research organizations targeting young sunflower growers as contact farmers might bring desirable results in influencing the adoption behaviour of respondents in the study area and the resultant sunflower productivity. RBQ analysis on the perceived production constraints of the respondents indicated that high cost of sunflower seeds, non-availability of quality seeds of the improved cultivars, damage due to unseasonal rains and lack of irrigation facilities were the major production constraints with RBQ values more than that of mean RBQ (Table 5). These results indicate the urgent need for making the seeds of improved sunflower cultivars pertaining to public sectors penetrate the seed chain through appropriate and effective strategies and the need for developing and popularizing micro-irrigation technology for sunflower. Similarly, information on thinning and maintaining optimum plant population, improved sunflower cultivars and integrated nutrient management were the major training needs with RBQ more than the mean RBQ value. These training needs are to be focused during the training programmes targeting both sunflower farmers and the extension personnel.

Analysis of the secondary data relating to area ('000 ha), production ('000 t) and productivity (kg/ha) of sunflower in Akola district during 1994-95 to 2004-05, indicated that sunflower area declined by 6.3 times and production by 7.7 times (Fig.1). This might be due to the decline in productivity by 108 kg/ha during the same period. Stiff competition for sunflower from sorghum and cotton+pigeon- pea inter-cropping system during raining and *kharif* season chickpea during *rabi* season towards area expansion also might be the reasons for decline in sunflower area as opined by the respondents during the survey. However, the secondary data pertaining to Akola district for 2004-05 to 2007-08 implied that the area increased by 2.2 times and the production by 3.4 times (Fig. 1). This might be to the increase in sunflower productivity by 282 kg/ha. and also due to increased cost of cultivation for cotton, though pigeon-pea had comparatively higher prices as opined by the respondents during the survey. The productivity increase in sunflower may also be attributed to the overall increase in the adoption behaviour of sunflower farmers in the study area.

Implicative strategies for improving sunflower production scenario in Akola district of Maharashtra

Transfer of technology efforts need to be strengthened to improve the adoption behaviour and the resultant sunflower productivity of general sunflower farmers (non-FLD) and those especially from rainfed situations. It can be done through conducting more number of FLDs and selecting sunflower farmers representing rainfed situations as the major target group of the transfer of technology activities including FLDs. The results indicated that there exists a gap in sunflower productivity between FLD and non-FLD farmers. Hence, transfer of technology efforts (training programmes, awareness campaigns and field days) are to be intensified to improve the adoption behaviour and the resultant sunflower productivity. Young sunflower farmers may be imparted training on improved sunflower production technologies by the sunflower researchers and extension personnel and may be utilized as the contact farmers to influence the fellow farmers to have better adoption level and resultant sunflower productivity. The results of constraints analysis indicated the urgent need for making the seeds of cultivars pertaining to public sectors penetrate the seed chain through appropriate and effective strategies and the need for developing and popularizing micro-irrigation technology for sunflower. The training needs of the respondents are to be highlighted in the information given to the sunflower farmers and officials of development departments during training programmes. FLDs on the training needs are to be implemented and if they are already being implemented, to be continued at a larger scale.

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Table 1. Adoption behaviour and sunflower productivityof the respondents (N=120)

No.	%	No.	%	M-W U test value	
				Adoption behaviour	Productivity
Based on farmers' category					
FLD		NFLD			
60	50.0	60	50.0	U=1047.0; Z=4.136**	U=999.0; Z=4.223**
Based on situation					
Irrigated		Rainfed			
28	23.3	92	76.7	U=583.5; Z=4.575**	U=529.0; Z=4.731**

**P=0.01; NFLD-Non-FLD

Table 2. Category - wise difference in adoption behaviour and resultant productivity (N=120)

Type of farmers	Category of farmers	Number	%	K-W test value	
				Adoption	Productivity
FLD	Small	9	15.0	0.748 NS	0.035 NS
	Medium	29	48.3		
	Large	22	36.7		
Non-FLD	Small	6	10.0	7.055**	4.758*
	Medium	20	33.3		
	Large	34	56.7		

**P=0.01; *P=0.05; 5% NS-Non-significant

Table 3. Distribution of respondents according to sunflower productivity (kg/ha) (N=120)

Type of farmers	Level of adoption	Farmers' category (%)			Total	Mean	SD
		Small	Medium	Large			
FLD	Low	3.3	6.7	3.3	13.3	1269	259
	Medium	6.7	25.0	25.0	56.7		
	High	5.0	16.6	8.3	30.0		
	Total	15.0	48.3	36.7	100.0		
Non-FLD	Low	6.7	5.0	8.3	20.0	1066	215

Table 4. Comparative sunflower productivity and profitability under real farm conditions (N=120)

Division	No. of farmers (Situation)		Mean seed yield (kg/ha)		% yield increase	Additional net returns (Rs./ha)	B:C ratio	
	FLD	Non - FLD	FLD	Non - FLD			FLD	NFLD
Akola	16 (I)	5 (I)	1455	1360	7.0	1522	2.5	2.5
	14 (R)	25 (R)	1188	1062	5.0	1486	2.6	2.5
	Mean		1287	1211	6.0	1519	2.5	2.5
Buldana	15 (R)	15 (R)	1174	983	19.0	3510	3.6	3.5
	1 (I)	6 (I)	1125	1079	4.0	1050	3.5	3.4
Amaravathi	14 (R)	9 (R)	1319	986	13.0	2418	3.4	3.4
	Mean		1123	1033	9.0	1734	3.5	3.4
Grand mean			1195	1076	11.0	2254	3.1	3.0

I, Irrigated
R, Rainfed

Table 6. Biotic and abiotic determinants and training needs (N=120)

Production constraints	Mean RBQ	Rank
High cost of seeds	100.0	1
Non -availability of quality seeds of improved cultivars	85.2	2
Damage due to unseasonal rains	77.8	3
Lack of irrigation facility	66.7	4
Damage due to insect - pests and diseases	44.5	5
Loss due to weeds	37.1	6
Fluctuations in the procurement price of sunflower seeds	33.3	7
High cost of labours	29.6	8
Damage due to birds	29.6	8
Overall mean RBQ value	56.0	
Training needs	**Mean RBQ**	**Rank**
Maintaining optimum plant population	100.0	1
Improved sunflower cultivars	80.9	2
Integrated nutrient management	76.2	3
Integrated pest management	47.6	4
Weed management	42.9	5
Irrigation management	38.1	6
Sunflower-based cropping systems	14.3	7
Overall mean RBQ value	57.1	

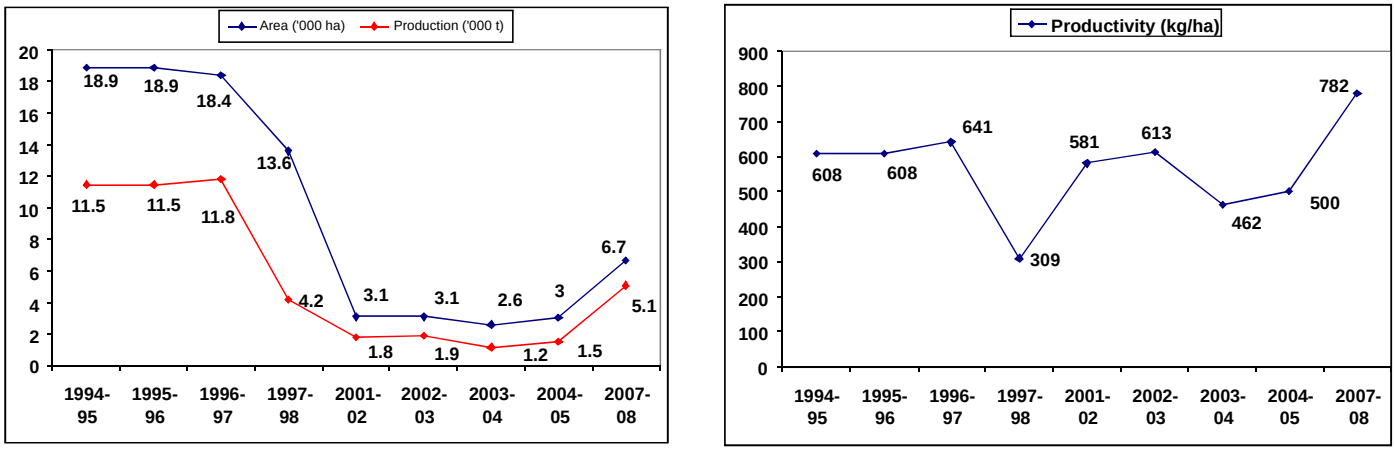

Fig. 1. Performance of sunflower in Akola district of Maharashtra during 1994-95 to 2007-08