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Performance of front line demonstrations on sunflower (*Helianthus annuus* L.) variety MFSH-17 in Ganjam district

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Abstract
The present study was conducted by Krishi Vigyan Kendra, Ganjam-II during 2017 in *rabi* in village Dengadi. The KVK scientists has conducted frontline demonstration in sunflower with the active participation of farmers with the objective to demonstrate the improved technologies in crop. The improved technologies consisting use of improved variety (MFSH-17), Integrated nutrient and weed management, pest and disease management. The results of demonstration showed that farmers could increase the sunflower productivity notably by switching over to improved variety and adoption of improved production technology. From the front line demonstration, it was observed that the sunflower variety MFSH-17 recorded higher yield (12.5q/ha) as compared to farmers practice (9.1)q/ha. The increase in the demonstration yield over farmer's practices was 37.4 per cent. The technology gap and technology index were 5.5 q/ha and 3.4q/ha respectively. The yield levels were considerably low under local practices because of considerable variations in the extent of adoption of recommended package of practices depending upon the amount of risk involved in terms of cost, convenience, skill and knowledge about the concerned practice. The productivity was better over local practice under demonstrations. Hence, sunflower production technology have a broad scope for increasing the area and production at each and every level i.e Farmers, State and National level.

Keywords: sunflower, FLD, yield and economic impact, extension gap

1. Introduction
Sunflower (*Helianthus annuus* L.) belongs to Asteraceae family is one of the important edible oilseed crops cultivated in different parts of the world and has become the fourth most important oilseed crop in India. It is an important versatile oilseed crop which can be grown in any season of the year. It is rich in polyunsaturated fatty acid (PUFA) as well as high vitamin E content. Sunflower cultivation in India was started with varieties introduced from outside the country and subsequently the hybrids were developed and are being grown widely covering nearly 95 % of the cultivated area. Oilseeds play the second important role in the Indian agricultural economy, next only to food grains in terms of area and production (Meena and Singh, 2013) [6]. India is one of the largest producers and consumer of vegetable oils in the world. Indian vegetable oil economy is the fourth largest in the world next to USA, China and Brazil. Generally, hybrids have higher yield potential compared to varieties (Kumar *et al*., 2013) [5]. In India it is cultivated over an area of about 10.01 lakh hectares with a production of 4.96 lakh tonnes and productivity of 765kg per hectare. At present, the oilseeds production in India is not meeting the domestic demands and now dependent on imports. The continuous increase in import of oilseed is a matter of great concern today (Katare *et al*., 2011) [4]. A wide gap exists in sunflower production with the use of available techniques and its actual application by the farmers and the higher incidence of pest attack leads to further reduction in yield, reflected through poor yield of sunflower crop on farmer's field. 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 through KVKs (Verma *et al*., 2014) [9].
Sunflower (*Helianthus annuus* L.) holds great promise as an oil seed crop because of it is also a crop of choice for farmers due to its wider adaptability, high yield potential, shorter duration and profitability. Wild adaptability to different agro-climatic regions and soil types. Due to that this crop play's very important role in contingency crop planning also,

sunflower can play an important role in meeting out the shortage of edible oil in country. Our country is facing acute shortage of edible oil mainly because of heavy demand due to population pressure, high standard of living and high demand from oil consuming industries. This demand is partly met by import of edible oils. Under such situation it needs to build up self sufficiency in oil production and to meet the increasing demand of consumers.

Sunflower seed is highly nutritious containing 14-19 per cent protein and 40-45 per cent oil associated with very high calorific value and 30-35 per cent carbohydrates. The oil is considered to be a high quality due to its non cholesterol properties. It contains oleic and linoleic acid, therefore it is recommended for the patients having heart problem. It contains sufficient amount of calcium, iron and vitamins like A, D, E and B complex. Sunflower oil is primarily used for cooking and is a major ingredient in some margarine and shortening products. High linoleic acid sunflower seeds are used for confectionary purposes. Sunflower oil has good keeping quality. The oil cake contains 40-44% high quality protein. It is ideally suited for poultry and livestock ration. It can also used for manufacturing baby foods. The sunflower kernel can be eaten raw or roasted. The oil is used for culinary purpose, in the manufacture of paints, soaps and cosmetics. The importance of sunflower as an oilseed crop in India is of very recent origin and date backs to three decades. But its contribution towards attaining self-sufficiency in edible oil as well as to "yellow revolution" in the country is note worthy.

The main aim of the Krishi Vigyan Kendra is to reduce the time lag between generation 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. KVKs are grass root level organizations meant for application of technology through assessment, refinement and demonstration of proven technologies under different ‘micro farming’ situations in a district. Front line demonstration (FLD) is an appropriate tool to demonstrate recommended technology among the farmers. The technologies developed at the agricultural universities and research stations through research activities are demonstrated in farmers field through FLDs. This is one of the most powerful tools of extension because farmers in general are driven by the perception that ‘seeing is believing’. The main objective of FLDs is to demonstrate newly released crop production and protection technologies and its management practices at the farmer’s field under different agro-climatic regions and farming situations.

2. Materials and Methods

The present study was conducted by Krishi Vigyan Kendra, Ganjam-II at the farmer’s field at village Dengadi operational area of KVK. The district of Ganjam lies in two agro climatic zones i.e East & South Eastern coastal plain zone and North Eastern Ghat Zone of Odisha extending from $18^0$13’N to $19^0$10’ North latitude to $82^0$5’ to $83^0$23’ East longitude. The Average Normal Rainfall of this district is 1276.2 mm and more than 75% of the precipitation is received over five months i.e. June-October. Agriculture is the primary occupation of inhabitants of this district. The maximum and minimum temperature of this district is 39^0C and 18.9^0C respectively.

Before conducting FLDs, a list of farmers of different villages were prepared from survey and farmer’s meetings and specific skill training was imparted in the form of practising farmer’s training at the farmer’s field or regarding different aspects of cultivation of sunflower and its plant protection measures The traditional practices were maintained in case of local checks. The data output were collected from both FLD plot as well as check plots and finally the extension gap (Katare *et al*., 2011) [4] along with the benefit cost ratio were worked out (Samui *et al*., 2000) [8] as given below:

To study the impact of frontline demonstrations data from FLD and farmer practices were analyzed. The extension gap, technology gap and the technology index were work out with the help of formulas given by Samui *et al*., (2000) [8] as mentioned below:

1. Benefit cost ratio = Gross return/Cost of cultivation.
2. Technology gap = Potential yield –Demonstration yield.
3. Extension gap = Demonstration yield-Local check yield.
4. Technology index = [(Py-Dy)/Py] x 100. Where Py = Potential yield and Dy = Demonstration yield

The soils under study was sandy loam in texture with a pH ranging between 7-7.2. The sowing of the sunflower seeds should be done by the end of January as delayed sowing of crop in the second fortnight of February lead to increases in the incidxence of pests and diseases. The 2.0 kg seed were sown per acre. Ridge sowing were done and the seed were placed about 6-8 cm below the ridge top. Irrigation to ridge sown crop was done 2-3 days after sowing and care was done that water level in the ridges well below the seed placement line. The benefit of the ridge sowing that the crop were not lodge and it also helps to save the water during hot summer months.

The data on average cost of cultivation, gross return, net return and benefit: cost ratio were collected from frontline demonstration plots for working out the economic feasibility of sunflower hybrid MFSH-17. The recommended packages of practices were followed to conduct the front line demonstrations (FLD) at the farmer’s field.

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.

3. Results and Discussion

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

The data of Table 2 revealed that the yield of the hybrids MFSH-17 performed well at the farmer’s field in demonstrated plot as compared to farmer’s practices (check). The average yield of in demonstrated plot was recorded 12.5 qtl/ha and local check (9.1 qtl/ha). The percent increase in yield was 37.4 per cent over local check (Table 2). The higher yield of sunflower in FLD was mainly attributed to the adoption of improved technologies. Sunflower variety MFSH-17 is potential yielder than local control and having moderate resistance to pests. The results clearly indicate the positive effects of FLDs over the existing practices towards enhancing the yield of the MFSH-17.The reasons for the higher yield in FLD is due to recommended dosages of fertilizers and modules for pest management against the pest and diseases were followed properly.

The technological gap i.e. the difference between potential yield and yield of demonstration plot was 5.5.The technological gap may be attributed to the dissimilarity in the soil fertility status and weather conditions. The extension gap of 3.4qtl/ha was recorded. 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 gaps. More and more use of latest production technologies with high yielding variety will subsequently change the 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 field and lower value of technology index more is the feasibility of the technology. In this demonstration 31.4 percent technology index was recorded which indicates proper adoption of improved technologies. Similar results were also recorded by Vikram *et al.*, (2018) [10] and Rupesh (2015) [7] in sunflower, Anuja *et al.*, (2014) [1] in different oilseeds crops, Balai *et al.*, (2012) [2] in rapeseed mustard and Berjesha *et al.*, (2013) [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 3). The cost of cultivation (Rs 18690.00/ha), Gross Return Rs 31250.00/ha, Net return Rs 12560.00/ha and Benefit Cost (B: C) ratio (1.67) was recorded in the MFSH-17 compared to local check. (Table 3). The results clearly indicate the positive effects of FLDs over the existing practices towards enhancing the yield of sunflower hybrid MFSH-17.

4. Conclusion

The study has shown that the FLD programme was found useful in enhancing the knowledge and adoption level of farmers in various adoption level of farmers in various aspects of sunflower production technologies. The above findings inferred that the usage of recommended package of practices leads to control the pest and diseases attack below the Economic Threshold level thus leads to increased productivity of hybrid MFSH-17 in Ganjam. To reduce the technological gap and to reverse the trend of extension gap, emphasizes is required to conduct more number of practising farmer's training at farmer's field and KVK campus regarding recommended package of practices.

Table 1: Details of sunflower hybrid MFSH-17 growing under existing farmer's practices and improved practices adopted in frontline demonstrations at farmer's field

S. No	Operations	Existing Farmer's Practices	Improved/Recommended* Practices adopted in Demonstrated Plot(FLDs)
1	Farming Situation	Irrigated	Irrigated
2	Time of Sowing)	Second fortnight of February or March	January end or February (first week)
3	Seed Treatment	Not done	Treatment with Thiram@2g/kg of seed
4	Method of sowing	Broadcasting	Ridge sowing
5	Fertilizers Dosages	Non adoption of recommended package of practices.	Soil test based fertiliser application
7	Plant protection measures	Injudicious use of pesticides	Need based plant protection measures

Table 2: Performance of Sunflower hybrid MFSH-17 in front line demonstration

Year	Seed yield (q/ha)		% increase in yield over FP	Technology gap	Extension Gap	Technology Index (%)
	FLD	FP				
2017	12.5	9.1	37.4	5.5	3.4	31.4

Table 3: Economic analysis of Sunflower hybrid MFSH-17 in front line demonstration

Year	Cost of cultivation(Rs/ha)		Gross return(Rs/ha)		Net Returns(Rs/ha)		B:C ratio	
	FLD	FP	FLD	FP	FLD	FP	FLD	FP
2017	18690	15632	31250	22750	12560	7118	1.67	1.45

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