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Performance of Groundnut under Broad Bed Furrow Method in Buldana District of Maharashtra

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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

The Frontline Demonstrations (FLDs) on groundnut were carried out by Krishi Vigyan Kendra, Jalgaon Jamod, Buldana district of Maharashtra during the *summer* season of 2015-16 to 2016-17 in fields of 50 farmers at different villages of Buldana district. Farmers were randomly selected. The result of the present study showed that sowing irrigated groundnut crops on broad bed furrows in demo plots recorded higher yields than conventional farmers' farming practices. The average pod yield in the broad bed furrow seed drill sowing method was 23.79 q/ha. The technological gap range was found 1.26 q/ha to 3.17 q/ha. The technology index varied from 4.85 percent to 12.19 percent with an average of 8.52 percent over the study period, which showed the effectiveness of technological interventions. The average highest gross return of FLDs plots was Rs 57,548/- per hectare *i.e.* more than 26 percent higher compared to the conventional practices and average the benefit-cost ratio was 2.24. Groundnut productivity was considerably increased by conducting cluster frontline demonstration of better variety with intervention methods using proven technologies in farmers' fields and improving the livelihood of the farming community.

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Keywords: Groundnut; broad bed furrow technology; FLD; technology gap; extension gap; technology index and economic return.

1. INTRODUCTION

'India is one of the major oilseeds producers and importers of edible oils. With regards to the vegetable oil economy, India ranks fourth in the world after the USA, China, and Brazil. Groundnut (*Arachis hypogaea L.*) is one of the most important oilseed crops in India. Groundnut contributes nearly 65% to the vegetable oil produced in India and holds the key to the fluctuating fortunes of the vegetable oil industry. Low crop yields under rainfed conditions are due to recurring drought stress, high soil temperature, widespread soil degradation and desertification, and poor management. Soil-related constraints that exacerbate drought stress include crusting and compaction, low water infiltration rate, low water retention capacity, high surface runoff, and high losses due to soil evaporation' [1]. 'Among the various land surface management practices like raised and sunken bed, ridge and furrow developed for Vertisols, Broad Bed and Furrow (BBF) system are very promising in controlling surface runoff, reducing the soil loss through erosion and increasing infiltration' (Singh et al., 1999). The BBF landform management system essentially reduces runoff water velocity and consequently increases the time that water can infiltrate and reduces sediment losses. In addition, during periods of heavy rainfall the furrow allows excess water to safely drain away from the plots and thus avoiding water congestion to the crop [2]. It points out that the productivity of groundnut in Buldana is comparatively low, mainly due to the unavailability of suitable varieties as well as the lack of improved production technologies, especially sowing method, and nutrient management. The present study was conducted to observe the role of the planting method in groundnut. The raised bed system of planting was compared to the flatbed method prevalent in the district [3-5].

2. MATERIALS AND METHODS

In order to increase the production and productivity of groundnut crop Krishi Vigyan Kendra, Jalgaon Jamod, Buldana district, Maharashtra newly introduced the technology for sowing of groundnut crop on broad bed furrow in demo plots in that region while control plots crop were grown according to commonly accepted agricultural practices. The trial was carried out in the summer season in 2015-16 and 2016-17 in farmers' fields in Jalgaon Jamod and Sangrampur tahsil, Buldana district of Maharashtra. Each year different areas of Jalgaon Jamod and Sangrampur tahsil were chosen for the study. Before the FLD trail was implemented, the farmers were trained by experts and KVK's scientists on the use of broad bed furrow machines. In demonstration quality seeds of an improved variety of groundnut crop i.e. TAG-25, seed treatment with Rhizobium culture @4 gm per kg and PSB bio-fertilizer @ 4 gm per kg seed, as per soil testing report fertilizer dose of urea 40 kg/ha, SSP 210 kg/ha and MOP 45 kg/ha were used and crop protection management techniques demonstrated in the farmer's field through frontline demonstration at various locations. The raised bed planted every year was done at five fields of 0.4 ha each. A tractor-drawn bed planter was used to plant groundnut seed in the broad bed furrow technique. Irrigation was done by sprinklers at the time of sowing and every 10 to 15 days intervals up to the flowering stage and then at the time of pod development. Crop yield was collected based on actual yield per hectare basis [6,7]. The growing cost and gross return were calculated on prevalent market prices in the study period. The conventional practices were maintained in the case of local checks. All major agricultural operations were carried out under the supervision of KVK, Jalgaon Jamod scientist by regular visits. The yield increase in demonstrations over farmers' practice was calculated by using the following formula:

Extension Gap (q/ha) = Demonstration Yield – Check Yield……..(1)
Technology Gap (q/ha) = Potential Yield – Demonstration Yield……..(2)
Technology Index (%) = Technology Gap / Potential Yield X 100……..(3)

3. RESULTS AND DISCUSSION

3.1 Groundnut Yield

The difference in groundnut pod yield in a broad bed furrow and conventional sowing is shown in Table-1. Results showed that the higher pod 23.79 q/ha yield of groundnut in FLDs than farmers' practices pod yield (18.96 q/ha) recorded. Through the introduction of improved variety and appropriate production technology,

the pod yield of groundnut could be increased by 25.78 % above compare to local agricultural methods of groundnut cultivation. Jat and Katiyar [8], Pawar et al., [9], and Undhad et al., [10] all reported similar results.

3.2 Technology Gap

The technology gap refers to the difference between the potential yield of the variety and the demonstration yield. Farmers will eventually use old varieties in favor of new technologies as a result of new technologies. The technology gap of 1.26 and 3.17 q/ha in 2015-16 and 2016-17 respectively (Table 1). The average technological gap was observed to be 2.32 q/ha. The technological gap observed can be attributed to the difference in soil fertility status and weather conditions i.e. irrigation and temperature. Therefore, a variety-wise location-specific recommendation seems necessary to minimize the technology gap for yield levels in different situations.

3.3 Extension Gap

The extensions gap referred to the difference between demonstrated yield and yield under existing agricultural practice. An extension gap of 4.46 and 5.19 q/ha was observed in 2015-16 and 2016-17 respectively (Table 1). The average extension gap was recorded in the demonstration as 4.83 q/ha emphasizing the need to train the farmers through various means to adopt improved groundnut production technologies to reduce this large extension gap. The increasing use of the latest production technologies with high-yielding varieties will subsequently change this alarming trend of the galloping extension gap.

3.4 Technology Index

The technology index referred to the relationship between the technology gap and the potential yield expressed as a percentage. The technology index shows the feasibility and performance of the demonstrated technology in the farmers' field. The lower value of the technology index shows the effectiveness of a good performance of technological interventions. In the present demonstration, the technology index fluctuated between 4.85 to 12.19 percent (Table 1). The average technology index was recorded at 8.92 percent in the groundnut crop during the three consecutive years of FLD programs The technology index can be reduced through the appropriate application of demonstrated technical interventions to increase the yield performance of the groundnut crop. The findings of this study are consistent with those of Jat and Katiyar [8] and Pawar et al., [9].

3.5 Economic Return

The economic analysis of the broad bed furrow technique of seed drill in groundnut under frontline demonstration and framers control plots are shown in Table 2. It shows that the average total return of both clusters of FLDs and the farmers' control plots is Rs 57,548/- and Rs 33,471/- per hectare respectively *i.e.* more than 72 percent higher in the demonstration compared to the farmers' practices.

Jat and Katiyar [8], Pawar et al., [9], and Undhad et al., [10] all reported similar findings.

Table 1. Pod yield and gap analysis of front line demonstration on Ground nut

Year	Area (ha)	No. of farmers	Yield q/ha			% increase over farmer practices	Technology gap (q/ha)	Extension Gap (q/ha)	Technology Index (%)
			Potential	FLD plots	Farmer practices				
2015-2016	10	25	26	24.74	20.28	22.14	1.26	4.46	4.85
2016-2017	10	25	26	22.83	17.64	29.42	3.17	5.19	12.19
	Mean			**23.79**	**18.96**	**25.78**	**2.22**	**4.83**	**8.52**

Table 2. Economics analysis of demonstrated plots and farmers practices of Ground nut

Year	Av. Cost of Inputs (Rs/ha)		Av. Gross return (Rs/ha)		Average net return (Rs/ha)		B:C ratio	
	Demo. Plots	farmers practices	Demo. Plots	farmers practices	Demo. Plots	farmers practices	Demo. Plots	farmers practices
2015-2016	46994	47718	99665	81688	52671	33969	2.12	1.71
2016-2017	46066	50700	108490	83682	62424	32973	2.36	1.65
Mean	**46530**	**49209**	**104078**	**82685**	**57548**	**33471**	**2.24**	**1.68**

Fig. 1. Training Programme of FLDs Farmers on BBF Method and Sowing

Fig. 2. Group meeting of FLDs farmers with KVK Scientist

3.6 Benefit-cost Ratio

The benefit-to-Cost ratio was also worked out for farmers' practice and demonstration plots as given in Table 2. The B: C ratio as reported in Table 2 was greater in Broad Bed Furrow plots (2.24) than in the conventional method (1.68) of sowing groundnut.

4. CONCLUSION

Based on the results obtained in the present study, groundnut productivity was considerably boosted as a result of conducting cluster frontline demonstrations of better variety with intervention methods of proven technologies in the farmers' field, resulting in greater farmer revenue and

improved farming community livelihoods. The results showed that broad bed furrow technology has great potential to increase the water productivity of groundnut. Farmers were inspired by cluster frontline demonstrations in groundnut crops and they planned to use this technology for many years.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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