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Knowledge and adoption level of front line demonstrations partner farmers on improved crop production practices in groundnut crop at Tumkur District of Karnataka State, India

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Abstract

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop in Karnataka, yet its productivity is often limited by inadequate knowledge and poor adoption of recommended crop production practices. Front Line Demonstrations (FLDs), implemented by Krishi Vigyan Kendras (KVKs), serve as an effective extension approach to enhance farmers' awareness and adoption of improved technologies. The present study assessed the knowledge and adoption levels of FLD partner farmers on improved crop production practices in groundnut crop in Tumakuru district of Karnataka State, India. The study was conducted in Tumakuru district by selecting 40 groundnut FLD partner farmers from KVKs at Konehalli and Hirehalli using an ex-post-facto research design. Data were collected through a structured interview schedule to measure farmers' knowledge and adoption levels before and after participation in the FLD programme. The findings revealed a significant improvement in farmers' knowledge and adoption of recommended practices such as soil testing, improved varieties, seed treatment, nutrient management, gypsum application, pest and disease management, and post-harvest operations after participation in FLDs. Overall knowledge and adoption levels shifted from low and medium categories to higher categories following the demonstrations. The study concludes that FLDs are an effective extension tool for enhancing knowledge and promoting adoption of improved groundnut production technologies among farmers.

Keywords: Front line demonstrations, knowledge level, adoption level, groundnut, Krishi Vigyan Kendra

Introduction

Groundnut (*Arachis hypogaea* L.) is an important oilseed and legume crop cultivated extensively in India, contributing significantly to edible oil production, farm income, employment generation, and soil fertility through biological nitrogen fixation. India ranks among the leading producers of groundnut in the world; however, the productivity of the crop remains below its potential in many regions due to constraints such as inadequate adoption of recommended production technologies, poor nutrient and pest management practices, and limited access to timely technical guidance (FAO, 2021) [5]. In Karnataka, particularly in semi-arid districts like Tumakuru, groundnut is predominantly grown under rainfed conditions, making the crop more vulnerable to climatic variability and management inefficiencies (Government of Karnataka, 2020) [6]. Addressing knowledge gaps and enhancing adoption of improved crop production practices are therefore essential for improving groundnut productivity and farmers' livelihoods.

Front Line Demonstrations (FLDs), implemented by Krishi Vigyan Kendras (KVKs), are an effective extension approach aimed at demonstrating the production potential of newly released varieties and improved crop management practices under farmers' field conditions. FLDs emphasize "seeing is believing" and facilitate direct interaction between scientists and farmers, thereby enhancing farmers' knowledge, skill, and confidence in adopting scientific technologies (Samui *et al*., 2000) [9]. Several studies have reported that FLDs significantly contribute to increasing yield, profitability, and adoption of recommended practices in oilseed crops by reducing the gap between research recommendations and farmers' practices (Choudhary *et al*., 2014; Singh *et al*., 2018) [2, 12]. In Tumakuru district, KVKs at Konehalli and Hirehalli have been actively conducting FLDs on groundnut with the objective of improving crop performance through location-specific technologies.

Knowledge and adoption are critical components in the process of agricultural development, as knowledge serves as a prerequisite for adoption, while adoption reflects the actual behavioral change among farmers. Rogers (2003) [8] emphasized that "knowledge alone is not sufficient unless it is translated into practice through adoption." Assessing the extent of knowledge gained and the level of adoption of

recommended practices by FLD partner farmers provides valuable feedback on the effectiveness of extension interventions. In this context, the present study was undertaken to assess the knowledge and adoption levels of frontline demonstration partner farmers on improved crop production practices in groundnut crop in Tumakuru district of Karnataka State, India, and to analyze the impact of FLDs in strengthening farmers' capacity and promoting sustainable groundnut production.

Methodology

The study was carried out in Tumakuru District of Karnataka state. Tumakuru district is purposively selected for the study as it has two Krishi Vigyan Kendras one at Konehalli, Tiptur taluk and another at Hirehalli, Tumakur taluk. The groundnut crop is considered for the study based on highest number of FLDs and partner farmers. The list of frontline demonstration Partner farmers and their villages and contact details were obtained from the records at KVK, Konehalli and Hirehalli. From this list, 40 demonstrators for groundnut crop were selected. *Ex-post-facto* research design was employed for the study. Since "Ex post facto research" is the most systematic empirical enquiry in which the researcher does not have control over the independent variables as their manifestation has already occurred or they are inherent and not manipulable. Thus, inferences about relation among variables were made without direct intervention from concomitant variation of independent and dependent variables (Kerlinger, 1995).

Results and Discussion

Knowledge Level of FLD partner farmers on improved crop production practices in Groundnut growers

The knowledge level of groundnut growers regarding individual recommended cultivation practices, both before and after the FLD program, is presented in Table 1. The data revealed that, before undergoing KVK frontline demonstration programme on Groundnut 75.00 per cent of the groundnut growers having no knowledge about importance of soil testing, time of soil sampling and its benefits. However after participation of FLD on Groundnut 95.00 per cent of the growers gained complete knowledge regarding soil testing- its importance and benefits. There is about 70.00 per cent difference in knowledge found after the FLD Participation.

Table 1: Knowledge Level of FLD partner farmers on improved crop production practices in Groundnut growers (n=40)

SL. No	Particulars	Before				After				Difference	
		Correct Knowledge		Incorrect Knowledge		Correct Knowledge		Incorrect Knowledge			
		f	%	f	%	f	%	f	%	f	%
1.	Soil testing (Time of drawing soil sample)	10	25.00	30	75.00	38	95.00	2	5.00	28	70.00
2.	Land preparation (one deep ploughing, two light ploughing followed by harrowing)	32	80.00	8	20.00	38	95.00	2	5.00	6	15.00
3.	Variety (K-6)	6	15.00	34	85.00	35	87.50	5	12.50	29	72.50
4.	Seed treatment (Treat with thiram 2.5g. /kg of seeds)	4	10.00	36	90.00	29	72.50	11	27.50	25	62.50
5.	Recommended Seed rate (45 kg / acre)	20	50.00	20	50.00	39	97.50	1	2.50	19	47.50
6.	Recommended Spacing (30 X 10 cm)	22	55.00	18	45.00	36	90.00	4	10.00	14	35.00
7.	Time of sowing (May - July)	33	82.50	7	17.50	38	95.00	2	5.00	07	12.50
8.	Method of sowing (line sowing using seed cum fertilizer drill as paired row system with a depth of 5 cm)	32	80.00	8	20.00	40	100.00	0	0.00	08	20.00
9.	FYM(4 Tonnes/ acre)	14	35.00	26	65.00	36	90.00	4	10.00	12	55.00
10.	NPK (10: 20: 10 Kg)	16	40.00	24	60.00	31	77.50	9	22.50	15	37.50
11.	Micronutrient (Apply Zinc sulphate- 4 kg/acre, Borax- 4 kg/acre)	4	10.00	36	90.00	28	70.00	12	30.00	24	60.00
12.	Gypsum application (Gypsum incorporated into the soil before sowing)	10	25.00	30	75.00	38	95.00	2	5.00	28	70.00
13.	Bio fertilizer (Rhizobium / PSB 5 Kg/ 1 tonne of FYM)	6	15.00	34	85.00	31	77.50	9	22.50	25	62.50
14.	Weed management (Provide 3 intercultivations at 15 days after sowing, at an interval of 10 days and do not take up intercultivation after 45 days)	22	55.00	18	45.00	37	92.50	3	7.50	15	37.50
15.	Drum rolling (50-70 DAS)	11	27.50	29	72.50	32	80.00	8	20.00	21	52.50
16.	Irrigation Management (Provide one irrigation at the time of sowing and limit the irrigation up to 4 weeks after sowing; subsequent irrigations are to be given at an interval of 10 - 12 days for irrigated crop; Total 12 irrigations are sufficient during Kharif and required 16 inches of water for rabi/summer.)	24	60.00	16	40.00	38	95.00	2	5.00	14	35.00
17.	Pest management(Spray Dimethoate 30 EC @ 1.7 ml/lit. water for aphids; Traps the moths by arranging light traps between 7 to 11 PM for red headed caterpillar; Seed treatment with chloropyriphos 10ml/kg for root grubs)	23	57.50	17	42.50	33	82.50	7	17.50	10	25.00
18.	Disease management (spray 1 g Carbendazim/lit. water for tikka disease)	19	47.50	21	52.50	37	92.50	3	7.50	18	45.00
19.	Post-harvest (Based on duration of the varieties when the pods matured, uproot the plants along with pods, pluck the pods and subject it for cleaning, drying and storage)	29	72.50	11	27.50	38	95.00	2	5.00	09	22.50

With regard to land preparation, majority (80.00%) of the growers were having the knowledge on practicing one deep ploughing, two light ploughings followed by harrowing under land preparation in irrigated and rainfed condition before participating in the FLD. Whereas 95.00 per cent of them came to know about the land preparation after the FLD initiation in their respective plots.

More than four fifth (85.00%)of the groundnut growers were not having knowledge on improved groundnut varieties which are high yielding, pest resistant before participating in the FLD. Whereas, 87.50 per cent of the respondents acquired complete knowledge on improved groundnut varieties and their specification after being a FLD partner farmer.

Seed treatment of Groundnut is one of the important practice which is responsible for higher germination, vigorous and uniform seedling growth. Before participation in FLD programme, the seed treatment with thiram was not known to 90.00 per cent of farmers. After participating in FLD programme, majority (72.50%) of the groundnut growers had complete knowledge regarding seed treatment using thiram with a recommendation of 2.5g/kg.

With regard to seed rate, half (50.00%) of them were not knowing the exact quantity of seeds required per acre before participation in FLD programme. Whereas, large majority (97.50%) of them came to know about the recommend seed rate after becoming FLD partner farmers. The spacing was not known by 45.00 per cent of growers before participation, whereas after participation in FLD programme, 90.00 per cent of farmers gained knowledge. Majority of groundnut growers (82.50 and 80.00%) were having knowledge about time and method of sowing before participating in FLD which rose to 95.00 per cent and cent per cent after participating in FLD.

The quantity of FYM (farmyard manure) required during the last ploughing is about 4 tonnes per acre. Before the FLD implementation, 35.00% of growers were aware of this requirement. After the FLD program, 90.00% of the growers acquired correct knowledge about the recommended FYM application for improved crop production, reflecting a 55.00% increase in knowledge.

Regarding chemical fertilizer application, 40.00% of the growers knew the recommended dose of NPK before participation, which increased to 77.50% after participation. Prior to the FLD program, the application of zinc sulphate and boron was unknown to 90.00% of the respondents. However, after the FLD program, the majority (70.00%) gained knowledge about the application of zinc sulphate and boron in groundnut.

Gypsum application in groundnut which enhances soil structure by improving water penetration and reducing crusting, which is known for his effective pegging and supports the creation and filling up of pods in groundnut. The three fourth of the groundnut growers were not having knowledge before the FLD programme. After participating in the FLD programme, majority (95.00%) of them came to know about the application of gypsum and its importance in groundnut. High majority (85.00%) of the farmers were not knowing about enrichment of bio fertilizers to the compost in groundnut crop production before FLD. Whereas, it was reduced to 22.50 per cent after participation in the FLD. With regard to weed management, 55.00 and 92.50 per cent of growers had knowledge about scientific weed control measures before and after participation in FLD programme.

Regarding drum rolling, the majority (72.50%) of respondents were unfamiliar with the practice before participating in the FLD program. After joining the FLD program, 80.00% of them learned about the practice. In terms of irrigation for groundnut, it is recommended to provide one irrigation at sowing and to limit irrigation to up to 4 weeks after sowing. Subsequent irrigations should be given at intervals of 10-12 days for irrigated crops, with a total of 12 irrigations sufficient during Kharif and 16 inches of water required for rabi/summer. Knowledge of the irrigation schedule from sowing to ripening stage was known to 60.00% of beneficiaries before the FLD program, which increased to 95.00% after the FLD program.

With regard to insect pest management, 57.50 per cent of the groundnut growers were having knowledge about aphids and red headed caterpillar and their management in groundnut before the FLD programme. After the FLD programme, majority (82.50%) of them acquired correct knowledge regarding pest management. With regard to tikka disease management practices, slightly less than fifty (47.50%) per cent of growers were having correct knowledge before the FLD programme which increased to 92.50 per cent after the FLD programme. With regard to post harvest management practices, majority of the groundnut growers were having correct knowledge before (72.50%) and after (95.00%) the FLD programme.

Overall knowledge level of FLD Partner farmers on improved crop production practices in Groundnut

According to the distribution of respondents based on their overall knowledge level (Table 2), before the FLD program, slightly less than half (45.00%) of the respondents were classified in the medium knowledge category, followed by 32.50% in the low knowledge category and 22.50% in the high knowledge category. After the FLD program, the distribution shifted to slightly less than half (45.00%) in the high knowledge category, with 32.50% in the medium knowledge category and 22.50% in the low knowledge category.

The increase in knowledge levels after the FLD program could be attributed to the active involvement of farmers in various extension activities, such as group meetings, off-campus training, and field days. These activities, conducted by KVK scientists, were focused on groundnut production technologies and likely contributed to the enhanced knowledge among the participants. The results are in concordance with the Sanketh, *et al.* (2019) [10] and Shivashankar, *et al.* (2023) [11].

Table 2: Overall knowledge level of FLD Partner farmers on improved crop production practices in Groundnut (n=40)

Indicators	Category	Before		After		W - Stat (WSR)
		F	%	f	%	
Knowledge Level	Low	13	32.50	9	22.50	5.525*
	Medium	18	45.00	13	32.50	
	High	9	22.50	18	45.00	
		Mean =8.43 SD =1.82		Mean =16.58 SD =2.75		

Adoption level of FLD Partner farmers on improved crop production practices in Groundnut

The adoption level of groundnut growers concerning detailed recommended cultivation practices, before and after the FLD program, is presented in Table 3. The data show that before the FLD program, 80.00 per cent of farmers had not adopted soil testing. However, after learning about the importance and benefits of soil testing during the FLD, 77.50 per cent of them adopted this technique. Regarding land preparation practices, 75.00 per cent of farmers adopted the recommended ploughing techniques before participating in the FLD program. This adoption rate increased to 95.00 per cent following the FLD program.

High majority (95.00%) of the groundnut growers not adopted recommended K6 variety before the FLD programme. Whereas, majority (80.00%) of them adopted cultivating recommended variety after participating in the FLD programme. The findings have similarity with the findings of Dinesha (2021) [4] and Mutturaj (2017) [7]. Before participation in FLD programme, the seed treatment with Thiramwas not adopted by 95.00 per cent of respondents. After participation, majority (65.00%) of them adopted the seed treatment with *rhizobium.*

With regard to seed rate, half (50.00%) of the respondents not adopted exact seed rate recommended in groundnut crop before the FLD programme. After participation in FLD programme large majority (87.50%) of them fully adopted the recommended seed rate. The recommended spacing was adopted by 55.00 per cent of the growers before participation which increased to 87.50 percent after participation in FLD programme.

Regarding the time of sowing and method of sowing, 75.00% of groundnut growers had fully adopted the recommended practices even before the FLD program. This adoption rate increased to 95.00 per cent and 100 per cent after the FLD program. The application of recommended quantity of FYM was not adopted by 70.00 per cent before the FLD programme. Whereas, 77.50 per cent respondents fully applied recommended quantity of FYM after participation. Regarding chemical fertilizers, nearly half (45.00%) of the respondents had adopted the application of the recommended dose of NPK before the FLD program.Whereas, after the programme more than three fourth (80.00%) of them adopted complete application of recommended dose of NPK fertilizers.

With respect to micro nutrient application, high majority (90.00%) of growers not adopted the application of zinc sulphate and borax to the soil before participation in the FLD programme. After the FLD programme, good majority (75.00%) of the groundnut growers completely adopted the application of zinc sulphate and borax in groundnut production. Gypsum application is one of the important practice in groundnut cultivation which is responsible for effective pegging and supports the creation and filling up of pods. Before the FLD programme majority (77.50%) of the respondents not adopted the application of gypsum. whereas after the FLD programme majority (90.00%) of the respondents completely adopted the practice of gypsum application.

Before participating in the FLD program, 90.00% of groundnut growers had not adopted the application of biofertilizers for compost to enhance crop development. However, after the FLD program, 82.50% of growers fully adopted this practice.Regarding weed management practices, half of the respondents had adopted the recommended weed management practices before participating in the FLD program. Whereas 90.00 per cent of the groundnut growers adopted weed management practices after the FLD implementation

Regarding drum rolling, the majority (82.50%) of respondents had not adopted the practice before participating in the FLD program. After becoming partner farmers under FLD programme, 70.00 per cent of them completely adopted the practice. This might be due the fact that, the rolling of an iron drum in the groundnut field can significantly improve yield. Regarding irrigation management, about 60.00% of the farmers practiced the recommended irrigation methods before participating in the FLD program. A high majority (95.00%) of the farmers completely adopted recommended irrigation practices after the FLD.

With regard to insect pest management, 50.00 per cent of growers adopted the recommended pest management practices for aphids before the FLD programme. However, after participation 75.00 per cent of them completely adopted the pest management practices in groundnut after the demonstrations. Regarding disease management practices, slightly less than half (47.50%) of groundnut farmers had fully adopted the recommended disease management practices before the FLD program. After the FLD program, 90.00% of them fully adopted the practices for managing Yellow Mosaic Virus (YMV) in groundnut.

More than half (60.00%) of groundnut growers had adopted post-harvest practices before participating in the FLD program. Whereas, 80.00 per cent of them completely adopted post harvesting practices after participation in FLD programme

Table 3: Adoption level of FLD Partner farmers on improved crop production practices in Groundnut (n=40)

SI. No.	Practices	Before				After				Difference	
		Adopted		Not adoption		Adopted		Not adopted			
		f	%	f	%	f	%	f	%	f	%
1.	Soil testing (Time of drawing soil sample)	8	20.00	32	80.00	31	77.50	9	22.50	23	57.50
2.	Land preparation (one deep ploughing, two light ploughing followed by harrowing)	30	75.00	10	25.00	38	95.00	2	5.00	8	20.00
3.	Variety (K-6)	2	5.00	38	95.00	32	80.00	8	20.00	30	75.00
4.	Seed treatment (Treat with thiram 2.5g. /kg of seeds)	2	5.00	38	95.00	26	65.00	14	35.00	24	60.00
5.	Recommended Seed rate (45 kg / acre)	20	50.00	20	50.00	35	87.50	5	12.50	15	37.50
6.	Recommended Spacing (30 X 10 cm)	22	55.00	18	45.00	35	87.50	5	12.50	13	32.50
7.	Time of sowing (May - July)	30	75.00	10	25.00	38	95.00	2	5.00	8	20.00
8.	Method of sowing (line sowing using seed cum fertilizer drill as paired row system with a depth of 5 cm)	30	75.00	10	25.00	40	100.00	0	0.00	10	25.00
9.	FYM (4 Tonnes/ acre)	12	30.00	28	70.00	31	77.50	9	22.50	19	47.50
10.	NPK (10: 20: 10 Kg)	18	45.00	22	55.00	32	80.00	8	20.00	14	35.00
11.	Micronutrient (Apply Zinc sulphate- 4 kg/acre, Borax- 4 kg/acre)	4	10.00	36	90.00	30	75.00	10	25.00	26	65.00
12.	Gypsum application (Gypsum incorporated into the soil before sowing)	9	22.50	31	77.50	36	90.00	4	10.00	27	67.50
13.	Bio fertilizer (Rhizobium / PSB 5 Kg/ 1 tonne of FYM)	4	10.00	36	90.00	33	82.50	7	17.50	29	72.50
14.	Weed Management (Provide 3 intercultivations at 15 days after sowing, at an interval of 10 days and do not take up intercultivation after 45 days)	20	50.00	20	50.00	36	90.00	4	10.00	16	40.00
15.	Drum rolling (50-70 DAS)	7	17.50	33	82.50	28	70.00	12	30.00	21	52.50
16.	Irrigation Management (Provide one irrigation at the time of sowing and limit the irrigation up to 4 weeks after sowing; subsequent irrigations are to be given at an interval of 10 - 12 days for irrigated crop; Total 12 irrigations are sufficient during Kharif and required 16 inches of water for rabi/summer.)	24	60.00	16	40.00	38	95.00	2	5.00	14	35.00
17.	Pest management (Spray Dimethoate 30 EC @ 1.7 ml/lit. water for aphids; Traps the moths by arranging light traps between 7 to 11 PM for red headed caterpillar; Seed treatment with chloropyriphos 10ml/kg for root grubs)	20	50.00	20	50.00	30	75.00	10	25.00	10	25.00
18.	Disease management Disease management (spray 1 g Carbendazim/lit. water for tikka disease)	19	47.50	21	52.50	36	90.00	4	10.00	17	42.50
19.	Post-harvest Post-harvest (Based on duration of the varieties when the pods matured, uproot the plants along with pods, pluck the pods and subject it for cleaning, drying and storage)	24	60.00	16	40.00	32	80.00	8	20.00	8	20.00

Overall Adoption level of FLD Partner farmers on improved crop production practices in Groundnut

Table 5 indicates that before the FLD program, 35.00 per cent of groundnut growers were classified in both the low and high adoption categories, with 30.00 per cent in the medium adoption category. After the FLD program, slightly less than half (47.50%) of the respondents were in the medium adoption category, followed by 27.50 per cent in the high adoption category and 25.00 per cent in the low adoption category. This change might be attributed to various capacity development activities organized under the FLD program by the scientists, which likely motivated farmers to adopt recommended groundnut cultivation practices. These findings are consistent with the observations made by Dinesh Dour (2015) [3] and Arunkumar *et al*. (2023) [1].

Table 5: Overall Adoption level of FLD Partner farmers on improved crop production practices in Groundnut (n=40)

Indicators	Category	Before		After		W - Stat (WSR)
		F	%	f	%	
Adoption Level	Low	14	35.00	10	25.00	5.514*
	Medium	12	30.00	19	47.50	
	High	14	35.00	11	27.50	
		Mean =16.58 SD = 4.64		Mean = 31.80 SD = 3.63		

Conclusion

The study revealed that Front Line Demonstrations (FLDs) significantly enhanced the knowledge and adoption levels of groundnut growers in Tumakuru district of Karnataka. Participation in FLDs led to marked improvements in farmers' awareness and adoption of recommended crop production practices such as soil testing, improved varieties, seed treatment, nutrient and water management, pest and disease control, and post-harvest practices. The observed shift of farmers from low and medium categories to higher levels of knowledge and adoption underscores the effectiveness of FLDs as a participatory extension approach in bridging the gap between research and field-level practices. The findings highlight the need to strengthen and scale up FLD programmes with greater emphasis on follow-up extension support, timely input availability, and convergence with ongoing government schemes to sustain technology adoption. Future research should focus on assessing the long-term impact of FLDs on productivity and income, comparing FLD and non-FLD farmers, and evaluating the cost-effectiveness of FLDs across different agro-climatic regions to guide evidence-based extension

policy and planning.

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