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Performance of groundnut through cluster front line demonstrations in farmers fields of Anakapalli district, AP

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Abstract
Cluster front line demonstrations (CFLD) programme was conducted during Rabi two consecutive years of 2022-2023 and 2023-2024 in groundnut through Improved management practices (IMP) in farmers fields of 100 locations at Krishi Vigyan Kendra, Kondempudi jurisdictional Villages Viz., Khandivaram, Jaitavaram, Varada, Sirijam, Kotapadu, Mediwada, Vaddadi of Anakapalli district. The Improved management practices (IMP) like high yielding varieties, seed treatment fungicide and bio control agents Viz., Trichoderma Viridi, timely weed and irrigation management, usage of micronutrients, biofertilizers and yellow sticky Traps and need based pest and disease management practices were demonstrated. The results of two years study revealed that the average pod yield of groundnut in demonstrated plots were 20.7 q/ha and 18.6 q/ha during rabi 2022-2023 & 2023-2024, respectively. While in farmers fields 16.8 q/ha and 13.7 q/ha in respective two years. The average technology gap, extension gap, and technology index were 7.3 q/ha, 3.9 q/ha, and 26%, respectively during 2022-2023 while in 2023-2024 technology gap was 6.4q/ha, extension gap was 4.9 q/ha and technology index was 25%. The yield potential of groundnut could be enhanced to a great extent through cluster front line demonstration with improved varieties and production technologies. Hence, it is necessary to educate the farming community for adoption of improved cultivation practices in groundnut to increase productivity and economic return.

Keywords: CFLD, extension gap, technology gap and technology index and improved practices

Introduction
India ranks first in groundnut acreage and is second-largest producer of groundnut in the world with 101 lakh hectares with a productivity of 1863 kg/ha in 2021-22 (Groundnut outlook report 2022). In India, groundnut is cultivated during Kharif, rabi and summer seasons under various cropping systems. The major groundnut-producing states are Andhra Pradesh, Tamil Nadu, Gujarat, Karnataka and Maharashtra. Groundnut is not only an important oilseed crop of India but also an important agricultural export commodity. Groundnut is also called wonder nut and poor men's cashew nut as they are rich sources of protein, fat, and various healthy nutrients. Groundnut kernel contains 44- 56% oil and 22-30% protein on a dry mass basis. It is a rich source of minerals (Phosphorus, Calcium, Magnesium, and Potassium) and vitamins (E, K, and B group) (Ingale and Shrivastava 2011) [3]. Thus, groundnut accounts for nearly half of the 13 essential vitamins and 7 of 20 essential minerals necessary for human growth and development, besides being a high-quality fodder for livestock. Groundnut is cultivated in 6.04 lakh hectares with a production of 4.87 lakh tonnes and productivity was 806 kg ha^{-1} in Andhra Pradesh, making it one of the state's major crops. However, there is a wide gap between the potential and the actual production realized by the farmers due to the partial adoption of recommended package of practices by the growers. Several constraints contribute to yield fluctuation on groundnut production, including unreliable rainfall, lack of high yielding, disease tolerant varieties, the appearance of pests and diseases, low producer prices, poor agronomic practices, and lack of institutional support (Bucheyeki *et al*. 2008; Okoko *et al*. 1999) [2, 8]. Cluster front line demonstration (CFLD) program of groundnut has been implemented through Krishi Vigyan

Kendras (KVKs) to boost the production and productivity of this crop. The actual groundnut yield at the farm level depends on the management aspect that is associated with socioeconomic in addition to biophysical factors (Bindraban *et al*. 2020) [1]. The main objective of cluster front-line demonstrations is to demonstrate improved management practices (IMP) in the farmers' field under different farming situations and at different agro-climatic regions. ICAR-KVKs are organizing cluster demonstrations on oilseeds with the financial support of the National Food Security Mission (Oilseeds). CFLDs offer a scope to identify the constraints and provide solutions, thereby attaining potential yields thus improving the economic status of farmers. Besides, there is a horizontal spread of the technology with the concept of seeing by doing. In view of the above-notified issues, the present study was carried out to enhance groundnut productivity and find out the impact of CFLDs on bridging the yield gap in terms of technology gap, extension gap and technology index. Keeping the above point in view, the CFLD on groundnut using improved production technologies was conducted by Krishi Vigyan Kendra, Kondempudi to enhance groundnut productivity and find out the impact of FLDs on bridging the yield gap in terms of technology gap, extension gap and technology index.

Methodology

The present experiment was carried out by Krishi Vigyan Kendra, Kondempudi during *Rabi* season over two consecutive years of 2022-23 and 2023-2024. A total of 100 locations, CFLD programme was demonstrated in the villages of Khandivaram, Jaitavaram, Varada, Sirijam, Kotapadu, Mediwada, Vaddadi etc., of Anakapalli district of farmers fields during both the years of study in four clusters. During experimental study, total area of 40 ha was covered during two years of study @ 20 ha each year and each farmers plot size was 0.4 ha (1.0 acre) under cluster frontline demonstration programme. Soils in the experimental area were Red sandy loam texture with pH ranges between 7.1 to 8.2 and EC 0.25 to 0.36. The available nitrogen content was low and which was ranges from 193 to 232 kg N ha^{-1}, available phosphorous content was low to medium (14.2 to 29.7 kg P_2O_5 ha^{-1}) and available potassium content was high (326.3 to 456.4 kg K_2O ha^{-1}) respectively.

KVK Intervention: The Improved management practices (IMPs) demonstrated *viz*., high yielding variety (Kadiri Lepakshi, TCGS 1694), Seed treatment with Imidacloprid @ 4 ml/kg of seed, biofertilizers (Rhiziobium & Phosphobacteria each @ 10 ml/kg of seeds) and bio-control agents (Trichoderma viride @ 8 g/kg seed & Pseudomonas fluorescens @ 8 g/kg seed), nutrient management @ 20:40:50 kg NPK/ha + 90 kg Sulphur as gypsum on 40- 45 DAS were adopted. Crop was sown between second fort night of December to first second fort night of January with spacing and seed rate of 30 × 10 cm and 100 kg/ha respectively in all the locations. The integrated nutrient management technologies viz., basal application of entire dose of nitrogen (urea 46% N), phosphorus (single super phosphate 16% P_2O_5) and potash (muriate of potash 60% K2 O), application of gypsum @ 500 kg/ha at 45 days after sowing and demonstrated across all the CFLD fields. The integrated pest and disease management strategies demonstrated were installation of yellow sticky traps @ 25/ha to attract sucking pests, pheromone traps to monitor leaf miner. And timely all need based management practices were taken (Table.1). The farmers practice consists of use of old seed variety (K-6 or local), sowing with higher seed rate 150 kg/ha, imbalance use of fertilizers and plant protection measures. The seed treatment with bio-fungicides and bio-fertilizers, optimum plant population maintenance and integrated nutrient management practices were not followed in the farmers practice. Before conducting the demonstrations, list of farmers were collected in group meeting and specific production technology training programme was conducted to create awareness among about the demonstrated technology and how it differ from farmers practices. In the demonstrations one control plot was maintained and the farmers were allowed to practice their regular cultivation practice.

The observations like plant height, number of pods $plant^{-1}$, 100 seed weight, and seed yield were recorded at harvest from demonstrated as well as from farmer's practiced plot. Gross returns (Rs ha^{-1}) were calculated on the basis of the prevailing market price of the groundnut, Net return (Rs ha^{-1}) was calculated by deducting the cost of cultivation from gross return. B:C ratio was calculated by dividing the total cost of cultivation by gross return. Following formulae have been used to estimate the technology gap, extension gap, and technology index as per:

Percent yield increase = (Demonstration yield -Farmers yield)/farmers yield) x 100

Technology gap = Potential yield – Demonstration yield

Extension gap = Demonstration yield – Farmer's yield

Technology index = {(Potential yield – Demonstration yield)/Potential yield} x 100

Table 1: Comparison Between demonstration packages and existing practice under groundnut CFLD Programme

S. No.	Particulars	Demonstration	Farmers Practice
1	Variety	TCGS 1694	K-6
2	Seed rate	120kg/ha	150 kg/ha
3	Seed Treatment	Seed treatment with Imidacloprid @ 4 ml/kg of seed, biofertilizers (Rhiziobium & Phosphobacteria each @ 10 ml/kg of seeds) and bio-control agents (Trichoderma viride @ 8 g/kg seed & Pseudomonas fluorescens @ 8 g/kg seed)	Without seed treatment
4	Method of sowing	Line sowing	Seed dropping behind the plough
5	Fertilizers	20:40:50 kg NPK/ha + 90 kg Sulphur as gypsum on 40- 45 DAS were adopted.	50 kg DAP and 50 kg MOP as basal
6	Weed management	Pre-emergence application of Pendimethalin @ 1.5 lit ha-1 at 2 DAS and Imazethapyr @ 750 ml/ha at 20 DAS	Manual Weeding
7	Integrated Pest and disease Management	Usage of pheromone traps, Sticky Traps and need based plant protection measures were taken like Spraying of Thiomethoxam 25% WG @ 0.2 g/litre of water for management of sucking pests. Spraying of Profenophos 50% EC @ 2 ml/litre of water for pest management like red hairy caterpillar and tobacco caterpillar. Drenching with Metalaxyl-M 8% + Mancozeb 64% WP @ 2 g/litre of water for management of collar rot.	Non judicious use of pesticides

Results and Discussion

The agronomic parameters of groundnut were depicted in table 2. The data revealed that the plant height was found to be high under demonstrated field (25.4 and 24.9 cm) during two consecutive years 2022-23 & 2023-24 respectively. The findings are corroborated with some other findings (Singh and Chaudhari 1995; Katare *et al*. 2011) [13, 4]. This was due to the recommended dose and timely application of fertilizers to the groundnut. The data pertaining to the no. of pods plant^{-1} revealed that more no. of pods plant^{-1} (43.8 No.) were observed with the demonstrated field than the farmers practice. This impact might be due to the of application of gypsum. These results are in concurrence with the findings of (Kumari and Reddy, 2019) [5].

Table 2: Agronomic parameters of groundnut observed in demonstrated and farmers fields during 2022-23 & 2023-24

S.no	Year	Area (ha)	Locations/ Farmers	Plant height (cm)		No.of Pods/plant (No.)	
				Demonstrated field	Farmers Practice	Demonstrated field	Farmers Practice
1	2022-2023	20	50	25.4	23.6	47.2	29.2
2	2023-2024	20	50	24.9	22.9	44.4	28.3
	Mean	--	--	25.2	23.3	43.8	28.8

Yield

The perusal of data from the table 3 and 4 revealed that the % increase of yield over the farmers practice ranges from 16.8 to 39.4 during the two consecutive years 2022-23 and 2023-24 respectively from one to four clusters. During 2022-23 the recorded maximum groundnut pod yield was 23 q/ha and minimum of 17.2q/ha with average of 19.5 q/ha under cluster I in 12 number farmers like wise in cluster II with 6 demonstrations the range pod yield fo rm 16.7 q/ha to 19.9 q/ha similarly in cluster III and Cluster IV the range of groundnut pod yield from 18.5 q/ha to 24.3 and 22.4 q/ha to 24.3 q/ha respectively, where as in farmers practices plots the recorded groundnut pod yield was 15.8 q/ha to 17.9 q/ha in four clusters.

Form the table:4, the results stated that, during 2023-24, the range of lowest to highest pod yield of groundnut was 15 to 22.4 q/ha, 17.2 to 23.2,15 to 21.2 and 13.4 to 23.4 q/ha from cluster I to cluster IV, respectively in demonstration, similarly in farmers practice 13.9 q/ha, 14.2 q/ha, 13.3 q/ha, 13.4q/ha from cluster I to Cluster IV, respectively. The average pod yield of groundnut in farmers practice was 15.2 q/ha, and it was 19.7 q/ha (Table:5) in the demonstrated plot. Like wise from the figure:1 data, showed that the range of average groundnut pod yield from 17.4 q/ha to 23.4 q/ha in demonstration plot similarly in farmers practice the range of groundnut pod yield from lowest 13.3 q/ha to maximum pod yield 17.9q/ha during two years of study. The increased in groundnut yield in the demonstrated plot was due to be suitable variety, adequate seed rate, seed treatment, balance dose of fertilizer application, and proper plant protection measures. On the other hand, an inappropriate package of practices gave lower yields in farmer's practices. Superior impact by intervention practices on groundnut was also observed in others carried out work (Pawar *et al*. 2018; Solanki and Nagar 2020) [9, 14].

Table 3: Cluster wise yield of groundnut under Cluster Front Line Demonstration during 2022-23

Cluster	Number of farmers	Yield (q/ha)				% increase over Farmer Practice
		Demonstrated field			Farmers field	
		Lowest	Highest	Average		
Cluster I	12	17.2	23.0	19.5	15.8	23.5
Cluster II	6	16.7	19.9	18.4	15.8	16.8
Cluster III	25	18.5	24.3	21.5	17.5	22.6
Cluster IV	7	22.4	24.3	23.4	17.9	30.4

Table 4: Cluster wise yield of groundnut under Cluster Front Line Demonstration during 2023-24

Cluster	Number of farmers	Yield (q/ha)				% increase over Farmer Practice
		Demonstrated field			Farmers field	
		Lowest	Highest	Average		
Cluster I	7	15.0	22.4	18.7	13.9	34.5
Cluster II	13	17.2	23.2	19.8	14.2	39.4
Cluster III	10	15.0	21.2	17.4	13.4	29.8
Cluster IV	20	13.4	23.2	18.3	13.3	37.5

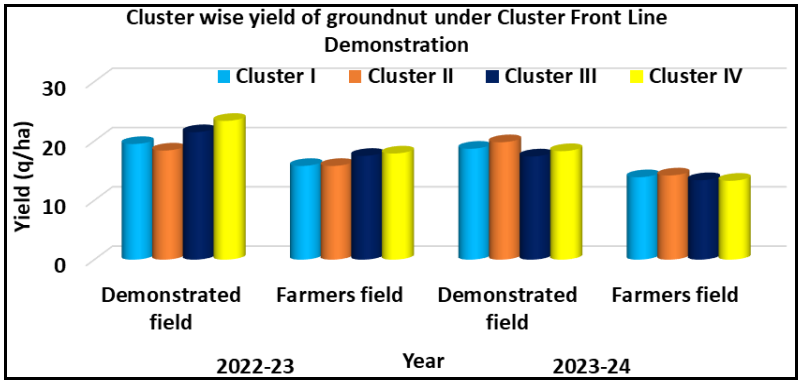

Fig 1: Cluster wise yield of groundnut under cluster front line demonstration (CFLD) and farmers practices (FP)

Table 5: Pod yield of groundnut, Technology gap, Extension gap and Technology index in groundnut under Cluster Front Line Demonstration during 2022-23 & 2023-24

S. No	Year	Pod Yield (q/ha)		% Increase over farmer Practice	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
		Demonstrated field	Farmers Practice				
1	2022-2023	20.7	16.8	23.5	7.3	3.9	26
2	2023-2024	18.6	13.7	35.3	6.4	4.9	25
	Mean	19.7	15.2	31.7	6.9	4.4	---

Technology Gap

The technology gap means the differences between potential yield and yield of demonstration plot. The technology gap of demonstration plots were 7.3 and 6.4 q/ha during 2022-2023 and 2023-24 (Table:5 and figure:2), respectively. These results were in accordance with Ramesh *et al*. 2023. On an average technology gap under two year CFLD programme was 6.9 q/ha. The technology gap observed may be attributed to dissimilarity in the soil fertility status, crop production, protection practices and local climatic situation. Hence, variety wise location specific recommendation appears to be necessary to minimize the technology gap for yield level in different situations.

Extension Gap

Extension gap means the differences between demonstration plot yield and farmers yield. Extension gap of 3.9 and 4.9 q/ha was noticed during 2022-23 and 2023-24(Table:5 and figure:2), respectively. On an average extension gap under two years CFLD programme was 4.4 q/ha which emphasized the need to educate the farmers through various extension programs i.e. Cluster front line demonstration for adoption of improved production and protection technologies, to revert the trend of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of galloping extension gap. These findings are in accordance with Raghunatha Reddy *et al*., (2019) [11].

Technology Index

Technology Index indicates the feasibility of the evolved technology in the farmers' fields. Lower the value of technology index, higher is the feasibility of the improved technology. The technology index varied from 25 to 26 per cent (Table:5 and figure:2) during the two years of CFLD programme, which shows the efficacy of good performance of technical interventions. It implies that the technology is practically suitable for farmers' field situations and warrants widespread awareness among many non-beneficiary farmers. Awareness programmes, field days, group discussions, documentation of success stories, and farmers feedback help in the horizontal spread of the technology. The results are in agreement with Lakhani *et al*., (2020) [6].

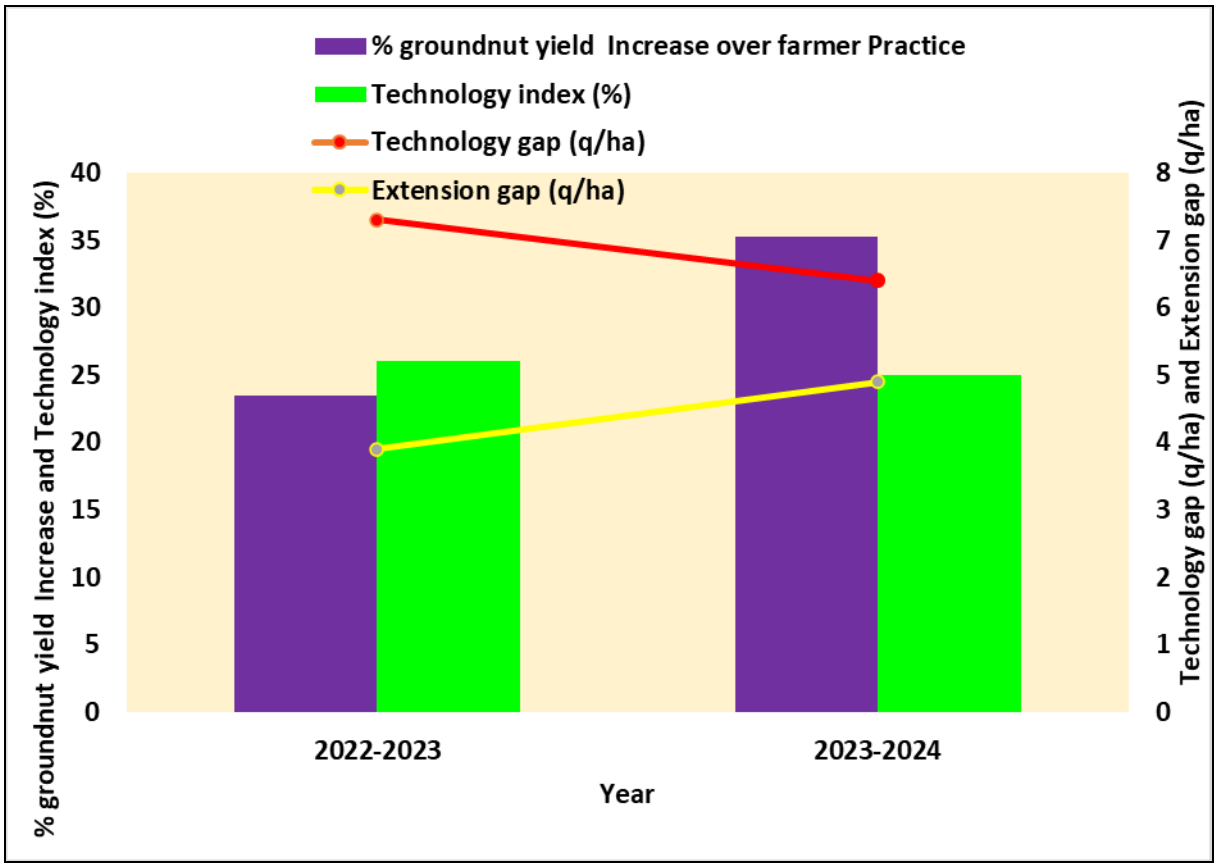

Fig 2: % yield increase over farmer practice, Technology Gap, Extension gap and Technology Index, under CFLD groundnut during 2022-23 and 2023-24

Economics

Cluster wise Gross, Net returns and B:C ratio data was depicted in table 6 and 7 and figure:3 showed that the range of gross returns from cluster I to Cluster IV was Rs. 110554/- to Rs. 140306 during both years, similarly Net returns and B:C ratio from Rs. 50273 to Rs. 79545 and 1.83 to 2.72 during 2022-2023 and 2023-2024, respectively under demonstration plot where as in farmers plot Gross returns, Net returns and B: C ratio ranged from Rs. 83083 to Rs.113788/-, Rs. 34467/- to Rs.51250/- and 1.71 to 2.12, respectively in two years of study.

The two years pooled data was depicted in table 8 for the years 2022-23 and 2023-24 revealed that highest Gross returns (Rs. 121179 ha^{-1}), Net returns (Rs. 67108 ha^{-1}), and B:C ratio (2.28) was observed with Demonstrated field. In farmers practice gross return, net return and B:C ratio values were Rs. 95395 ha^{-1}, Rs. 43731 ha^{-1} and 1.86 respectively. Similar findings was observed with of Raghava & Punna rao (2013) [10], Undhad *et al*., (2019) [15], Raghunatha *et al*., (2019) [11], Levish *et al*., (2020) [7] and Lakhani *et al*., (2020) [6]

Table 6: Cluster wise gross returns, Net returns and B:C ratio of groundnut under Cluster Front Line Demonstration during 2022-23

Cluster	Demonstration			Farmers field		
	Gross Return(Rs.)	Net Returns (Rs.)	B;C ratio	Gross Return(Rs.)	Net Returns (Rs.)	B;C ratio
Cluster I	116825	56760	1.94	102462	44417	1.77
Cluster II	110554	50273	1.83	102756	44959	1.78
Cluster III	128765	65944	2.05	113788	51250	1.82
Cluster IV	140306	78204	2.26	107597	44767	1.71

Table 7: Cluster wise gross returns, Net returns and B:C ratio of groundnut under Cluster Front Line Demonstration during 2023-24

Cluster	Demonstration			Farmers field		
	Gross Return (Rs.)	Net Returns (Rs.)	B:C ratio	Gross Return (Rs.)	Net Returns (Rs.)	B:C ratio
Cluster I	118977	71160	2.48	83083	39539	1.90
Cluster II	126029	79545	2.72	90701	47606	2.12
Cluster III	111151	63895	2.37	77736	34467	1.80
Cluster IV	116827	71084	2.56	85037	42840	2.02

Table 8: Economics of groundnut under Cluster Front Line Demonstration during 2022-23 & 2023-2024

S. No	Year	Gross Returns (Rs.)		Net Returns (Rs.)		B:C ratio	
		Demonstrated field	Farmers Practice	Demonstrated field	Farmers Practice	Demonstrated field	Farmers Practice
1	2022-2023	124113	106651	62795	46348	2.02	1.77
2	2023-2024	118246	84139	71421	41113	2.53	1.96
	Mean	121179	95395	67108	43731	2.28	1.86

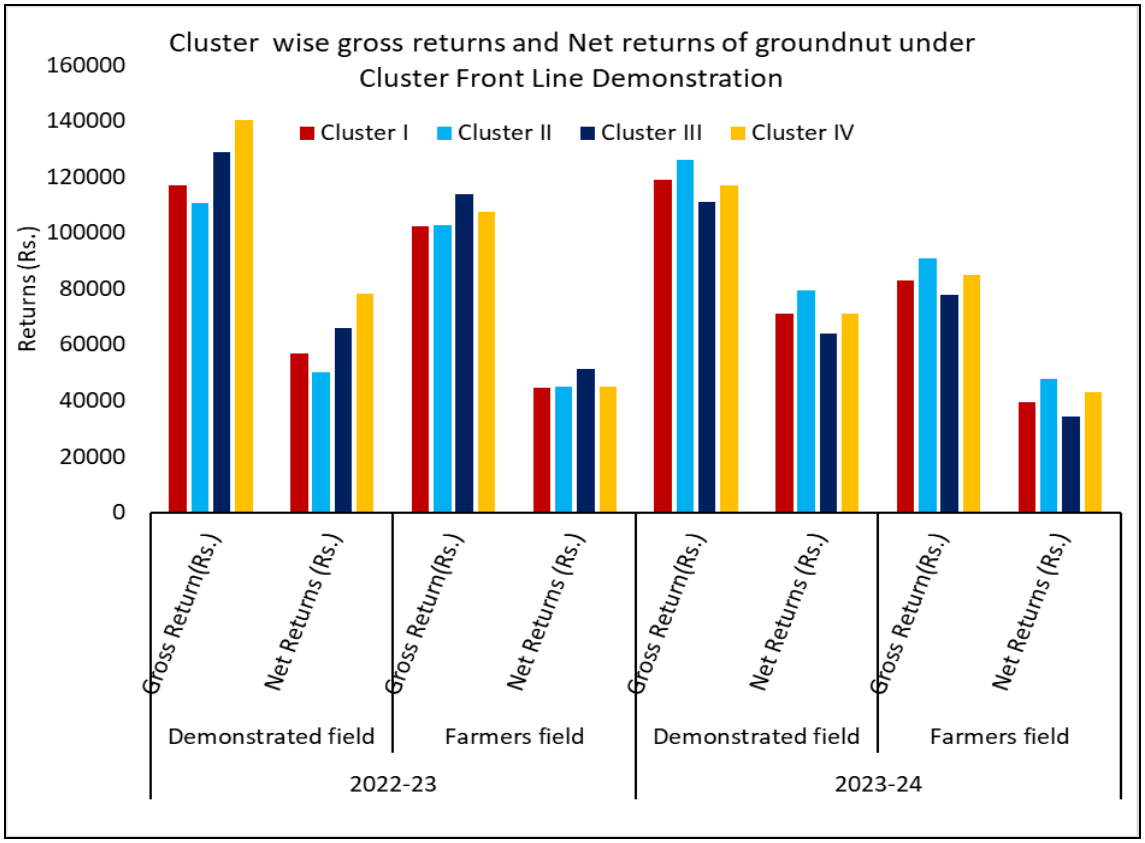

Fig 3: Economics of groundnut under demonstration and farmers pots during 2022-23 and 2023-24

Conclusion

Groundnut is a potential *rabi* pulse crop in Anakapalli district of Andhra Pradesh but its productivity is very meagre due to unavailability of improved technology in the district. It is found from the study that there exists a wide gap between the potential and demonstration yields in groundnut mainly due to technology and extension gaps and also due to the lack of awareness about new technology in groundnut cultivation in Anakapalli district of Andhra Pradesh. The higher average yield was recorded in demonstration plots compared to farmers pracice due to increased knowledge and adoption of full package of practices. Hence, it is concluded that the CFLDs programme is a successful tool in improving the production and productivity of groundnut crops with latest improved varieties and specific technologies.

References

1. Bindraban PS, Stoorvogel JJ, Jansen DM, Vlaming J, Groot JJR. Land quality indicators for sustainable land management: proposed method for yield gap and soil nutrient balance. Agric Ecosyst Environ. 2000;81(2):103-112. https://doi.org/10.1016/S0167-8809(00)00168-6.
2. Bucheyeki TL, Shenkalwa EM, Mapunda TX, Matata LW. On-farm evaluation of promising groundnut varieties for adaptation and adoption in Tanzania. Afr J Agric Res. 2008;3(8):531-536. https://doi.org/10.5897/AJAR.
3. Ingale S, Shrivastava SK. Nutritional study of new variety of groundnut (*Arachis hypogaea* L.) JL-24 seeds. Afr J Food Sci. 2011;5(8):490-498. https://doi.org/10.5897/AJFS.
4. Katare S, Pandey SK, Mustafa M. Yield gap analysis of rapeseed-mustard through front line demonstration. Agric Update. 2011;6(2):5-7.
5. Kumari C, Reddy BS. Evaluation of groundnut varieties for drought tolerance under imposed moisture stress conditions. J Oilseeds Res. 2019;36(1):24-29. https://doi.org/10.1007/s11406-018-0113-1.
6. Lakhani SH, Baraiya KP, Baraiya AK. Impact of cluster frontline demonstrations (CFLDs) on kharif groundnut productivity and income of farmers in Jamnagar district of Gujarat. Int J Curr Microbiol Appl Sci. 2020;9(11):1116-1120. https://doi.org/10.20546/ijcmas.2020.911.134.
7. Levish C, Singh D, Singh M. Enhancement of groundnut production through front line demonstration in Khumlo. Int J Curr Microbiol Appl Sci. 2020;9(12):2601-2609. https://doi.org/10.20546/ijcmas.2020.912.307.
8. Okoko ENK, Rees DJ, Kwach JK, Ochieng P. Participatory evaluation of groundnut production in Southwest Kenya. In: Towards Increased Use of Demand Driven Technology KARI/DFID NARP II Project, Nairobi Kenya. 1999, 305-307.
9. Pawar YD, Malve SH, Chaudhary FK, Dobariya U, Patel GJ. Yield gap analysis of groundnut through cluster front line demonstration under north Gujarat condition. Multilogic Sci. 2018;VII(XXV):177-179.
10. Raghava NV, Punna Rao P. Impact of front line demonstrations on groundnut production technology in Guntur district of Andhra Pradesh. Agric Update. 2013;8(1-2):283-290.
11. Raghunatha Reddy RL, Noorulla Haveri, Tulasi Ram K. Impact of front line demonstration of new groundnut (*Arachis hypogaea* L.) variety GKVK 5 in Kolar district, Karnataka. Int J Agric Sci. 2019;15(2):227-232. https://doi.org/10.15740/HAS/IJAS/15.2/227-232.
12. Ramesh G, Durgaprasad NVVS, Jahnavi M, Satya Swarupa Rani M. Impact of cluster frontline demonstrations on yield of groundnut in Prakasam district, Andhra Pradesh. Int J Agric Sci. 2023;8(1):414-420. https://doi.org/10.15740/HAS/IJAS/8.1/414-420.
13. Singh AL, Chaudhari V. Source and mode of sulphur application on groundnut productivity. J Plant Nutr. 1995;18(12):2739-2759. https://doi.org/10.1080/01904169509365113.
14. Solanki RL, Nagar KC. Yield and gap analysis of groundnut (*Arachis hypogaea* L.) productivity through frontline demonstration in district Chittorgarh of Rajasthan, India. Int J Curr Microbiol Appl Sci. 2020;9(6):4119-4125. https://doi.org/10.20546/ijcmas.2020.906.496.
15. Undhad SV, Prajapati VS, Sharma PS, Jadav NB, Parmar AR. Role of cluster frontline demonstrations in enhancement of groundnut production. J Phytochem Pharmacol. 2019;8(4):1862-1863. https://doi.org/10.31254/jpp.2019.8405.