Journal of Experimental Agriculture International

Volume 46, Issue 12, Page 882-888, 2024; Article no.JEAI.129517
ISSN: 2457-0591
(Past name: American Journal of Experimental Agriculture, Past ISSN: 2231-0606)

Impact of Improved Crop Management Practices in *Rabi* Groundnut through Frontline Demonstrations in Nagarkurnool District, Telangana, India

K. Mamatha [a++*], K. Sravanthi [b], G. Seshu [b], Ch. V. Durga Rani [b] and K. Avil Kumar [a]

[a] Department of Agronomy, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Telangana State, India.
[b] Department of Genetics and Plant Breeding, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Telangana State, India.

Authors' contributions

This work was carried out in collaboration among all authors. Author KM conducted the frontline demonstrations. Authors GS and KS provided their valuable suggestions in providing need-based inputs to the farmers. Authors ChVDR and KAK monitored the demonstrations and provided support as senior members. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jeai/2024/v46i123204

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/129517

Original Research Article

Received: 27/10/2024
Accepted: 30/12/2024
Published: 30/12/2024

[++] Scientist (Crop Production);
**Corresponding author: E-mail: mamatha.cp.daattc@gmail.com;*

Cite as: *Mamatha, K., K. Sravanthi, G. Seshu, Ch. V. Durga Rani, and K. Avil Kumar. 2024. "Impact of Improved Crop Management Practices in Rabi Groundnut through Frontline Demonstrations in Nagarkurnool District, Telangana, India". Journal of Experimental Agriculture International 46 (12):882-88. https://doi.org/10.9734/jeai/2024/v46i123204.*

ABSTRACT

Frontline Demonstrations were conducted in the *rabi*, 2020-21 in bijinepally mandal of nagarkurnool district. Groundnut is a major crop in nandivaddeman village having 70-80% of the area under groundnut in *rabi* season. A total of 25 demonstrations allotted were conducted in nandivaddeman village of bijinepally mandal in nagarkurnool district. The study aims to demonstrate improved crop management practices in groundnut to increase the productivity and profitability of groundnut crop. The study revealed that improved crop management practices enhanced groundnut production and profitability to groundnut farmers. The results indicate that, demonstrated ICM practices increased the pod yield (2762 kg ha^{-1}) over the conventional method of farming (farmer's practice) (2276 kg ha^{-1}) with 17.4% increase in the pod yield. The technology gap ranged from 250 kg ha^{-1} and the extension gap ranged from 486 kg ha^{-1} with an average technology Index of 49.5%. In conclusion, The ICM practices have reduced the cost of cultivation by Rs.2807/- per hectare and increased the gross returns by 17.3%, net returns by 26% over farmer's practice. The study revealed that, improved crop management practices can enhance productivity and profitability of *rabi* groundnut.

Keywords: Groundnut; frontline demonstrations and improved crop management.

1. INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is an important legume and oilseed crop of tropical and sub-tropical areas cultivated in about 25 million hectares of land in more than 90 countries in the world under different agroclimatic regions where rainfall during the growing season exceeds 500 mm. India occupies first in terms of area and second in terms of production in the world. In India. The country has exported 680,698.61 MT of Groundnuts to the world for the worth of Rs. 7,135.35 Crores/ 860.68 USD Millions during the year 2023-24 Indonesia, Vietnam, Philippines, Malaysia and Thailan as Major Export Destinations. (APEDA, 2023-24). Indian groundnuts are available in different varieties: Bold, Java, and Red Natal**.** In addition to raw edible peanuts, India also supplies blanched peanuts, roasted salted peanuts, dry roasted peanuts, peanut butter, and various peanut-based products (IOPEPC).

The major groundnut-producing countries in the world are India, China, Nigeria, Senegal, Sudan, Burma, and the United States of America. Out of the total area of 18.9 million hectares and the total production of 31.09 MT in the world, these countries account for about 69 percent of the area and 70 percent of the production. India occupies the first place regarding the area and the production in the world (Karthickraja et al., 2023; Kundu et al., 2023a). The major groundnut-growing states are Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Rajasthan, Madhya Pradesh, Telangana, Orissa and Uttar Pradesh. Groundnut is an important oilseed crop of Telangana grown in Mahabubnagar, Nagarkurnool, Wanaparthy, Gadwal, Mahababadad, Suryapet, Karimnagar and Warangal districts which contributes nearly 80% of total groundnut production in the state.

The area under *rabi* groundnut in Telangana increased tremendously during the *rabi* season with productivity ranging from 2261-2330 kg ha^{-1}. In India, 24.4 percent of rabi season Groundnut is cultivated in Telangana State (Kundu et al., 2022). In the state lion share of area and production are contributed from Wanaparthy, Nagarkurnool and Gadwal districts (72,030 ha). The average yield (2047 kg ha^{-1}) of groundnut in Telangana is higher than the national average (1,486 kg ha^{-1}) because of the season, suitable soils, weather, 90% of groundnut area under sprinkler system of irrigation combined with partial mechanization (All India crop situation *rabi*, 2019-20, GOI). There is tremendous scope for increasing the productivity of the *rabi* groundnut due to the above-mentioned reasons. To boost the productivity of groundnut frontline demonstrations were conducted.

A survey was conducted by AICRP on Groundnut, RARS, Palem, the Nagarkurnool district groundnut farmers were surveyed about the package of practices followed and found out the reasons for the yield gap (Mamatha et al., 2024). In the survey, it was found that due to a lack of awareness, the farmers are not practicing the recent technologies or improved crop management practices which has created an extension gap. Therefore, there was an immediate need to encourage farmers to practice scientific technologies through Frontline

Demonstrations. This study helps to develop new hypotheses and build upon scientific discoveries on the impact of improved crop management practices on productivity and profitability of groundnut with a specific reference to frontline demonstrations.

In this regard, AICRP on Groundnut Scheme, Regional Agricultural Research Station, Palem has conducted frontline demonstrations realising the scope of technical and extension gaps with the objectives of enhancing yield and income levels of the farmers of Nagarkurnool District.

2. METHODOLOGY

The frontline demonstrations on improved crop management in groundnut were conducted by AICRP on Groundnut Supporting Centre at the RARS, Palem. A total of 25 Frontline demonstrations were conducted in Nandivaddeman villages of Bijinepally Mandal and Nagarkurnool District during *rabi* season, 2020-21.

The soils of the demonstrated area are red sandy and sandy loam soils having low available nitrogen, medium in available phosphorus and high in available potash contents. The demonstrated area has having good canal wat irrigation facility.

The farmers were selected and an awareness program cum training was conducted on the “Improved Crop Management Practices to enhance the Productivity of Groundnut”. The selected farmers then allotted 0.4 ha of area for ICM Practices and 0.4 ha for traditional practices or farmers practices or control.

The selected farmers were recommended to use 200 kg of groundnut seed per hectare sown in line sowing against 250 kg ha^{-1} seed rate in zig-zag sowing. Different inputs were provided such as seed treatment chemical (Tebuconazole 2 DS (2% w/w)) against the use of Dithane M-45 (75% WP), Pre-emergence herbicide Diclosulam 84% WDG against the use of Pendimethalin 30% EC, 500 kg gypsum ha^{-1} at 40 DAS against no application of gypsum and need-based plant protection chemicals. The recommended package of practices was demonstrated in the demo plot. The farmer's practices are the traditional practices farmers have practiced over the years. The adjacent fields near by the demonstrations plots of other farmers who are practicing traditional practices were considered as farmers practice.

Table 1. Package of practices for groundnut cultivation

S.No.	Particulars	Farmers Practice	ICM Practice
1.	Seed Rate	250 kg seed per hectare	200 kg seed per hectare
2.	Seed Treatment	Dithane M-45 (75% WP)	Tebuconazole 2 DS (2% w/w)
3.	Fertilizers	Source of Phosphorus: DAP Application of Gypsum at peg formation stage: No	Source of Phosphorus: SSP Application of Gypsum at peg formation stage: 500 kg ha^{-1}
4.	Plant Protection Chemicals	Need-based chemicals at early stages of pest infestation.	High-concentration chemicals after pest outbreak

The data on socioeconomic characteristics, yield parameters, cost of cultivation and other parameters were collected and analyzed. The following formulas were used to analyze different parameters.

$$\text{Gross Income (Rs.)} = \text{Economic yield (kg/ha)} \times \text{Market Price (Rs/kg)} \quad (1)$$

$$\text{Net Income (Rs.)} = \text{Gross Income} - \text{Cost of Cultivation} \quad (2)$$

$$\text{B:C Ratio (Rs.)} = \text{Gross Returns/Cost of Cultivation} \quad (3)$$

$$\%\ \text{increase in the yield} = (\text{Demonstrated yield-farmers yield/ Farmers yield} \times 100 \quad (4)$$

$$\text{Technology Gap} = \text{Pi (Potential Yield)} - \text{Fi (Farmers Yield)} \quad (5)$$

$$\text{Extension Gap} = \text{Di (Demonstration Yield)} - \text{Fi (Farmers Yield)} \quad (6)$$

Technology Index= (Potential Yield-Demonstration Yield)/(Potential Yield) ×100 (7)

Impact of yield = (Yield of Demonstration Plot-Yield of Control Plot)/ (Yield of Control Plot)×100

An impact study was conducted in the demonstrated village in the year 2023-24 to study the rate of adoption of technologies demonstrated and adopted 3 years after completion of demonstration.

The study has been conducted with the following objectives:

1. To enhance the productivity of the groundnut crop in Nagarkurnool District.
2. To increase the B: C Ratio of the groundnut farmers.
3. To encourage the farmers to practice improved package of practices in Groundnut crop.

3. RESULTS AND DISCUSSION

3.1 Yield Gap Analysis

A yield gap analysis was conducted before implementing the frontline demonstrations to study the gap between demonstration and farmer's practice. Technologies to be demonstrated were decided based on the presence of gap. Depending on the priority some technological gaps were targeted through giving awareness and some through giving inputs like tebuconazole for treating the seed, basal application of single super phosphate and Gypsum for improving the test weight, need-based pesticides and insecticides for identification and timely application of the insecticides and pesticides.

3.2 Yield Parameters

The perusal of the yield data (Table 3) indicates that due to frontline demonstration, groundnut yields have been improved significantly ranging from 2100 to 2700 kg ha^{-1} against farmer's practice ranging from 1900 to 2450 kg ha^{-1} with a yield increment of 9.4%. An average yield of 2338 kg ha^{-1} was obtained under the demonstration plot as compared to the control plot of 2116 kg ha^{-1}. The yield increment observed in groundnut cultivation in 2019 was 9.4% due to the farmers' literacy level (68%).

These findings are similar to Chakraborty et al. (2024), Chhodavadia et al. (2024), Natarajan, et al., (2024), Meena et al. (2023), Bai et al. (2022), Shaker et al. (2022).

3.3 Economic Parameters

The data on the economic parameters of the Frontline Demonstrations indicate that, in terms of the cost of cultivation, the Frontline Demonstration could save Rs. 2,852/- hectare due to reduced pesticide costs. Higher gross returns were observed with the demo plot (Rs.1,41,890/-) over the demo plot (1,28,102/-). A similar trend was followed for net returns. Higher Benefit: Cost Ratio was observed with demo plot (2.04) over control plot (1.59). The results are inline with Chakraborthy et al. (2024), Chhodavadia et al. (2024), Natarajan, et al*.,* (2024), Bai et al. (2022), Shaker et al*.* (2022).

3.4 Impact of Frontline Demonstrations on Adoption of Improved Package of Practices

The Frontline Demonstrations have significantly impacted the adoption of the improved Package of Practices recommended for the groundnut crop. Most of the farmers followed an increased seed rate over the recommended seed rate which increased seed cost. After Frontline demonstrations 200% impact was observed. 35% for mechanical sowing with seed cum ferti drill. Earlier farmers used seed treatment but with dithane M-45 which was irrelevant to the location's diseases after the demonstration156%. After the introduction of the pre-emergence herbicide diclosulam, farmers have shifted from not using pre-emergence herbicides and using pendimethalin with 267% impact (% change), with respect to use of single super phosphate, murate of potash and gypsum 100% change, only 33% shift has been observed with reduction of application of pesticide. The influence of input dealers on the use of pesticides was strongly observed. Similar findings were observed with Patil et al*.* (2018), Rayudu et al*.* (2018), Alagudurai et al. (2022), Rani et al*.* (2010).

Table 2. Details of the front-line demonstration technology

S.No.	Particulars	Demonstration	Farmers practice	Gap
1.	Seed	K-6 (Local Admixtures)	K-6 (Local Admixtures)	Full Gap
2.	Seed rate	80 kg	80 kg	No Gap
3.	Seed Treatment	Seed Treatment with Tebuconazole 1gram per kg seed	Seed Treatment with Dithane M-45	Moderate
4.	Sowing Time	October 1st fortnight to 2nd fortnight	October 1st fortnight to 2nd fortnight	No Gap
5.	Fertilizers	50-250-82 kg Urea, SSP and MOP. Application of Gypsum 500 kg ha^{-1}	70 kg Urea, 90 kg DAP	Full Gap
6.	Weed Management	Pre-emergence herbicide: No application	Pre-emergence herbicide Pendimethalin 30 EC 1.3 to 1.6 liters per acre	Moderate
7.	Irrigation Management	Irrigation with sprinkler irrigation system	Irrigation with sprinkler irrigation system	No Gap
8.	Pest Management	Early diagnosis and timely spraying of effective low-dose chemicals	Higher concentration chemicals after pest outbreak	Moderate Gap
9.	Disease Management	Early diagnosis and timely spraying of effective low-dose chemicals	Higher concentration chemicals after pest outbreak	Moderate Gap

Table 3. Productivity in front line demonstration over farmers practice

Year	No. of Farmers	Area (ha)	Yield (kg/ha)			% increase in yields
			Potential Yield	Demonstration Yield	Farmers Yield	
2020-21	25	10	3000	2762	2276	17.4

Table 4. Technology gap, technology index and extension gap in front line demonstration over farmers practice

Extension gap (kg/ha)	Technology gap (kg/ha)	Technology Index
486	250	49.5

Table 5. Economic parameters of the front line demonstration

S.No.	Parameter	Demo/Check	(Rs/ha)
1.	Cost of Cultivation (Rs/ha)	Demo	Rs. 46,775/-
		Check	Rs. 49,627/-
2.	Gross Returns (Rs/ha)	Demo	Rs. 1,41,890/-
		Check	Rs. 1,28,102/-
3.	Net Returns (Rs/ha)	Demo	Rs. 95,115/-
		Check	Rs. 78,475/-
4.	B: C Ratio	Demo	2.04
		Check	1.59

4. CONCLUSION

The research discloses that groundnut cultivation using scientific methods has increased groundnut pod yield by 17.4 %, gross returns by 17.3%, and net returns by 26.0% over farmer practice. The cost of cultivation decreased by Rs.2807/- per hectare. On average the adoption of technology after conducting frontline demonstrations was 131.8%. The demonstration plots recorded higher yields consistently due to the use of gypsum, seed treatment and timely pest and disease management with appropriate doses of chemicals.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

ACKNOWLEDGEMENT

The Directorate of Groundnut Research, Junagadh, Gujarat, allotted and funded these Frontline Demonstrations, which were implemented by AICRP on the Groundnut sub-center, RARS, Palem, Department of Agriculture Officers from Nagarkurnool in the selection of farmers are greatly acknowledged.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Alagudurai, S., Thirunavukkarasu, T & Sharmilabharathi, C. (2022). Performance of Groundnut varieties in Kallakurichi district through farmer participatory mode. *International Journal of Plant & Soil Science*, 34(22), 831-834.

Bai, K., Ali, S., Reddy, G.K., Nagaraj, K.H., Kulkarni, L. R & Ranganatha, S.C. (2022). Impact of improved production technology and mechanized decortication of groundnut (Arachis hypogaea L.) on productivity and income of farmers in Ramanagara district of Karnataka: Impact of Improved Production Technology of Groundnut in Karnataka. *Journal of Oilseeds Research*, 36(2), 112-118.

Chakraborty, M & Singh, A.K. (2024). Impact of frontline demonstration on groundnut productivity in South Tripura district. *Indian Journal of Agricultural Sciences*, 20(1): 187-190.

Chhodavadia, H.C., Dadhaniya, D.J., Pithiya, N.M & Khunt, K. (2024). Knowledge of FLDs farmers and fellow farmers about groundnut production technology. *International Journal of Agriculture Extension and Social Development*. 7(85):154-156.

Indian Oilseed and Produce Export Promotion Council. https://iopepc.org.

Karthickraja, M., Premavathi, R., Murugan, P.P & Vanetha, K.P. (2023). Constraints faced by the groundnut growers in the adoption of cluster frontline demonstration of

Villupuram district. *Madras Agricultural Journal,* 110(7-9), 91-97.

Kundu, R., Biswas, S., Jash, S & Moinuddin, G. (2023). Assessment of demonstration through yield and gap analysis of kharif groundnut in the different districts of West Bengal. *Journal of Oilseeds Research*, 40 (3), 156-160.

Kundu, R., Biswas, S., Poddar, R & Chatterjee, S. (2022). Impact of demonstrations on improving production and income from groundnut in farmers field of Purulia district of west Bengal. *International Journal of Economic Plants*, 9(2),127-129.

Mamatha, K., Seshu, G., Madhuri, G., Rani, V.D., Rani, Ch.V.D & Kumar, K.A. (2024). Economic Importance of Frontline Demonstrations on Groundnut Production Technology in Nagarkurnool District, India. *Journal of Experimental Agriculture International*, 46(9), 1036-1042.

Meena, S.N., Verma, P., Yadav, S., Jadon, C.K., Gupta, v., Kumar, N & Yadav, A.K. (2023). Evaluation of technological interventions on the productivity and profitability of chickpea (Cicer arietinum L.) through frontline demonstrations in South-Eastern Rajasthan. *Journal of Food Legumes*, 36(2&3), 187-191.

Natarajan, K., Hanif, N.A.K.A., Jayakumar, J., Senguttuvan, K., Gayathry, G., Kumar, B.K., et al. (2024). Study on Yield and Value Sustainability in Groundnut (Arachis hypogea) Through Cluster Frontline Demonstrations Approach in Cuddalore District of Tamil Nadu. *Legume Research-An International Journal*, 47(7), 1172-1178.

Patil,S.S., Mahale, M.M & Chanvan, S.S. (2018). Impact of frontline demonstrations (FLDs) on oilseed crops in South Konkan Coastal Zone of Maharashtra. *Current Agriculture Research Journal*, 6(3), 355-364.

Rani, M.K.K., Raja, D., Shivacharanm, R & Premavathi, R. (2010). Effective way of transfer of technology to boost the groundnut yield under rainfed condition through frontline demonstration in Salem, Tamil Nadu. *Agriculture Update,* 5(1&2), 32-35.

Rayudu, B.T., Akshatha, M.K., Reddy, D.V.S & Dixit, S. (2018). Performance of cluster frontline demonstrations on black gram in Tamilnadu: a pathway for bridging yield gap. *Research Journal of Applied Sciences*, 9(6), 1396-1402.

Shaker, B.R.M., Narendar, G., Goverdhan, M & Kumar, A.K. (2022). Impact of Front-line Demonstration in Transfer of Groundnut Production Technologies for the Livelihood Improvement of Oilseed Farmers Citation (VANCOUVER). *International Journal of Bio-Resources and Stress Management,*13 (8), 806-814.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/129517