International Journal of Agriculture Sciences
ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 15, Issue 5, 2023, pp.-12372-12374.
Available online at https://bioinfopublication.org/pages/jouarchive.php?id=BPJ0000217

Research Article

IMPACT OF CLUSTER FRONTLINE DEMONSTRATIONS ON YIELD OF GROUNDNUT IN PRAKASAM DISTRICT, ANDHRA PRADESH

RAMESH G.*[1], DURGAPRASAD N.V.V.S.[2], JAHNAVI M.[3] AND SATYA SWARUPA RANI M.[4]
[1]Scientist (Crop Production), ICAR-Krishi Vigyan Kendra, Drasi, 523247, Acharya N. G. Ranga Agricultural University, Lam, Guntur, 522034, Andhra Pradesh, India
[2]Programme Coordinator, ICAR-Krishi Vigyan Kendra, Drasi, 523247, Acharya N. G. Ranga Agricultural University, Lam, Guntur, 522034, Andhra Pradesh, India
[3,4]Subject Matter Specialist, ICAR-Krishi Vigyan Kendra, Drasi, 523247, Acharya N. G. Ranga Agricultural University, Lam, Guntur, 522034, Andhra Pradesh, India
*Corresponding Author: Email - g.ramesh@angrau.ac.in

Received: May 03, 2023; Revised: May 26, 2023; Accepted: May 28, 2023; Published: May 30, 2023

Abstract: The Cluster frontline demonstrations (CFLDs) on groundnut were conducted by Krishi Vigyan Kendra, Darsi, Prakasam Dt during Rabi season of 2019-20 and 2021-22 across an area of 20 ha with 25 demonstrations. Results revealed that per cent increase in demonstration yield over farmers practice was 22.5 and 21.2 during 2019-20 and 2021-22 respectively. Highest B: C ratio (2.14 and 2.03) was realized from demonstration during the study period against B: C ratio of 1.87 and 1.78 in farmers practice. During investigation, average technology gap (10.18 q/ha), average extension gap (6.3 q/ha) and technology index of 33.7 % and 29.7% in respective years was recorded. Increased production and economic returns improved livelihood of farmers. The existing study signifies that location particular recommendations should be formulated to slim down technology gap and motivate beneficiary farmers to undertake full proven technological know-how to reduce extension gap.

Keywords: *Groundnut, Cluster frontline demonstrations (CFLD), Yield, Yield gap, Gross returns*

Citation: Ramesh G., *et al*., (2023) Impact of Cluster Frontline Demonstrations on Yield of Groundnut in Prakasam District, Andhra Pradesh. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 15, Issue 5, pp.- 12372-12374.

Academic Editor / Reviewer: Pratik P. Javiya

Introduction

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. With a productivity of 1816 kg/ha in 2020-21 (Groundnut outlook record 2021) [1] and 101 lakh tonnes of groundnut production, India is the world's second-largest groundnut producer after Brazil. Groundnut is not only an important oilseed crop of India but also an important agricultural export commodity. In vegetable oil production, mustard, soybean and groundnut contribute 27%, 34% and 30%, respectively (Cooperation and Farmers' Welfare Annual report 2020-21, Department of Agriculture) [2]. Groundnut oil exports rose by 142%, to 2,13,448 tons in (Apr-Feb) 2021 from 35,629 tons in 2020, according to IOPEPC [3]. 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) [4]. 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 6.61 lakh hectares across Andhra Pradesh, making it one of the state's major crops. It is widely grown in Aantahpuram, Kadapa, Chitoor, Districts. The potential yields and the actual production realized by the farmers, however, differ significantly. Due to the high cost of purchasing seed, which accounts for about 25% of the total cost of cultivation, maintaining a low plant population and resulting lower yields using lower seed rates; using local, age-old, low yielding varieties which are susceptible to drought and non-adoption of seed treatment which favors seed-borne diseases resulting in lower plant population ultimately less yields. Groundnut is the most neglected crop and is cultivated in all types of soils, including marginal lands; hence nutrient management is of prime importance. Though a legume crop, groundnut requires nitrogen during the initial stages. But most farmers do not resort to nitrogen application. Farmers apply less than the recommended dose of P_2O_5 and K_2O, which affects the root growth resulting in lower yields. Besides, they use complex fertilizer for top dressing, which leads to nutrient deficiencies of Ca & S, which are essential for preventing pops and enhancing oil content in pods. Farmers on a large scale fail to apply gypsum, which is necessary at pegging due to lack of availability on time. Weeds account for 24 to 70% of yield losses in groundnut as they compete with the crop for sunlight, water, nutrients, and space.

In addition, they harbour pests and disease organisms. One important reason why sowing is delayed until January is the fact that the ideal time to sow during the Rabi season is from September 2nd fortnight to October. This significantly reduces yields. Significant yield reduction is also caused by pest and disease. In groundnut, white grub, thrips, tobacco caterpillar and hairy caterpillar are responsible for considerable yield losses regarding the disease's viruses and early and late leaf spots, stem rot is a major disease in groundnut that leads to yield loss. The higher crop productivity can be achieved by adopting improved production technology and using the latest high yielding variety through cluster frontline demonstrations (CFLDs) in farmer's fields under different agro-climatic regions and farming situations under close supervision of the KVK staff.

ICAR-KVKs are organizing cluster demonstrations on oilseeds with the financial support of the National Food Security Mission (Oilseeds & Oilpalm) – NFSM (OS&OP). With the help of CFLDs, it is possible to pinpoint problems and offer solutions, achieving maximum yields and enhancing farmers' financial circumstances. Besides, there is a horizontal spread of the technology with the concept of seeing by doing. The current study was conducted to increase groundnut productivity and determine the effect of CFLDs on closing the yield gap in terms of the technology gap, extension gap, and technology index in light of the aforementioned problems.

Table-1 Comparison between demonstration packages and existing practice under groundnut CFLDs

Chickpea			
SN	Particulars	Demonstration package	Farmers practice
1	Farming situation	Irrigated	Irrigated
2	Variety	KadiriLeepakshi	TAG-24
3	Time of sowing	First week of October	First week of October
4	Method of sowing	Line sowing	Line sowing
5	Seed treatment	Imidacloprid 600 FS @ 5 ml/kg seed + Mancozeb @ 3.0 g per kg seed	Not adopting
6	Fertilizer dose	20:50:0 kg N:P:K ha^{-1} and 500 kg/ha Gypsum (N in form Urea and P inform of SSP)	50 kg DAP and 50 kg MOP as basal
7	Biofertilizers application	Seed inoculation with Rhizobium 5 g and soil application of biofertilizer consortium @ 12.5 kg ha^{-1} at time of sowing	Not adopting
8	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
9	Plant protection	Need based application	Non judicious use of pesticides

Table-2 Seed yield, technology gap, extension gap, technology index and B:C ratio of groundnut under FLD

Year	Seed yield (q/ha)			% increase over control	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)	B:C ratio	
	Potential	Demo	Control					Demo	Check
2019-20	32	28.50	22.50	28.00	9.50	6.00	29.70	2.14	1.87
2021-22	32	27.80	21.20	31.10	10.80	6.60	33.70	2.03	1.78
Mean	15	28.20	21.80	28.80	10.20	6.30	31.80	2.08	1.82

Table-3 Economic analysis of the frontline demonstrations on groundnut

Year	Cost of cultivation cost (Rs.ha^{-1})		Gross returns(Rs.ha^{-1})		Net return(Rs.ha^{-1})		Additional Return (Rs.ha^{-1})FLD's	B:C ratio	
	Recommended Practice (RP)	Farmer's Practice (FP)	Recommended Practice (RP)	Farmer's Practice (FP)	Recommended Practice (RP)	Farmer's Practice (FP)		Recommended Practice (RP)	Farmer's Practice (FP)
2019-20	87875	74250	178560	139500	90685	65250	25435	2.03	1.87
2021-22	80500	73720	172360	131440	91860	57720	34140	2.14	1.78
Mean	84187	73985	175460	135320	74202	61485	29787	2.08	1.82

Materials and Methods

The cluster frontline demonstrations (CFLDs) were conducted on groundnut cultivation in different mandals of Praksam district. Based on the information collected, production of groundnut is decreasing day by day because farmers not adopting the improved production technologies. Krishi Vigyan Kendra, Darsi, Prakasam district, Andhra Pradesh state conducted on conducted frontline demonstrations on groundnut at farmers' field to assess its performance during rabi seasons of the year 2019-20, 2020-21 and 2021-22 in different villages viz., Kothapalem and Vetaplaem of Prakasam district. A total 25 farmers were selected for conducting of Cluster frontline demonstrations (CFLDs) with an area of 10 ha. The soil of the demonstration field was clay loam in texture, slightly alkaline in reaction (pH 8.2). In general, the soil of the area under study was clay loam in texture, slightly alkaline in reaction (pH 8.2) with low to medium fertility status. An awareness programme was organized for the beneficiary farmers wherein the entire package of practices in groundnut was explained in detail [Table-1]. Each Cluster frontline demonstrations (CFLD) was conducted with components of demonstration comprised of Improved variety (Kadiri Leepakshi), proper tillage, proper seed rate, line sowing using seed cum fertilizer drill, Seed treatment with fungicide mancozeb @ 3 g/kg seed to prevent soil-borne pathogenic disease was demonstrated to them. Advised the farmers to apply SSP instead of DAP, which contributes essential secondary nutrients like Sulfur, Calcium, and Magnesium in traces necessary for pod filling, kernel size and oil content, besides decreasing the input cost. To overcome the weed problem, pre-emergence application of pendimethalin @ 3.25 L/ha followed by post-emergence application of Imazethapyr @750 ml/ha was recommended. Applying the correct seed rate @ 200 kg/ha to maintain optimum plant stand towards realizing potential yields was advocated. Emphasized gypsum application @ 500 kg/ha at the time of pegging in the podding zone for pod development and prevention and pops. Created awareness and motivated farmers to follow IPM practices with low-cost, eco-friendly methods like pheromone traps, bird perches, poison bait, and trap crops like marigold to keep the pest population under control. A flexi board on package of practices was displayed at the gram panchayat office for reference. Frequent follow-up visits were conducted during the entire crop period delivering timely agro advisories and farmer's feedback was also collected regularly. The weather was congenial for the growth of the crop and no serious pest or disease attack was observed in the demonstrated plots. For the study, technology gap, extension gap and technology index were calculated as suggested by Samui *et al.,* (2000) [5]

1. Percent increase yield = [(Demonstration yield - Farmers yield) / Farmers yield] x 100

2. Technology gap = Potential yield - Demonstration yield

3. Extension gap = Demonstration yield-farmer's practice yield

4. Technology index = [(Potential yield - Demonstration yield) / Potential yield] x 100

Results and Discussion

Pod yield

The yield performance and economic indicators are presented in [Table-2]. The data revealed that under demonstration plot, the performance of groundnut yield was found to be higher than that under FP during two consecutive years of demonstrations (2019-20 & 2021-22). The yield of groundnut under demonstration recorded was 28.5 and 27.8 q/ha during 2019-20 & 2021-22, respectively. The yield enhancement due to technological intervention was to the tune of 28.0 % to 31.1 % over farmer's practice. The cumulative effect of the technological intervention over two years, revealed on average yield of 28.2 q/ha, 28.8 % higher over farmer's practice. The year-to-year fluctuations in yield and cost of cultivation can be explained on the basis of variations in prevailing social, economic and prevailing microclimatic condition and improved production technology aimed at yield maximization, which included improved variety *i.e.,* Kadirileepakshi, optimum seed rate of 200 kg/ha, seed treatment, timely weed control and balanced nutrient management and integrated pest management. Similar results were observed by Raghava & Punna Rao (2013) [6], Undhad *et al.,* (2019) [7], Raghunatha Reddy *et al.*, (2019) [8] and Lakhani *et al*., (2020) [9] and Dash *et al.,* (2021) [10] .

Technology Gap

The technology gap means the differences between potential yield and yield of demonstration plot. The technology gap of demonstration plots was 9.5 and 10.8 q/ha during 2019-20 and 2021-22 [Table-2], respectively. On an average technology gap under two-year CFLD programme was 10.2 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 farmer's yield. Extension gap of 6.0 and 6.6 q/ha was noticed during 2019-20 and 2021-22 [Table-2], respectively. On an average extension gap under two years FLD programme was 6.3 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) [8] and Solanki *et al.,* (2000) [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 29.7 to 33.7 per cent [Table-2]. On an average technology index was observed 31.8 per cent 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 Levish *et al.,* (2020) [12], Samir *et al.,* (2021) [11] and Samul *et al.,* (2021) [13].

Economics

Economic indicators *i.e.,* cost cultivation, gross returns, net returns and B: C ratio of front-line demonstration is presented in [Table-3]. The data clearly revealed that the net return from the recommended practice were substantially higher than farmers practice plot during 2019-20 & 2020-21. Average net returns from recommended practice were observed to be Rs. 74202 /ha in comparison to farmers practice plot *i.e.,* Rs 61485/ha. On an average Rs. 29787/ha as additional income is attributed to the technological intervention provided in demonstration plots *i.e.,* recommended practices. Economic analysis of the yield performance revealed that benefit cost ratio of demonstration plots was observed higher than farmers practice plots. The benefit cost ratio of demonstration and farmers practice plots were 2.03 and 2.14 during 2019-20, 2020-21 respectively. Hence favorable benefit cost ratios proved the economic viability of the intervention made under demonstration and convinced the farmers on the utility of intervention. The data clearly revealed that the maximum increase in yield and benefit cost ratio observed was 28.5and 2.14, respectively during 2019-20. The variation in benefit cost ratio during all the years may mainly on account of yield performance and input output cost in that particular years. The higher net returns and B: C ratio in redgram demonstration might be due to the higher grain yield and better pricing of the produce in the market. The results corroborate with findings of Raghava & Punna rao (2013) [6], Undhad *et al*., (2019) [7], Raghunatha *et al.,* (2019) [8], Levish *et al.,* (2020) [12] and Lakhani *et al.,* (2020) [9], Singh *et al.,* (2000) [14] and Sowmya *et al.,* (2022) [15]

Conclusion

Groundnut is a potential kharif pulse crop in Prakasam 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 due to the lack of awareness about new technology in groundnut cultivation in Prakasam district of Andhra Pradesh. The higher average yield was recorded in demonstration plots over the years compared to local check due to increased knowledge and adoption of full package of practices. Hence, it is concluded that the FLDs programme is a successful tool in improving the production and productivity of groundnut crops through FLDs with latest and specific technologies.

Application of research: The current study was conducted to increase groundnut productivity and determine the effect of CFLDs on closing the yield gap in terms of the technology gap, extension gap, and technology index considering the problems.

Research Category: Frontline Demonstrations

Abbreviations: CFLD- Cluster Frontline Demonstrations

Acknowledgement / Funding: Authors are thankful to ICAR-Krishi Vigyan Kendra, Drasi, 523247, Acharya N. G. Ranga Agricultural University, Lam, Guntur, 522034, Andhra Pradesh, India

****Principal Investigator or Chairperson of research: Dr G. Ramesh**

University: Acharya N. G. Ranga Agricultural University, Lam, Guntur, 522034, Andhra Pradesh, India

Research project name or number: Research station study

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Kadiri Leepakshi, Prakasam District, Andhra Pradesh

Cultivar / Variety / Breed name: Groundnut

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

References

[1] Bindraban P.S., Stoorvogel J.J., Jansen D.M., Vlaming J., Groot J.J.R. (2000) Agriculture*, Ecosystem & Environment*, 81(2), 103-112.

[2] Department of Agriculture, Cooperation and Farmers' Welfare (2020) *Annual report,* 11.

[3] Agricultural Market Intelligence Centre (2021) *Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Telangana*, 500 030, India.

[4] Ingale S., Shrivastava S.K. (2011) *African Journal of Food Science*, 5(8), 490-498.

[5] Samui S.K., Maitra S., Roy D.K., Mondal A.K., Saha D. (2000) *Journal of Indian Society of Coastal Agricultural Research*, 8(2), 180-183.

[6] Raghava N.V., Rao P.P. (2013) *Agriculture Update*, 8(1&2), 283-290.

[7] Undhad S.V., Prajapati V.S., Sharma P.S., Jadav N.B., Parmar A.R. (2019) *Journal of Pharmacognosy and Phytochemistry*, 8(4), 1862-1863.

[8] Raghunatha Reddy R.L., Noorulla Haveri, Tulasi Ram K. (2019) *Karnataka International Journal of Agricultural Sciences,* 15(2), 227-232.

[9] Lakhani S.H., Baraiya K.P., Baraiya A.K. (2020) *International Journal of Current Microbiology and Applied Sciences*, 9(11), 1116-1120.

[10] Dash S.R., Behera N., Das H., Rai A.K., Rautaray B.K., Bar N. (2021) *International Journal of Agriculture, Environment and Biotechnology*, 14 (2), 199-202.

[11] Solanki R.L. and Nagar K.C. (2020) *India Int. J.Curr. Microbiol. Appl. Sci*., 9(6), 4119-4125.

[12] Levish C., Singh D., Meghachandra Singh I. (2020) *International Journal of Current Microbiology and Applied Sciences*, 9(12).

[13] Samul S. K., Mitra S., Roy D. K., Mandal A. and Saha D. (2000) *Journal of the Indian Society of Costal Agriculture Research*, 18(2), 180-183.

[14] Singh D., Kumar C., Chaudhary M.K., Meena M.L. (2000) *Indian Journal of Extension Education*, 54(3), 115-118.

[15] Sowmya Ch., Shyam Prasad M., Arunjyothi R. and Narasimha J. (2022) *The Pharma Innovation Journal*, SP-11(4), 1632-1635.