

Impact of Cluster Frontline Demonstrations on yield of groundnut in Prakasam district, Andhra Pradesh

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Abstract: The Cluster frontline demonstrations (CFLDs) on groundnut were conducted by Krishi Vigyan Kendra, Darsi, Prakasam Dt during Rabi season of 2019-20 and 2020-21 across an area of 20 ha with 50 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 present study signifies that location specific recommendations must be formulated to narrow down technology gap and encourage beneficiary farmers to adopt full demonstrated technology to lessen extension gap. The technology index warrants horizontal spread.

Keywords: Groundnut, cluster frontline demonstrations (CFLD), yield, yield gap, gross returns

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1. Introduction

India ranks first in groundnut acreage and is the second-largest producer of groundnut in the world with 101 lakh tonnes with a productivity of 1816 kg/ha in 2020-21 (Groundnut outlook report 2021). 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. 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,). According to IOPEPC, groundnut oil

exports increased by 142% and stood at 2, 13, 448 tons in (Apr-Feb) 2021 against 35,629 tons in 2020 (Agricultural Market Intelligence Centre, PJTSAU 2021). 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). 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. However, there is a wide gap between the potential yields and the actual production realized by the farmers. The major constraints in groundnut production is maintaining low plant population thereby lower yields due to the application of lower seed rate in view of high cost towards purchase of seed constituting about 25% of the total cost of cultivation; use of 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 P₂O₅ and K₂O, 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 pods 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. The optimum time of sowing during Rabi season i.e., September 2nd fortnight to October, is one of the significant factors that is deviated and sowing is carried out till January, which decreases yields considerably. Pest and diseases also cause significant yield reduction. In groundnut, white grub, thrips, tobacco caterpillar and hairy caterpillar are responsible for considerable yield losses regarding the diseases 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). 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.

2. Materials and Methods

The cluster frontline demonstrations (CFLDs) were conducted on groundnut cultivation in different mandals of Prakasam 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 followup 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).

1. Percent increase yield = $\frac{\text{Demonstration yield} - \text{Farmers yield}}{\text{Farmers yield}} \times 100$
2. Technology gap = Potential yield – Demonstration yield
3. Extension gap = Demonstration yield-farmer's practice yield
4. Technology index = $\frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$

3. 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), Undhad et al., (2019), Raghunatha Reddy et al., (2019) and Lakhani et al., (2020) and Dash et al., (2021).

Technology Gap

The technology gap means the differences between potential yield and yield of demonstration plot. The technology gap of demonstration plots were 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 farmers 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) and Samir et al., (2021).

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 Lakhani et al., (2020) and Samir et al., (2021).

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 28.5 and 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), Undhad et al., (2019), Raghunatha et al., (2019), Levish et al., (2020) and Lakhani et al., (2020)

4. 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 also 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.

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

| S. No. | Particulars | Chickpea | |
|--------|----------------------------|---|----------------------------------|
| | | 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 in form 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 | 28.5 | 22.5 | 28.0 | 9.5 | 6.0 | 29.7 | 2.14 | 1.87 |
| 2021-22 | 32 | 27.8 | 21.2 | 31.1 | 10.8 | 6.6 | 33.7 | 2.03 | 1.78 |
| Mean | 15.0 | 28.2 | 21.8 | 28.8 | 10.2 | 6.3 | 31.8 | 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 |