Impact of Cluster Frontline Demonstrations (CFLD) on Oilseeds Productivity and Profitability

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Authors’ contributions

This work was carried out in collaboration among all authors. Author RMP designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Author RH wrote the protocol and the final draft of the manuscript and authors BKD and MKC managed the analyses of the study. Author PKB managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The Cluster Front Line Demonstration (CFLD) programmes on oilseeds were carried out with respect to yield, extension gap, technological gap and economic returns in oilseed crops in Darrang district of Assam, India during 2016-17 and 2017-18 under NMOOP, Ministry of Agriculture and Farmers welfare, GoI. The fields were selected from different villages/clusters of the district. The observations on selected parameters of demonstration plots as well as control plots were recorded through experimental designs ('Control-Treatment') of social research. The results reflected that the average grain yield in demonstration plots of the selected oilseed crops namely; Rapeseed & Mustard, Sesamum and Groundnut was more compared to farmers practice. The crop sesamum recorded with the lowest extension gap (1.9q/ha), technology gap (0.90 q/ha) and technology index (11.25%) followed by rapeseed & mustard with 2.95q/ha, 0.31 q/ha and 3.42% and groundnut with 5.7q/ha, 15.6q/ha and 42.3% respectively. The highest additional income (Rs. 31307/ha) in demonstration plot over control was recorded in cultivation of groundnut followed by sesameum (Rs. 31307/ha) in demonstration plot over control was recorded in cultivation of groundnut followed by sesameum (Rs.
and implements, irrigation devices along with capacity building of farmers is the basic strategy of the Mission on Oilseeds. The ICAR has been implementing this CFLD programme on different oilseed crops through its Krishi Vigyan Kendras (KVKs) across the country to enhance the production and productivity scenario of oilseed crops with improved varieties and location specific technologies.

In India, rape seed mustard is an important source of edible oil followed by ground nut [1]. By conducting cluster frontline demonstrations in a methodical manner to accelerate the dissemination of new & proven technologies at farmer’s fields in a participatory mode with an objective to find out the possible locally available resources of crop production and also to minimize the productivity gaps by enhancing the production and income security of rural farmers. Therefore, KVK in this particular district is being emphasized to organize large scale CFLD programs on oilseed crops for harnessing its productivity potential.

2. MATERIALS AND METHODS

Krishi Vigyan Kendra (KVK), Darrang has conducted 149 number of Cluster Front Line Demonstrations on rapeseed & mustard, 50 on sesemum and 15 on groundnut in farmer’s field in different blocks of the district during 2016-17 and 2017-18. For conducting CFLDs, farmers were identified/ selected following the survey suggested by Choudhary [2] The required inputs were supplied and regular visits to the demonstration fields by the KVK scientists ensured with proper guidance to the farmers. Field days and group meetings were also organized to provide the opportunities for other farmers to witness the benefits of demonstrated technologies. However, the practices followed by farmers in general are use of local cultivar, high seed rate, no seed treatment, delay sowing, indiscriminate use of fertilizer, no irrigation facility and plant protection measures. All the technological interventions were taken as per prescribed packages of practices of Assam Agricultural University for selected varieties of rapeseed & mustard, sesamum and groundnut.
However in rapeseed & mustard, bee hives boxes were placed @ 5 nos./ha in all demonstrated plots to enhance productivity. The KVK scientists used to visit to the cluster frontline demonstrations fields and farmer’s field (control) on regular basis for close supervision and data collection during the entire process of demonstration programme. The study was conducted in experimental designs ('Control-Treatment') of social research.

2.1 Data Collection and Analysis

The data on selected parameters of demonstration plots as well as control plots were collected on regular basis and continued till harvesting of crops to assess the overall performance of CFLDs on selected oilseed crops. The triangulation of data was made with the interaction of state agriculture officials and secondary data available with the departments. The data outputs were also collected from CFLD plots as well as control plots and finally the extension gap, technology gap, technology index, additional return along with the benefits-cost ratio were worked out (Table 3 & 4) as per the formula adopted by [3] as given below:

Extension Gap = Demonstrated yield-Farmers' practice yield

Technology Gap= Potential yield- Demonstration yield

Technology Index = Potential yield- Demonstration yield  X 100
Potential yield

Additional Return = Demonstration return – Farmers practice return

Benefit: cost = Gross return
Gross cost

The basic information from the farmer’s field as well as feedback information were systematically recorded and analyzed to see the comparative performance of cluster frontline demonstrations (CFLDs) and farmer’s practice (control).

3. RESULTS AND DISCUSSION

The year-wise outcome of the demonstrations conducted by KVK, Darrang, Assam is furnished in Table 2. One suitable variety of each oilseed crop namely; TS-46 (rapeseed & mustard), Nagaon Local (sesamum) and JL-24 (groundnut) were taken up along with their recommended package of practices against locally available old variety with traditional cultivation practices adopted by the farmers in their local situations. A total of 149, 50 and 15 demonstrations on improved varieties of rapeseed & mustard, sesamum and groundnut respectively covering 95.0 ha of area were conducted at farmers’ field during 2016-17 and 2017-18 (Table 2 & 3).

3.1 Yield and Gap Analysis

Yield and gap analysis in demonstrated plots under CFLD and farmer’s practice (check) is presented in Table 3. Performances of all the three crops were considerably found to be higher under the demonstration plots compared to control during the period of demonstration. The results showed that average yield of rapeseed & mustard under cluster front line demonstration was 8.75 q/ha compared to 5.8 q/ha in farmer’s practice with 50.8 % average increase over farmer’s practice. With regards to sesamum average yield of 7.1 q/ha in CFLD plot was recorded against 5.2 q/ha in farmer’s practice with 36.5 % average increase over local check. While in groundnut average yield of 21.3 q/ha in CFLD plot was recorded against 15.6 q/ha in farmer’s practice with 36.5 % average increase over local check. The result is in compliance with the observations of Tiwari and Saxena [4] and Tiwari et al. [5] and Chaudhary et al [6]. The outcome during the study clearly reflected the positive effect of CFLDs over the existing practices toward enhancing the productivity of oilseeds in the study area due to use of high yielding variety, timely sowing, balance doses of fertilizers, proper irrigation, need based plant protection etc. and inclusion of honey bee colonies in rapeseed & mustard.

The results presented in Table 3 also indicate that Nagaon local variety of sesamum was found with the lowest extension gap (1.9 q/ha), technology gap (0.90 q/ha) and technology index (11.25%) compared to other oilseed crops under investigation. It was followed by rapeseed & mustard with 2.95q/ha, 0.31 q/ha and 3.42% and groundnut with 5.7q/ha, 15.6q/ha and 42.3% respectively. The outcome thus emphasizes the need of KVKs to educate the farmers more particularly those non participating farmers through various extension means for the adoption of improved scientific practices in cultivation of all the oilseed crops. These varieties may be popularized in this area by the extension agencies to bridge the higher extension gap.
Table 1. Details of recommended package of practices for rapeseed & mustard, sesameum and groundnut followed by farmers under CFLD and in farmer’s practice (FP)

| Particulars          | Rapeseed & Mustard | Sesame | Groundnut |
|----------------------|--------------------|--------|-----------|
|                      | Technological intervention | FP | Technological intervention | FP | Technological intervention | FP |
| Variety              | TS-46              | M-27   | Nagaon Local | Local | JL-24 | Local |
| Seed rate            | 7.5 kg/ha          | 10-12kg/ha | 4.0 kg/ha | >5.0 kg/ha | 65.0 kg/ha | 70.0 kg/ha |
| Seed treatment       | Seed treatment with metalaxyl 35 WS @ 6 g/kg of seed or Trichoderma @ 810 gm/kg seed | No use | Seed treatment with Carbendazim @2 g/kg or Trichoderma @ 5gm/kg seed | No use | Seed treatment with 3g Thiram or Captain/kg of Kernel | No use |
| Sowing method/Spacing | Broadcasting East west direction of sowing | Broadcasting, no direction of sowing methods | 30cm between rows, 15cm between plants | Broadcasting | 35cm between rows, 15cm between plants | Broadcasting |
| Time of Sowing       | Mid October- mid November | Last week of October to last week of November | July –mid August | Last week of August | June-July | July-August |
| Nutrient management  | 40:35:15 (N:P:K) kg/ha Borax @ 7.5 kg/ha | No proper dose | 30:20:20(N:P:K) kg/ha | No proper dose | 20:40:30 (N:P:K) kg/ha | High doses of NPK |
| Weed management      | Application of glyphosate @ 5 ml/litre water at least 10 days prior to sowing | No weed management | 2-3 intercultural operation or hand weeding at 20 days after sowing. The crop should be thinned out to maintain required spacing. | No weed management | One weeding 30-35 days after sowing or use of weedicide (Pendimethalin @1.0 kg/ha) immediately after sowing helps in controlling weeds. | No weed management |
Insect-pests and disease management.

Need based application of imidacloprid @ 0.5 ml/lit of water for the management of aphid control.

Indiscriminate use of pesticides

Seed treatment with Carbenzadim @2 g/kg of seed against Phytophthora blight. Alternatively Trichoderma @ 5gm/kg of seed against stem rot and Phytophthora blight. Spraying with Chlorpyriphos 20 EC against infestation of leaf eating caterpillar.

Indiscriminate use of pesticides

Spray Carbenzadim @0.5 g/lit of water against leaf spot followed by a second spray after 20 days. Spray phosphamidon 100EC@ 0.5ml /lit of water against aphid, leaf miner etc.

Spray Carbendazim @0.5 g/lit of water against leaf spot

Indiscriminate use of pesticides

Spray Carbendazim @0.5 g/lit of water against leaf spot followed by a second spray after 20 days.

Spray phosphamidon 100EC@ 0.5ml /lit of water against aphid, leaf miner etc.

Table 2. Particulars of oilseed grown under Cluster frontline demonstrations (CFLDs) and farmers practices

| Oilseed          | Variety       | Farmers practice | 2016-17 | 2017-18 |
|------------------|---------------|------------------|---------|---------|
|                  | Area (ha.)    | No. of farmers   | Area (ha.) | No. of farmers |
| Rapeseed & Mustard | TS-46 M-27 | 20.0 | 24 | 50.0 | 125 |
| Sesamum          | Nagaon Local  | 10.0 | 25 | 10.0 | 25 |
| Groundnut        | JL-24 Local   | - | - | 05.0 | 15 |
| Total            | -             | 30.0 | 49 | 65.0 | 165 |

Table 3. Productivity (Yield), extension gap, technology gap and technology index of oilseeds under CFLDs (average over years)

| Oilseed          | Average Yield (q/ha) | % increase over FP (check) | Extension gap (q/ha) | Technology gap (q/ha) | Technology Index (%) |
|------------------|----------------------|---------------------------|----------------------|-----------------------|---------------------|
| Rapeseed & Mustard | 9.06                | 50.8                      | 2.95                 | 0.31                  | 3.42                |
| Sesame           | 8.0                  | 36.5                      | 1.9                  | 0.9                   | 11.25               |
| Groundnut        | 36.9                 | 36.5                      | 5.7                  | 15.6                  | 42.3                |
| Average          | 17.98                | 41.26                     | 3.52                 | 16.81                 | 18.99               |
3.2 Economic Analysis of Oilseed Crops

The economic aspect of cluster frontline demonstration on oilseed crops under study is depicted in Table 4. It is evident from the table that the net return from demonstration plots under CFLD’s was Rs. 18050/ha as compared to Rs.7031/ha in farmers practice in case of rapeseed & mustard (var. TS 46) during the study period with additional net profit of Rs. 11019. While average net return of Rs. 30134/ha was recorded in sesamum (var. Nagaon local) in demonstration field against Rs. 17000/ha in farmers practice accounting Rs. 13134 as additional gain due to CFLD in farmers field. While Rs. 45998/ha was the net return of groundnut (var. JL24) in demonstration plot (CFLD0 by using improved cultivation practices compared to Rs. 31307/ha in farmers’ field (check) with traditional cultivation practices. The findings are in compliance with different workers those of Meena et al. [7]. Samui et al [3] and Singh et al [8] in their study on yield gap analysis of oilseeds through front line demonstrations also found that the improved production technology resulted higher gross return, net return with higher benefit cost ratio over farmer’s practices. Similar finding was recorded by Singh et al. [9] in pulses.

The results in Table 4 also reflected higher benefit cost ratio (B:C ratio) of recommended practices in demonstration plots under CFLD as compared to control plot in all the oilseed crops under the study. This might be due to higher yields obtained under improved technologies (demonstrations) compared to local check (farmers practice). Singh et al. [10] also reported similar findings. Higher B:C ratio was recorded in recommended practice with 2.22, 2.13 and 1.7 in groundnut, sesameum and rapeseed & mustard as compared to 1.46, 1.89 and 1.32 in farmer’s practice respectively. These results correspond with the findings of Katare et al. [11]. The dominance of findings under recommended package of practices in cluster frontline demonstration plots over farmers’ practice was also reported by Singh et al. [8]. Hence, the result of benefit cost ratios convincingly proved the economic feasibility of the better technological interventions. The adoption of improved production technologies will substantially aid the income as well as the livelihood of small and marginal to attain self sufficiency in oilseed production in the region.

CONCLUSION

The present findings reflected that all the chosen improved high varieties of oilseeds namely; TS-46 (rapeseed & mustard), Nagaon Local (sesamum) and JL-24 (groundnut) resulted in higher yield with regards to recommended practice (CFLD’s) than farmers practice (check) in all locations. During the study period, it was found that there is a wide gap between potential yield and farmers’ yield most likely due to Technology and Extension gap. Use of latest technologies can minimize the technology gap to a substantial extent resulting in to increased productivity of oilseeds in the district. It requires collaborative extension efforts to enhance adoption of location and crop specific technologies among of the farmers for bridging these gaps. Economic scrutiny on different parameters also showed that net returns and additional income in recommended practice (CFLD’s), which implies that the CFLD programme is an efficient tool for escalating the production and productivity of oilseeds. Therefore, it is suggested that policy maker may provide adequate financial support to frontline extension system for organizing CFLDs under the close supervision of agricultural scientists and extension professionals. It can be also concluded that oilseed productivity can be increased by adopting the improved technologies by changing the farmers’ attitude towards new technology and thereby doubled their income.

Table 4. Economics of cluster frontline demonstrations on oilseeds under CFLDs (average over years)

| Oilseed            | Gross returns(Rs./ ha) | Gross cost (Rs./ ha) | Net return (Rs./ha) | Additional gain (Rs./ha) in FLD’s | B:C ratio |
|--------------------|------------------------|----------------------|---------------------|----------------------------------|-----------|
|                    | CFLD   | FP     | CFLD   | FP     | CFLD   | FP     | CFLD   | FP     | CFLD   | FP     |                   |           |
| Rapeseed & Mustard | 43750/- | 29000/- | 25700/- | 19699/- | 18050/- | 7031/- | 11019/- | 1.7  | 1.32  |
| Sesame             | 56800/- | 36000/- | 26666/- | 19000/- | 30134/- | 17000/- | 13134/- | 2.13 | 1.89  |
| Groundnut          | 83700/- | 46628/- | 37702/- | 31937/- | 46998/- | 14691/- | 31307/- | 2.22 | 1.46  |
| Average            | 61417/- | 37209/- | 28101/- | 24302/- | 31394/- | 12907/- | 18487/- | 2.02 | 1.57  |
COMPETING INTERESTS

Authors have declared that no competing interests exist.

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