International Journal of Research in Agronomy 2024; SP-7(1): 21-24

E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; SP-7(1): 21-24
Received: 28-10-2023
Accepted: 01-12-2023

D Pujari
SMS, Krishi Vigyan Kendra, Assam Agricultural University, Bongaigaon, Assam, India

CK Sarma
Principal Scientist, AICRP on Irrigation Water Management, Assam Agricultural University, Jorhat, Assam, India

BK Das
SMS, Krishi Vigyan Kendra, Assam Agricultural University, Bongaigaon, Assam, India

P Ahmed
Associate Professor, SCS College of Agriculture, Assam Agricultural University, Dhubri, Assam, India

MS Sarma
SMS, Krishi Vigyan Kendra, Assam Agricultural University, Darrang, Assam, India

G Das
SMS, Krishi Vigyan Kendra, Assam Agricultural University, Bongaigaon, Assam, India

M Choudhury
Assistant Professor, SCS College of Agriculture, Assam Agricultural University, Dhubri, Assam, India

RK Nath
Associate Professor, SCS College of Agriculture, Assam Agricultural University, Dhubri, Assam, India

Corresponding Author:
P Ahmed
Associate Professor, SCS College of Agriculture, Assam Agricultural University, Dhubri, Assam, India

Impact of cluster front-line demonstration on yield, yield gap and economics of linseed in Bongaigaon district, Assam

D Pujari, CK Sarma, BK Das, P Ahmed, MS Sarma, G Das, M Choudhury and RK Nath

DOI: https://doi.org/10.33545/2618060X.2024.v7.i1Sa.220

Abstract
A total of 196 numbers of cluster frontline demonstration (CFLD) on high yielding variety of linseed (T 397) in 57 hectares of land spreading over seven villages was conducted by Krishi Vigyan Kendra, Bongaigaon, Assam in four consecutive years i.e. 2015 to 2018 to assess the effect of FLDs on bridging the gap between the potential yield and the yield obtained from famers' practice. It was observed that improved agro-technology substantially increased the yield and returns from linseed crop. On an average, 22.13% increase in linseed production was observed under FLDs compared to farmers' practice. A technology gap of 2.10 q/ha and extension gap of 1.75 q/ha was observed which reflects the needs for specialized extension methodologies. The technology index that decreased from 22.0% to 20.3% clearly indicated the importance of the technologies demonstrated. The positive effect of various technologies was clearly visible by the higher B: C ratio under FLD plots.

Keywords: Seed yield, yield gap, linseed, net returns, cluster frontline demonstration

Introduction
Rice is the staple food crop of Assam occupying 2.36 lakh ha. Out of various types of rice grown (*Ahu*, *sali*, *boro* and *bao*), sali rice (*kharif*) is considered as the most important rice crop that occupies an area of 18.63 lakh ha in Assam (Annonymous, 2022) [4]. After harvesting *kharif* rice majority of land remains fallow for a period of 4-5 months and those lands can be utilized for growing certain *rabi* crops. Approximately, an area of about 11.7 million hectare remains fallow during *rabi* season after harvest of paddy in Eastern India (Kumar *et al*. 2018) [12] and there is a scope of crop intensification with the introduction of rabi oilseeds in rice fallows. Linseed is an important *rabi* oilseed crop of Assam grown in 4,920 ha yielding 6.14 q/ha (Annonymous, 2022) [4]. In India, the crop occupies 1.79 lakh ha area with production and productivity of 1.2 lakh tonnes and 6.71 q/ha, respectively (Annonymous, 2022) [4]. Thus, it is evident that the productivity of linseed is low in the state of Assam as compared to national average most probably due to inadequate availability of quality seed of improved varieties and poor crop management practices.
Linseed (*Linum usitatissimum* L.) is grown in many countries of the world for oil and fibre extracting purpose. From time immemorial linseed oil used for preparations of a number of Ayurvedic products (Bunga and Patlolla, 2020) [6]. Considering the area and production linseed is the second most important oilseed crop in India. Amongst all the oilseeds crops grown in the country, linseed ranks first in terms of technical oil production. Besides oil, every other part of the linseed plant has commercial value (Singh *et al*. 2018) [15].
The crop is gaining popularity in recent years as the market price has gradually increased due to both the research and development of value-added products made from linseed (Zhao *et al*. 2020) [16]. Globally, the cultivated area under linseeds is increasing on account of the increasing demand and economic value of the crop (Gao, 2020) [9]. The seed and oil consumption are reported to have many health benefits. The nutritional ingredients of linseed are found to be beneficial against human diseases and disorders (Saleem *et al*. 2020) [13]. Though the oil is

mostly used as edible oil, it is also widely used in medicine, food additive, cosmetic powder, paint, printing, tanning, and other industrial departments (Gao *et al*. 2020) [9].

It has a great potential as a crop component in rice-based cropping system. It is also a desirable crop even in areas with less fertile soil. Though a large rice fallow area is available, which is otherwise suitable for linseed cultivation in the Bongaigaon district of Assam, the present area under cultivation and productivity of the crop is quite unsatisfactory. Therefore, the present study was conducted as cluster frontline demonstration for assessing the impact of technological intervention in terms of yield, yield gap and returns of linseed cultivation.

Materials and Methods

The study was conducted by Krishi Vigyan Kendra, Bongaigaon, Assam to assess the effect of cluster frontline demonstration (CFLD) on linseed crop in rice fallow areas during *rabi* season 2015-16, 2016-17, 2017-18 and 2018-19 (four consecutive years) (Table 1). In this study, 196 farmers of 7 different villages of Bongaigaon district were selected for frontline demonstration. An area of 57 ha was covered during the study period. Linseed variety T 397 was used for the study. The other technologies incorporated in the study were: seed treatment with *Azospirillum* and PSB biofertilizers @ 50g/kg of seed; 50% of 20:10:5 kg/ha of N: P_2O5:K_2O and other recommended package and practices for the crop. The training programme was organized for farmers' selection and development of skill about technological intervention for successful linseed cultivation. Field days were also conducted in each cluster to show case the results of FLDs to the farmers of the same village and neighboring villages. Yield data were recorded from FLDs immediately after harvesting for the years 2015 to 2018. At the end of the CFLD, yield, cost, returns and B:C ratio was worked out. To find out yield gaps, different parameters were calculated by following formula (Singh and Singh, 2020) [14].

$$\text{Percent increase in yield (\%)} = \frac{\text{Yield from demonstration plot (q/ha)} - \text{Yield of check (q/ha)}}{\text{Yield of check (q/ha)}} \times 100$$

Technological gap (q/ha) = Potential yield of the crop (q/ha) – Demonstration yield of the crop (q/ha)

Extension gap (q/ha) = Yield from demonstration plot (q/ha) – Farmers' plot yield (q/ha)

$$\text{Technological index (\%)} = \frac{\text{Potential yield of the crop (q/ha)} - \text{Yield from demonstration plot (q/ha)}}{\text{Potential yield of the crop (q/ha)}} \times 100$$

Table 1: Details of front-line demonstrations laid out on linseed crop

Crop season	Technology demonstrated	Nos. of FLD	Area covered (ha)	Nos. of farmers
Rabi season 2015-16	HYV of Linseed (T 397) with scientific management practices	17	10	17
Rabi season 2016-17	HYV of Linseed (T 397) with scientific management practices	55	12	55
Rabi season 2017-18	HYV of Linseed (T 397) with scientific management practices	58	15	58
Rabi season 2018-19	HYV of Linseed (T 397) with scientific management practices	66	20	66
Total		196	57	196

Results and Discussions

Impact of FLDs on seed yield of linseed

The seed yield of linseed under CFLD varied from 7.80q/ha to 7.97q/ha, however in farmers' practice, seed yield of local check varied from 6.0q/ha to 6.4q/ha (Table 2). The mean higher seed yield 7.90q/ha was recorded under CFLD plots as compared to farmers' practice (6.15q/ha). In demonstration plots, the increase in seed yield ranged from 17.95% (2015-16) to 24.72% (2018-19). Over the years mean percent increase in yield was recorded 22.13%. These results corroborate with findings of Ambulkar and Dixit (2014) [2] and Gogoi *et al*. (2020) [11]. The higher seed yield in demonstration plot was due to use of improved variety of seed, seed treatment with biofertilizers, recommended dose of fertilizers and integrated crop protection management. Ahmed *et al*. (2017) [1] also reported that use of recommended practices for rapeseed cultivation improved seed yield.

Yield gap analysis

The results showed that (Table 2) linseed produced an average yield of 7.90 q/ha under FLDs as against potential yield of 10.0 q/ha. An average technology gap of 2.10q/ha was observed between the demonstration yield and potential yield. This might be due to varied agro-ecosystems, soil fertility status and weather conditions of the area. Further, decrease in technology gap from 2.20q/ha to 2.03q/ha was observed in due course of demonstration which reflects more numbers of farmer participation in conducting FLDs. The wide variations in crop management practices, soil fertility status and other physiographic factors might have resulted in the technology gap (Bora *et al*. (2018) [5].

It was observed that with every succeeding year the extension gap widened that varied from 1.40q/ha to 1.97q/ha during the study years. The average extension gap (1.75q/ha) clearly indicates the need of farmer's education on recent and improved agricultural technologies. Greater use of the latest production technologies along with more emphasis on the adoption of high yielding varieties will lead to a narrow extension gap. The latest technologies will gradually lead to the farmers to discontinue the old technology and to adopt new technology.

Similarly, the trend of the technology index was similar with technology gap during the period of study. Higher technology index reflected the inadequate proven technology for transferring to farmers and insufficient extension services for transfer of technology. The technology index shows the feasibility of the evolved technology at the farmers' fields and the lower the value of technology index more is the feasibility of the technology. During the study period, a diminishing trend in technology index from 22.0 per cent during 2015-16 to 20.3 per cent during 2018-19 was observed. This reduction exhibited the feasibility of different technology demonstrated in the study areas (Table 2). The variation in the technology index during the study period indicates of higher scope for further improvement in productivity of linseed in the district. Deka *et al*. (2021) [8] also reported similar finding in rapeseed.

Table 2: Overall yield gap analysis in Linseed variety T-397

Crop season	Variety demonstrated	Farmers' variety	Nos. of FLD	Area covered (ha)	Seed yield (q/ha)			Increase in yield (%)	Technology gap (q/ha)	Extension gap (q/ha)	Technological index (%)
					Potential Yield	Yield under CFLD	Yield of local check				
Rabi season 2015-16	T 397	Local	17	10	10.00	7.80	6.40	17.95	2.20	1.40	22.0
Rabi season 2016-17	T 397	Local	55	12	10.00	7.90	6.20	21.52	2.10	1.70	21.0
Rabi season 2017-18	T 397	Local	58	15	10.00	7.93	6.00	24.34	2.07	1.93	20.7
Rabi season 2018-19	T 397	Local	66	20	10.00	7.97	6.00	24.72	2.03	1.97	20.3
Total			196	57							
Mean					10.00	7.90	6.15	22.13	2.10	1.75	21.00

Impact of FLDs on economics

The inputs and outputs prices of commodities prevailed during the study of demonstration were taken for calculating net return and Benefit: Cost (B:C) ratio (Table 3). The net returns obtained for the cultivation of local check varied from Rs 8500 to 9600/ha as compared to demonstration (Rs 12526 to 16320/ha). An average net return and B:C ratio under farmers' practice was Rs 9000/ha and 1.67 respectively as compared to demonstration (Rs 14179/ha and 1.98). The higher B: C ratio were the evidences that the intervention of technologies is economically feasible and convincing the farmers for the adoption. The variation in B: C ratio during different years may mainly be on account of yield performance and input output cost in that particular year. The B:C ratio of CFLD plots were higher compared to farmers' yield throughout the study and this may be due to higher yield obtained under improved technologies compared to farmers' practice. This finding is in corroboration with the findings of Ambulkar and Dixit (2014) [2] and Gogoi *et al*. (2020) [11].

Table 3: Economic analysis of FLD's vs farmer's practice on linseed crop

Crop season	Variety demonstrated	Gross cost (Rs. / ha)		Gross return (Rs./ha)		Net return (Rs./ha)		B:C ratio	
		FLD	Farmers' practice	FLD	Farmers' practice	FLD	Farmers' practice	FLD	Farmers' practice
Rabi season 2015-16	T 397	13550	15500	27300	24000	13750	8500	2.01	1.55
Rabi season 2016-17	T 397	13600	12000	29920	21600	16320	9600	2.20	1.80
Rabi season 2017-18	T 397	13600	12200	27720	21600	14120	9400	2.03	1.77
Rabi season 2018-19	T 397	18800	15500	31326	24000	12526	8500	1.67	1.55

Conclusion

From the study it can be concluded that that adoption of improved agro-techniques increased the crop yield substantially. An average increase of 22.13% in mean grain yield of linseed was observed in CFLD plots compared to farmers' practice. While comparing the potential yield of linseed variety under study with that of demonstration yield, an average technology gap of 2.10 q/ha and extension gap of 1.75 q/ha were observed. The declining technology indices clearly indicated the importance of the technologies demonstrated. The positive effect of various technologies was visible by higher B: C ratio under FLD plots.

References

1. Ahmed P, Nath RK, Sarmah AC, Deka PC. Yield gap analysis of toria (*Brassica campestris*) in Tinsukia district of Assam. Indian Res J Ext Edu. 2017;17(3):44-46.
2. Ambulkar PL, Dixit H. Yield gap analysis of linseed through front line demonstration in Dindori district of Madhya Pradesh. Int. J Plant Prot. 2014;7(1):209-211.
3. Anonymous. Agriculture Statistics at a glance 2022. Ministry of Agriculture & Farmers Welfare, Department of Agriculture & Farmers Welfare, Economics & Statistics Division, Government of India, New Delhi; c2022.
4. Anonymous. Statistical Handbook Assam 2022. Directorate of Economics & Statistics, Govt. of Assam, Guwahati, India; c2022.
5. Bora SK, Saud RK, Thakuria K. Production potential of linseed (*Linum usitatissimum*) in rice fallows under rainfed condition. *Agric Sci Digest*. 2018;38(2):143-145.
6. Bunga AP, Patlolla PR. Linseed (*Linnum usitatissimum* L.) – an oilseed crop with potential to be used in many ways: review article. Acta Sci Agric. 2020;4:42-46.
7. China. Oil Crop Sci. 5, 23.
8. Deka P, Baishya BK, Bhagawati G, Bhuyan MK, Nath RK. Yield gap analysis of rapeseed (*Brassica campestris* var. Toria) in Kokrajhar District of Assam, India. Asian J Agric Ext Economics Sociol. 2021;39(10):425–428.
9. Gao YH, Li Y, Wang YZ, Wu B, Ke J, Niu JY, Guo LZ. Effect of different film color mulching on dry matter and grain yield of oil flax in dry-land. Oil Crop Sci. 2020;5:17–22.
10. Gao YH. Oilseed flax (*Linum usitatissimum* L.), an emerging functional cash crop of; c2020.
11. Gogoi B, Bhagowati S, Deka N. Yield gap analysis of utera cropping of linseed in rice-fallow areas. Int J Curr Microbiol App Sci. 2020;9(06):181-184.
12. Kumar R, Mishra JS, Upadhay PK, Hans H. Rice fallows in the eastern India: Problems and Prospects. Indian J Agril Sci. 2018;89(4):567-577.
13. Saleem MH, Kamran M, Zhou YY, Parveen A, Rehman M, Ahmar S, *et al*. Appraising growth, oxidative stress and copper phytoextraction potential of flax (*Linum usitatissimum* L.) grown in soil differentially spiked with copper. J Environ Manag. 2020;257:109994.
14. Singh N, Singh AK. Yield gap and economics of cluster frontline demonstrations (CFLDs) on pulses under rain-fed condition of Bundelkhand in Uttar Pradesh. Int J Adv Res Biol Sci. 2020;7(8):1-7.
15. Singh SK, Manibhushan, Kumar A. Organic linseed (Tisi) farming: A step towards doubling farmers' income. Indian Farming. 2018;68(1):55–58.
16. Zhao BQ, Gao YH, Yan B, Cui ZJ, Wang HD, Cao Z. Varied previous crops on improving oilseed flax productivity in semiarid Loess Plateau in China. Oil Crop Sci. 2020;5:187–193.