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Impact Assessment of Cluster Front Line Demonstration on Relay Field Pea (*Pisum sativum* L.) Production on Rice Fallows in the Nagaon district of Central Brahmaputra Valley Zone

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A B S T R A C T

Fieldpea is an important rabi pulse crop grown throughout India. The Cluster front line demonstration on field pea variety Prakash was conducted by Krishi Vigyan Kendra Nagaon during the period from 2015-16 and 2018-19 in sixteen to eighteen villages in Nagaon district under central Brahmaputra zone by the active participation of farmers with the objective of popularizing improved technologies of field pea among the farmers. The results of demonstration showed that farmers could increase the field pea productivity notably by switching over to improved variety and adoption of good agriculture practices. Existing farmers' practices were treated as control for comparison with demonstrated practices. The results revealed that the demonstrated plots recorded an average yield ranging from 6.21– 7.93 q/ha with an average of 7.15 q/ha whereas in Farmers practice it ranged between 4.48 to 5.6 q/ha with an average of 5.08 q/ha. The per cent increase in demonstration yield over the farmers' practice during 2016-17 to 2018-19 was 35.71% to 46.30% respectively. The extension gap and the technology gap was ranging between 1.73 to 2.51q/ha and 10.30 t0 12.02 q/ha.The technology index was 56.50 to 65.93 % during the period under study. The results highlighted the fact that field pea production on rice fallows through adoption of recommended technologies which were followed in the CFLDs can be encouraging to our farmers and thereby paving the way towards increasing cropping intensity in mono-cropped areas.

Introduction

Field pea (*Pisum sativum* L.) is the third most important grain legumes in the world and is the third most popular Rabi pulse of India. It is an important grain legume crop for human as well as for animal nutrition. The crop provides a major source of protein (21% - 25%) with high levels of amino acids, lysine and tryptophan that have high nutritional value (Bhat *et al.,* 2013). Field pea a winter season crop requires a cool growing season with moderate temperature throughout the life. In Assam it is cultivated during the Rabi

season (Mid Oct to Mid Nov) under rainfed conditions and during this period almost 50 per cent of medium textured medium Sali rice (*Oryza sativa* L.) lands remain fallow during this season These areas bear tremendous potential for field pea cultivation as a winter rice-relay crop under rainfed conditions. Farmers usually cultivate rice during the rainy season (June-Sept) and land remain leftover fallow after rice harvest in the post rainy season (Nov-March) due to lack of sufficient rainfall or irrigation amenities. However sufficient residue soil moisture are available in rice fallow areas in the post rainy season (Nov-March) which can be utilized for raising second crop.

It is a general practice for the farmers of this region Nagaon District to sow various winter pulse crops like lathyrus (*Lathyrus sativus* L.), chickpea (*Cicer arietinum* L.) and pea (*Pisum sativum*) in the standing rice crop field, just before the harvest to ensure germination using the residual moisture and to avoid tillage operations during pulse growing period. As such the cluster frontline demonstration on Field pea var Prakash was undertaken as one of the practical means on this unique system of growing under residual moisture and fertility in rice fallows, to maximize the production by display of relevant technologies at farmers field under close supervision of agricultural scientist and thereby paving the way towards increasing cropping intensity in mono-cropped areas.

Materials and Methods

The study was conducted at farmer's field during the Rabi Season from 2015-16 to 2018-19 (4 consecutive years by KVK Nagaon) of Assam comprising a total of 16-18 villages in Nagaon district under central Brahmaputra zone (92.6838^0 E longitude and 26.3480^0N latitude) to find out the performance of Field pea under relay methods of sowing on Rice fallows. The Sali/winter rice variety was 'Ranjit' which was transplanted in the second week of July in medium land situation. The required inputs were supplied and regular visits to the demonstration fields by the KVK scientists ensured 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. The field pea variety Prakash seeds@ 70 kg/ha was broadcasted during mid-October to mid November in standing rice field 15-20 days after 50 per cent flowering of the rice crop when the soil was in moist condition. However, the practices followed by farmers in general use local cultivar, seed rate @ 50 kg/ha, no seed treatment, and the seeds were broadcasted in the rice field 4-5 days before harvest and no fertilizer application measures followed. The data on listed parameters of demonstration plots as well as existing farmer's practices plots were collected on fixed interval till harvesting of crops to assess the overall performance of Field pea crop. The data outputs were also collected from CFLD plots as well as Farmer's practices Plots and finally the extension gap, technology gap, technology index, additional return along with the benefits- cost ratio were worked out (Table 3) as per the formula adopted by (Samui *et al.*, 2000) as given below.

Technology gap = Potential yield – Demonstrated yield

Extension gap = Demonstrated yield – Yield under existing practice

Technology index =

$$\frac{\text{Potential yield} - \text{Demo. yield}}{\text{Potential yield}}$$

Results and Discussion

Results of Cluster Front Line Demonstrations conducted during 2015-16 to 2017-18 in different villages of Nagaon District revealed that the cultivation practices comprised under CFLD *viz.*, use of improved variety, method of sowing, application of 50% of recommended dose of fertilizers + Biofertilizers (Rhizobium and PSB) @50 g per kg of seed before sowing (Table 1). The need based inputs provided to farmers were depicted in table 2.

Yield performance

The results of Cluster front line demonstration revealed that under the demonstrated plots, performance of fieldpea (yield) was comparatively much higher than the local check during the study period (2015-16 to 2018-19). The average increase in yield under demonstration recorded 7.15 q/ha compared to local check (5.08 q/ha) . However, in the demonstration plot the yield enhancement due to technological intervention was to the tune of 40.78 % over the farmer's practice. Data further showed that the yield of field pea over the respective years increased successively which clearly speaks of the positive impact of front line demonstration over local variety of fieldpea. This improvement in yield might be due to the fact of high yielding variety, application of 50% RDF, seed treatment with Rhizobium and PSB provided significantly higher seed yield than partial application of fertilizer & no seed treatment in the existing farmers practice. Early sowing of field pea at 15-20 days before harvesting of rice may result in effective utilization of more residual moisture from the rice field which gave a better performance in respect of yield; Duary *et al.*, (2004) were of the same opinion. Similar findings with respect to yield enhancement in different crops were reported by Nabadeep *et al.*, (2018) in Blackgram *et al.*, (2018) in mustard; and Dhaka *et al.*, (2015) in Coriander, in cluster front line demonstrations.

Technology gap and extension gap

The technological gap (ranging from 12.02 to 10.30 q/ha) in the respective years from (2015-16 to 2018-19), respectively reflected the farmer's cooperation, in carrying out such demonstrations (Table 3). The technology gap observed may be attributed to variability in the soil fertility and climatic conditions. The extension gaps were 1.73 to 2.51 q/ha during the period of study, emphasized the need to educate the farmers through various means for the adoption of improved agricultural technologies. More adoption of recent production technologies with high yielding varieties would subsequently change this alarming trend galloping the extension gap.

Table.1 Comparison between demonstration and existing practices under CFLD Field Pea

Operation	Field Pea	
	Demonstration Rainfed medium land	**Farmers Practice Rainfed medium land**
Use of seed	Prakash	Local
Time of sowing	Mid October to Mid November	November to first week of December
Method of sowing	Broadcasted in standing rice field 15 days after 50 per cent flowering of the rice crop	Broadcasted in the rice field 4-5 days before harvest
Seed treatment	Biofertilizers (Rhizobium and PSB) @50 g per kg of seed before sowing	Nil
Fertilizer management	50% of recommended dose of fertilizer	Nil

Table.2 Details of need based input given on CFLD of field pea

Year	No of Demonstration	Variety	Technology demonstrated	Need based input
2015-2016	25	Prakash	Improved variety, INM	Use of high yield varieties,50% of recommended dose of fertilizer, Seed treatment with biofertilizers (Rhizobium and PSB @50 g per kg of seed before sowing, Group meetings and Trainings
2016-2017	75	Prakash	Improved variety, INM	Use of high yield varieties, 50% of recommended dose of fertilizer, Seed treatment with biofertilizers (Rhizobium and PSB @50 g per kg of seed before sowing, Group meetings and Trainings .
2017-2018	75	Prakash	Improved variety, INM	Use of high yield varieties,50% of recommended dose of fertilizer, Seed treatment with biofertilizers (Rhizobium and PSB @50 g per kg of seed before sowing, Group meetings and Trainings
2018-2019	76	Prakash	Improved variety, INM	Use of high yield varieties,50% of recommended dose of fertilizer, Seed treatment with biofertilizers (Rhizobium and PSB @50 g per kg of seed before sowing, Group meetings and Trainings

Table.3 Productivity, technology gap, extension gap, technology index and benefit-cost ratio of Field Pea grown under CFLDs and existing farmer's practices

Year	Area (ha)	No. of Farmer's	Seed yield Q/ha			% increase over control	Tech gap Q/ha	Ext gap Q/ha	Technical index %	B.C ratio CFLD:FP
			Potential	CFLD	F P					
2015-2016	10	25	18.23	6.21	4.48	38.61	12.02	1.73	65.93	2.4 :1.9
2016-2017	30	60	18.23	6.84	4.80	42.50	11.39	2.04	62.47	2.5:1.6
2017-2018	30	54	18.23	7.6	5.6	35.71	10.63	2.0	58.31	2.7:2.03
2018-2019	30	65	18.23	7.93	5.42	46.30	10.30	2.51	56.50	3.2:2.1
Average	-	-	18.23	7.15	5.08	40.78	11.15	2.07	60.80	2.7:1.9

Table.4 Average yield parameters under CFLDs and existing farmers practice.

Sl.No	Yield Parameters	CFLD	FP
1.	Plant height (cm)	89.3	67.5
2.	No of branches/Plant	6.8	3.2
3.	No of pod/plant	15.7	8.6
4.	Pod length (cm)	7.5	4.7
5.	No of seed /pod	5.8	4.6

Fig.1 Flowering, Pod formation stage and harvesting stage of Field pea

Technology index

The technology index showed the feasibility of the demonstrated technology at the farmer's field. However it was observed that lower the values of technology index the more is the feasibility of the technology. As such, the decrease in the trend of the technology index from 65.93 to 56.50 per cent indicate that the demonstrated technology was feasible (Table 3).

Benefit cost ratio

The benefit cost ratio of field pea under cluster front line demonstrations presented in Table 3 clearly showed higher benefit cost ratio of recommended practices than control plot in all the years of study. The benefit cost ratio in case of field pea with HYV var-Prakash was 2.7:1.9.The superiority of recommended package of practices under cluster frontline demonstration over farmers' practice was also reported by Mitra and Samajdar (2010) and Balai *et al.,* (2012). This may be due to higher grain yields recorded under recommended technologies compared to local check (farmers practice). The findings are in the line of that of the study conducted by N. Singh *et al.*, (2020). Higher benefit cost ratios proved the economic viability of the technological interventions and convinced the farmers on the utility of interventions. The yield parameters under demonstration practices as enhanced by the improved package of practices over the existing farmers practice are shown in table 4.

In conclusion, the farmers involved under cluster frontline demonstrations were highly satisfied with the performance of the technology. The productivity enhancement of the demonstration over traditional farmers practice created greater awareness and

motivated the other farmers of the locality to adopt appropriate production technology for the field pea cultivation in the Nagaon district. The selection of improved production and management technology like improved variety, biofertilizer inoculation of seed, 50% of recommended dose of fertilizer, plant protection measures, etc. were found to be the main reason for increase in yield and thus, it would be said that the demonstration programme conducted from 2015-16 to 2018-19 has shown positive impact. Hence CFLDs were the most successful tools for transfer of technology to the farming community for increasing the productivity of field pea in the Nagaon district.

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