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Impact of Cluster Frontline Demonstration on Organic Nutrient Management in Field Pea in Mamit District, Mizoram, India

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ABSTRACT: Cluster frontline demonstrations on organic nutrient management in field pea were conducted by KVK Mamit under PKVY during the periods from 2018–19 and 2019–20, respectively, in Darlak and Bawngva villages of Mamit District. KVK provided all critical inputs, *i.e.*, seeds, FYM, bio fertilizers, etc., to the farmers. The productivity and economics of 25 CFLD farmers as well as 25 non-CFLD farmers were investigated during 2018–19 and 2019–20. The CFLD results showed that, in contrast to the potential production of 22 q/ha, the yield of the demonstrations was measured at 15.15 q/ha in the first year and 15.52 q/ha in the following years with mean (15.34 q/ha). The demonstration's percent increase yield was 47.09% in 2018–19 and 49.23% in 2019–20, respectively. There is still a heck of a lot of opportunity to increase the yield, as seen by the mean technology gap of 6.67 q/ha. The technology index ranged from 29.45 to 31.14%, while the extension gap ranged from 4.85 to 5.12 q/ha on average during the study period. With an average benefit-cost ratio of 2.45 compared to the local checks 1.84, the exhibited field produced greater mean gross returns (Rs. 78190/ha) and mean net returns (Rs. 46100/ha) (1.84). The current findings conclusively demonstrate that the use of the suggested technology can increase the productivity and profitability of field peas. It has been determined that cluster frontline demonstrations (CFLD) have been successful in boosting field pea productivity.

Keywords: CFLD, field pea, organic nutrient management, technology gap, extension gap, yield, economics.

INTRODUCTION

The self-pollinated diploid field pea (*Pisum sativum* L.) has 2n = 14 genetics. It is frequently cultivated in the world's highlands in tropical and cooler temperate climates (McKay *et al.*, 2003). The crop offers a significant supply of protein (between 21 and 25 percent), as well as high levels of nutritionally valuable amino acids like lysine and tryptophan (Bhat *et al.*, 2013). It ranks third among Rabi pulses in India and is the third-most significant grain legume in the world. India is in fourth place in terms of area (10.53%) and fifth place in terms of production (6.96%) (FAO, 2014). Field pea was grown on 959 ha in Mizoram, producing 1234 t, but only 56 ha in Mamit District, producing 64 t (https://agriculturemizoram.nic.in, 2020-2021). It is grown in a variety of soil types, from light sandy loams to deep clays, although it cannot withstand salty or wet soil. Optimal soil pH ranges from 5.5 to 6.5. Chilly growth seasons with temperate temperatures are necessary for field peas because they are a winter crop.

In Mizoram, field pea is cultivated during the Rabi season (mid-October to mid-February), after the harvesting of rice (Singh *et al.*, 2013). Most farmers in Mamit district had not adopted proper organic nutrient management practises due to insufficient knowledge; they only applied a very small quantity of FYM and other manure in an inadequate manner. Therefore, the present cluster frontline demonstration on organic nutrient management in field pea was undertaken by Krishi Vigyan Kendra Mamit at farmer fields in Dialdawk and Bawngva villages of Mamit District, Mizoram, India, in 2018–19 and 2019–20.

METHODS AND MATERIALS

The cluster frontline demonstration on organic nutrient management in field pea was conducted in two villages, *viz.*, Darlak and Bawngva, of Mamit District, under the PKVY Programme in the years 2018–19 and 2019–20, respectively. A total of 25 farmers were selected for cluster front line demonstrations. The critical inputs were provided to farmers as per the recommended

package of practises for organic nutrient management developed by ICAR-NOFRI, Tadong, Gangtok. Demonstrations at farmer's fields were regularly monitored by subject matter specialists (SMSs) of Krishi Vigyan Kendra, Mamit, from the time of sowing to harvesting and marketing. Basic data on all 25 farmers was collected before and after the cluster frontline demonstration by personal interview with the help of a well-structured interview schedule. The interview schedule was developed through discussion with experts, scientists, and extension officers of the horticulture department in the district. Before initiating the demonstration, the beneficiary farmers were given skill training on various technological aspects of field pea cultivation, including organic nutrient management, Kumar *et al.* (2018); Raghav *et al.* (2020). The details of the technology demonstrated are listed below (Table 1).

Table 1: Details of technological interventions followed under farmer's practices and demonstration.

CFLD (Package of practices)	Farmers Practice (Local Check)
Variety: Prakash	**Variety:** Prakash
80 kg per hectare for seeding	100 kg/ha for seeding
Treatment of seeds with 20 grammes of rhizobium per kilogramme of seeds combined with a sluggish solution, then dried in shade	No seed treatment was applied.
Method/Spacing of Sowing: minimal tillage and line sowing at 30 cm × 10 cm	**Method of sowing:** broadcasting
Second fortnight of October to the first fortnight of November is the sowing period.	Second fortnight of October to the first fortnight of November is the sowing period.
Application of manure: FYM at 5 t/ha during land preparation and vermicompost at 2.5 t/ha	**Manure application:** Use only a small amount of manure.
Minimum tillage is used during land preparation.	Minimum tillage is used during land preparation.
Plant protection: In accordance with the technology-recommended practise package.	Protection of plants: not used

Data on output was collected from CFLDs as well as local plots regarding the production and economic performance of the cluster frontline demonstrations. Ultimately, yield, cultivation costs, net returns, and the benefit cost ratio were computed. Utilizing data from CFLD experiments carried out in farmer's fields under the careful observation of experts from Krishi Vigyan Kendra, Mamit in various locations throughout the district, data on proven plot yield was acquired. Additionally, information on the actual yield attained by farmers employing their own management techniques on their farms was gathered. In light of the study's objectives, the collected data was processed, tabulated, classified, and evaluated in terms of a mean percent score and rank. These data were used to compute the yield gap between demonstration plot yield and potential yield (Yield gap-I), the yield gap between demonstration plot yield and actual yield or yield under current practises (Yield gap-II), and the yield gap between potential yield and actual yield (Total yield gap). Using the formula suggested by Samui *et al.* (2000) the extension gap, technology gap, and technology index were calculated.

Technological gap (yield gap-I) = Potential yield - Demonstration plot yield
Extension gap (yield gap- II) = Demonstration - Actual yield (Farmers plot yield practice)
Total yield gap = Potential yield - Actual yield
Technology index (%) = Technology gap/Potential yield × 10

RESULTS AND DISCUSSION

The findings of the study and pertinent discussions have been compiled under the headings below:

Growth and yield attributes and yield. From Table 2 compares the growth characteristics and yield performance of demonstrated procedures and local check. Results showed that when compared to farmer's practises, which were plant height (84.6 cm), number of pods per plant (10.4), pod length (5.36 cm), and number of seeds per pod (4.45) recorded in farmer's practise, the CFLD recorded higher plant height (92.6 cm), number of pods per plant (11.4), pod length (6.55 cm), and number of seeds per pod (5.27) Similar findings were reported by Singh *et al.* (2020); Das *et al.* (2021).

Table 2: pooled data (2018-19& 2019-20) of CFLD on growth attributes and yield of Field pea.

Sr. No.	Parameter	Demonstration	Farmers Practices
1.	Plant height (cm.)	92.6	84.6
2.	Number of pod per plant	11.4	10.4
3.	Pod length (cm)	6.55	5.36
4.	No. of seed per pod	5.27	4.45
5.	Shelling per cent	45.36	43.37

Yield Gap. In Table 3, the yield gaps are presented. The demonstration plot yield was sustainably higher than the local check yield in all study years (2018-19 and 2019-20), which was recorded at 15.15 q/ha and 15.52 q/ha by cluster frontline demonstrations during 2018-19 and 2019-20, respectively. The potential yield of field pea var. Prakash was found to be 22.00 q/ha. However, the farmers' actual yield from their farm in 2018–19 and 2019–20, using their own management techniques, was 10.30 q/ha and 10.40 q/ha, respectively. The use of manure and other management techniques improved the performance of the demonstration plots. Therefore, by increasing production by a total of 47.09% during 2018–19 and 49.23% during 2019–20 over the local check, respectively, Kumar *et al*. (2018) anticipate that the CFLD may have a favourable effect on the district's farming community. The results show that the cluster front line demonstrations had a favourable effect on the farming community in the Mamit district because they stimulated them to utilise organic nutrient management and other beneficial agricultural practices in the CFLD plots. This finding is in corroboration with the findings of Das *et al.* (2021); Raghav *et al.* (2020); Singha *et al*. (2020); Singh *et al.* (2020); Bezbaruah and Deka (2020). Yield of the front line demonstration trials and the potential yield of the crop were compared to estimate the yield gaps, which were further categorized into technology and extension gaps Singh and Singh (2020).

Technology Gap. The technology gap is the difference or gap between the demonstration yield and potential yield, and it was 6.85 and 6.48, in 2018–19 and 2019–20, respectively (Table 4). The technological gap may be attributed to the dissimilarity in soil fertility status, acidity, erratic rainfall, and other vagaries of weather conditions Bhat *et al.* (2013); Singha *et al*. (2020) (Table 4).

Table 3: Yield and yield difference of Field pea under Cluster front line demonstrations.

Year	No. of CFLDs	Yield (q/ha)		Additional yield over local check (q/ha)	Per cent increase yield over local check
		CFLD	Local Check		
2018-19	25	15.15	10.3	4.85	47.09
2019-20	25	15.52	10.4	5.12	49.23
Mean	25	15.34	28.19	4.985	48.16

Table 4: Yield gap and technology index in cluster front line demonstrations.

Year	No. of CFLDs	Technology gap (q/ha)	Extension Gap (q/ha)	Technology Index (%)
2018-19	25	6.85	4.85	31.14
2019-20	25	6.48	5.12	29.45
Mean	25	6.67	4.99	19.02

Extension Gap. The variation or gap between the demonstration yield and farmer practises is known as the extension gap (control). For the time span of the study, the extension gap varied between 4.85 and 5.12 q/ha (Table 4). This extension gap should be attributed to the demonstration techniques that adopted better transfer technologies and produced a greater head yield than conventional farmer practises. This highlighted the need for farmers to be educated via a variety of methods for increased adoption of enhanced high yielding varieties and recently upgraded agricultural technologies to close the substantial extension gap. Similar finding reported by Kumar *et al.* (2018), Mukherjee (2003); Singh *et al.* (2020). Farmers' increased use of new high-yielding varieties will help to reverse the alarming trend of a widening extension gap. Farmers will eventually ignore old varieties in favour of new technologies as a result of the new technologies. This finding is consistent with Hiremath and Nagaraju (2009); Raghav *et al*. (2020) findings.

Technology Index. A lower value on the technology index suggests better feasibility of varied and developing technologies in agricultural fields. In 2018–19 and 2019–20, the technology index decreased from 31.55 to 29.45 percent (Table 4), demonstrating the higher viability of the exhibited technology. The findings of Das *et al.* (2021), Singh *et al.* (2021); Bezbaruah and Deka (2020).are supported by this finding.

Economics of Cluster Front Line Demonstration. According to economic analysis of yield performance, participating farmers in FLDs throughout the research period not only produced more food, but also received higher prices for it compared to food sold in local markets (Kumar *et al.*, 2018; Raghav *et al*., 2020). The economics of field pea production under cluster front-line demonstrations are shown in Table 5. The results of the economic analysis of field pea production showed that the mean cost of cultivation increased in the demonstration practise (Rs 31,900/ha) as opposed to farmer practise plot check (Rs 28,700/ha), and it was also noted that the mean gross return and mean net return were higher in the demonstration practise (Rs 52,790/ha and Rs 46,327/ha, respectively), compared to farmer practise (Rs 98130/ha and Rs 24,090/ha). Additionally, the cost ratio of the demonstration plot over the study period was 2.45 in favour of the farmer's practise, which was 1.84. These findings concur with those of Singh *et al*. (2020); Singha *et al*. (2020); Das *et al.* (2020); Raghav *et al*. (2020); Kumar *et al*. (2018).

Table 5: Economics of cluster front line demonstration.

Year	Cost of cultivation (Rs/ha)		Gross Return (Rs/ha)		Net Return (Rs/ha)		B: C Ratio	
	FLD	Local Check	FLD	Local Check	FLD	Local Check	FLD	Local Check
2018-19	31500	28400	75750	51500	44250	23100	2.40	1.81
2019-20	32300	29000	80704	54080	48404	25080	2.50	1.86
Mean	31900	28700	78227	52790	46327	24090	2.45	1.84

CONCLUSION

The study concluded that the results clearly demonstrated that organic nutrient management practices were superior in terms of increasing production and productivity of field pea; this may be due to improved soil fertility. The CFLD programme is a useful instrument for boosting field pea yield and productivity as well as altering farmers' knowledge, attitudes, and abilities. The idea of cluster frontline demonstration can be applied for all farmer categories, including progressive farmers, to swiftly and broadly propagate the advised approaches to other farmers as well as to other crops.

FUTURE SCOPE

The success of these "cluster demonstrations" will encourage farmers in Mamit District to increase their crop area under organic field pea cultivation. That will help with a sustainable increase in field pea production and increase farmers' income.

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Conflict of Interest. None.

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