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Effects of front line demonstrations on pea (var. Prakash) yield and economics in the Koshi zone of Bihar

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Abstract
The current study assessed the effectiveness of enhanced cultivars with scientific packages and techniques in terms of pea productivity, yield, and profitability. Frontline demonstrations were held in Sattarkattaiya and Sonbersa blocks of the district during 2017-18 and 2018-19 to evaluate the performance of prakash, a variety of pea, and to collect farmer feedback. The data revealed that the average yield of pea during frontline demonstrations was 17.84 and 18.41 q/ha, compared to 14.32 and 14.56 q/ha recorded in farmer's practice, resulting in a 24.58 and 26.44 percent increase, respectively. During consecutive years of research blocks, the benefit-cost ratio (B:C) of recommended practices (FLDs) was 2.89 and 2.91, compared to 2.49 and 2.45 in farmer practice. An average extension gap of 3.68 q/ha and an average technology gap of 3.87 q/ha were reported. As a result, the findings clearly show that the use of better varieties, packaging, and methods, together with scientific intervention under the frontline demonstration programme, contributes to increased pulse productivity and profitability in Bihar.

Keywords: Yield gap, technology gap technology index and B.C. ratio

Introduction

In India, field peas, or *Pisum sativum* L., are a common pulse crop. India is the world's leading producer, importer, and consumer of pulses. In India, field peas and garden peas are grown. When the green pods are collected, garden peas are cooked either fresh or preserved for later use. Dry seeds from field peas are typically grown for use in a range of culinary applications and pulses. Reddy (2010) [4] states that dry peas are extremely nutrient-dense, with high percentages of fat (1.8%), carbs (62.1%), minerals (calcium, iron), and vitamins (thiamine, riboflavin). The Mediterranean region of Europe and Central Asia is most likely the pea's origin.

After Russia, India is the world's second-largest producer of peas. 10.95 million tons of field peas are produced annually on an area of 6.51 million hectares. Field peas are found in Ethiopia, France, Canada, USA, Russia, China, Australia, Africa, Europe, and North America. Field pea productivity in India averages 9.06 q/ha. Maharashtra, Madhya Pradesh, Uttar Pradesh, and Bihar are the states that cultivate the most field peas.

Materials and Methods

Although field peas are a significant revenue crop for farmers, their profitability is still modest. To investigate the causes of its low productivity, a thorough Rapid Rural evaluation and multiple rounds of group sessions with field pea growers were arranged. The meetings produced a number of gaps in the deployment of technology. Farmers assisted in using a matrix ranking system to the production limits.

Problems are prioritized and ranked using a matrix. Front-line demonstrations of field pea were recommended in the Krishi Vigyan Kendra Saharsa district's yearly action plan for 2017-18 and 2018-19. During the years 2017-18 and 2018-19, the FLD initiative, which included a full package of practices, benefited 27 field pea growers. Individual demonstration areas ranged from 0.4 to 0.8 ha, and the total size was 8.5 ha. Most of the farmers who participated retained a control plot for comparison.

The farming time was divided into several growing periods. All farmers received field training on the specific operation of field pea cultivation. Such an approach was incredibly encouraging, and participation was 100%.
The technology shown was an enhanced field pea variety, Prakash, seeded with a 30 cm row spacing at a seed rate of 100 kg/ha after seed treatment with Carboxin + Thiram @ 2g/kg seed and bio-fertilizer Rhizobium + PSB @ 10 g/kg seed. Basal fertilizers were administered at a rate of 20N:50P:20K kg/ha using urea, single superphosphate, and MOP, respectively. Pesticides were applied as needed to manage insect pests and diseases.

Table 1: A set of procedures used in both general plot and under FLD plot

Details	Methods used in FLD	Methods Used by Farmers
Cultivar	Prakash	Regional variety (Small seed)
Seed rate	1.0q/ hactare	1.60q/ hactare
Seed treatment	*Trichoderma viride* with 8-10 gram/kg + *Rhizobium* with 20 gram/kg	No use
Sowing time	Second fortnight of October	October end to November end
Sowing method	20-25 x 8-10 cm and sowing in the direction of east west	Scattered way
Management of Fertilizer	N20: P60: K20 kg/ha	Less amount of manures are used
Management of weed	Pendimethalin 30 EC 3.3 liter/hactare was used pre-emergence, and 30 days after sowing, manual weeding was conducted.	No use
Management of Water	Light irrigation (during dry spells) prior to flowering and following podding	No use
Management of Insect-Pest	Applying sulfur at a rate of 3 grams per liter of water based on need to control powdery mildew	No use

Initial data was gathered from the chosen FLD Farmers using a random crop cutting technique and a personal interview schedule to assess technology acceptability and performance. After converting the qualitative data into quantitative form, Samui *et al*. (2000) [5] suggested expressing the results in terms of percent improved yield, extension gap, and technology index.

$$\text{Percent increase yield} = \frac{\text{Demo yield - farmers yield}}{\text{Farmers yield}} \times 100$$

Technology gap = Potential yield – Demo yield

Extension gap = Demo yield- Yield under existing practice

$$\text{Technology index (\%)} = \frac{\text{Potential yield- Demo yield}}{\text{Potential yield}} \times 100$$

Results and Discussion
Table -2 displays data for the past two years. 2018–19 yields were higher than 2017–18 in both the farmers plot (14.56 q/ha) and the demonstration plot (18.41 q/ha). Nonetheless, in 2017–18 and 2018–19, the demonstration plots' mean yield exceeded the farmers' plots by 24.58 and 26.44 percent, respectively. The results demonstrate that yields can rise when using the suggested field pea production technology. Additionally, Diwedi *et al*. (2010) discovered that using technology is essential to raising crop productivity. The mean yield of the two-year demonstration was higher (18.12q/ha) than that of farmers' practices (14.44 q/ha).

Technology Gap
Compared to the Prakash variety of Field pea's potential production of 22.00 q/ha, the demonstration's mean yield was 18.12 q/ha. The 3.87 q/ha yield discrepancy indicates a possible technological gap. Field peas of the Prakash variety were developed for irrigated and fertile areas of north India; trials were conducted in the agroclimatic zone of Saharsa. Development managers should therefore not be surprised by such a yield disparity.
Nonetheless, efforts ought to be made to narrow the existing technology disparity even more. This can be achieved by carrying out on-farm experiments in the Saharsa district with assured irrigation and a variety of soil types. According to Raj *et al*. (2013) [3], differences in soil fertility and weather patterns cause a technological yield gap for crops.

Extension Gap
Interestingly, the extension yield gap was greater than the technical yield gap across the study period (ranging from 3.52 to 3.85 q/ha).
This emphasizes how field agricultural extension workers can improve their understanding of field pea production technology by visiting research stations, participating in short-term in-service training, or receiving skilled-based field training. For field agricultural extension personnel to properly translate knowledge into prospective crop yield, they also need to be trained in technology transfer abilities. Another tactic would be to regularly include farmers in Krishi Vigyan Kendra to encourage them to grow field peas. The current finding is supported by Singh *et al*. (2017) [6] in their research on the extension gap.

Table- 2: The FLD's performance in 2017–18 and 2018–19

Year	Crop (variety)	Area (ha)	Yield (q/ha)			% increased yield over local check	Technology gap (q/ha)	Extension gap (ka/ha)	Technology index (%)
			Potential of variety	FLD yield	Farmers Practices				
2017-18	Field Pea (Prakash)	5.5	22.00	17.84	14.32	24.58	4.16	3.52	18.90
2018-19	Field Pea (Prakash)	3.0	22.00	18.41	14.56	26.44	3.59	3.85	16.31
Average		4.25	22.00	18.12	14.44	25.51	3.87	3.68	17.60

Technology Index

A lower technology index signifies higher feasibility for farmers to use advanced technology on their crops. The technology index measures this practicality. The technology index showed a small discrepancy between the acceptance and evolution of technology at farmers' fields, ranging from 16.31 to 18.9 percent. Raj *et al.* (2013) [3] discovered a similar outcome. The results demonstrate that field pea growth and production under semi-irrigated circumstances were significantly increased by using several inputs, including upgraded variety, high-quality seed, and seed treatment with fungicides and biofertilizers.

Economic Return

The cost of cultivation, gross return, net return, and benefit cost ratio were determined using the input and output prices of the commodities that were in demand during the demonstration study (table 3). When field peas were grown using enhanced technology, the average net return was greater at Rs. 39475/ha as opposed to Rs. 27775/ha when farmers used traditional methods. In comparison to farmers' practices, the field pea benefit-cost ratio under enhanced technology was higher (2.90) than it was (2.47). This result is consistent with the research conducted by Mokidue *et al.* (2011) [1].

Table- 3: FLD's economics and farming practices

Year	Production Cost (Rs./ha)		Gross profit (Rs./ha)		Net Profit (Rs./ha)		C:B Ratio	
	Farmers practices	Demo Plot	Farmers practices	Demo Plot	Farmers practices	Demo Plot	Farmers practices	Demo Plot
2017-18	18250	20500	45500	58800	27250	38300	2.49	2.89
2018-19	19500	21250	47800	61900	28300	40650	2.45	2.91
Average	18875	20875	46650	60350	27775	39475	2.47	2.90

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