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Impact of front line demonstration on productivity and profitability of field pea under rice pulse cropping system of West Tripura district

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Abstract

Pulses are the important crops which provide high quality proteins to improve human health. The cultivation of pulses builds-up a mechanism to fix atmospheric nitrogen in their root nodules and thus meet their nitrogen requirements to a great extent. In India, Pulses can be produced with a minimum use of resources and hence, it becomes less costly than the animal protein. Field pea is one of the important pulse crop of rabi season after dry beans and chickpea. Field pea (*Pisum sativum* L.) is a good source of dietary protein to complement the cereal based diet, particularly for vegetarian masses in the country. It is a highly productive crop. In Tripura field pea is grown after harvesting of Kharif rice. The Cluster Frontline Demonstration on Field Pea was carried out by KVK West Tripura during 2018-2019, 2019-20 & 2020-21 in the West Tripura district. Based on the trials conducted by ICAR, improved variety of field pea (Aman) was selected for demonstration. Total 75 nos. of demonstration was conducted covering an area of 15 ha. The demonstration was conducted through a number of extension practices like group meeting, awareness programmes, trainings, demonstrations, field day, etc. The average seed yield of field pea was 1684.49 kg/ha under demonstrated plot as compared to farmers practice (1152.60 kg/ha). The average yield of field pea var. Aman increased under demonstration was 46.20% per cent over farmers practice. Highest net return of Rs. 43571.15/- with benefit cost ratio of 2.30: 1 was obtained with improved technologies in comparison to farmers' practices. The results clearly indicated that the beneficial impact of front line demonstrations over the farmers practices towards enhancing the productivity of field pea cultivation in West Tripura district. Demonstrated technologies proved more remunerative and economically viable compared to farmers traditional practices in field pea cultivation.

Keywords: Field pea, front line demonstration, technology gap, yield, variety

Introduction

Pulses are an important commodity group of crops that provide high quality protein complementing cereal proteins for pre-dominantly substantial vegetarian population of the country. Although, being the largest pulse crop cultivating country in the World, India's production of pulses is relatively mere in comparison to total cereal crops productions. The cultivation of pulses builds-up a mechanism to fix atmospheric nitrogen in their root nodules and thus meet their nitrogen requirements to a great extent. In India, Pulses can be produced with a minimum use of resources and hence, it becomes less costly even than animal protein. In comparison with other vegetables, pulses are rich in protein which are less expensive and can be cultivated as an inter-crop and also as mixed crop. Pulses are mostly cultivated under rainfed conditions and do not require intensive irrigation facility and this is the reason why pulses are grown in area left after satisfying the demand for cereals/cash crops. Pulses are grown in all three seasons. The season-wise pulses are as under:

1. *Kharif* – Arhar (Tur), Urd (Blackgram), Moong (Greengram), Lobia (Cowpea),
2. Kulthi (Horsegram) and Moth.
3. *Rabi* – Gram, Lentil, Pea, Lathyrus and Rajmash
4. *Summer* – Greengram, Blackgram and Cowpea

Field pea (*Pisum Sativum* L) is one of the important pulse crop of rabi season after dry beans and chickpea. It is a highly productive crop. Field pea is being grown by the farmers of West Tripura district after harvesting of kharif rice, But the farmers of West Tripura district are getting very low yield. The national productivity of field pea is 1500 kg/ha but under Tripura condition it is only 900 kg/ha. The key reasons, for such a poor productivity in Tripura and particularly in West Tripura district, are cultivation of field pea in marginal areas, non- adoption of improved farming

techniques, minimal adoption of high yielding improved varieties and an overall lack of awareness among farmers about improved packages of practices. There is wide scope for extension machinery to educate the farmers of West Tripura district for higher adoption of improved and specific production technology of field pea by front line demonstration. Demonstrations are one of the practical approaches to maximize the production by display of relevant technologies at farmers field under close supervision of agricultural experts helped to narrow down the technological gaps to a considerable extent (Katare *et al.*, 2011) [1]. Therefore, it is essential to demonstrate the high yielding varieties, resistant to biotic and abiotic stresses and other improved pulse production technologies for getting good yield by the farmers. With this view, Krishi Vigyan Kendra, West Tripura conducted a series of Front Line Demonstration (FLD) on field pea crop during rabi season with the following objectives:

- To exhibit the performance of recommended High Yielding varieties (HYV) of field pea.
- To increase the productivity of pulse crops by practicing scientific package of practices in West Tripura district.
- To compare the yield levels of local check (Farmers field) and demonstrated technology.

Materials and Methods

The programme on Cluster Front Line Demonstration of Field pea was laid out in the selected villages of West Tripura district of Tripura State through number of extension practices like group meetings, awareness programmes, trainings, demonstrations, field day, etc. Based on the trials conducted by ICAR, improved variety of field pea Aman was selected for demonstration in the farmers field in six selected villages (Ragavendra *et.al* 2018) [10]. All together 75 demonstrations were conducted covering an area of 15 ha for three consequtive year (during rabi season of 2018-2019, 2019-2020 and 2020-2021). In general soil of the area under study was sandy loam to clay loam and medium in fertility status.

Awareness programme on importance of pulse crop in human diet and inclusion of pulse crop in cropping system was organized by the scientist of Krishi Vigyan Kendra. A group meeting was also conducted in each village. Training programme on the topics like improved cultivation practices of field pea, integrated nutrient management, integrated pest management was conducted before starting the demonstration programme in the selected villages. In the training programme a pre- and post-training evaluation was done to see the change in knowledge level of the farmers on the demonstrated technology. Besides imparting training, printed leaflet on field pea cultivation was distributed among the farmers. Regular visits by the KVK scientist were ensured to guide the farmers on all aspects of cultivation. These visits were also utilized to collect feedback for further improvement in research and extension programme. Field Day was organized at the demonstration site to provide opportunities for other farmers to witness the benefit of demonstrated technologies. The critical inputs like seed, fertilizer, insecticide/pesticides were supplied to the demonstration farmers by KVK, West Tripura. Regular data on various parameters were collected from the farmers field.

The demonstrations were conducted to study the technology gap between the potential yield and demonstrated yield, extension gap between demonstrated yield and yield under existing practices and technology index. The yield data was collected from both the demonstration and farmers practice by random crop cutting method and analyzed by using simple statistical tools. The percent increase yield, technology gap, extension gap and technology index were calculated by using following formula as per Samui *et al*. (2000) [4], as given below:

Percent increase in yield = (Demonstration yield - Farmers practice yield)/ Farmers practice yield X 100

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmers practice plot yield

Technology index (%) =Technology gap/Potential yield X 100

Results and Discussion

Frontline demonstrations studies were carried out in West Tripura district of Tripura state in *Rabi* season from 2018 to 2021. Major gap was observed between improved technology and farmers practice of field pea cultivation in West Tripura district (Table 1). Among varying technological component, full gap was observed in the component *viz* variety, seed treatment, seed inoculation, sowing method and plant protection measure and partial gap was observed in seed rate, fertilizer dose, irrigation. These gaps observed at the farmers field were ascribed to slow pace of extension activities; coupled with unreached extension system, poor accessibility of improved agro technologies especially among small holder farmers (Shivran *et al.*, 2020) [5]. Under farmers practice, seed of local/nondescriptive type with low yield potential was sown instead of newly recommended varieties for the district with improper application of improved recommended package technologies. On the basis of observed gap under the demonstration, improved variety of field pea Aman, fungicide, insecticide, biofertilizer (*Rhizobium* and PSB culture) etc. were provided to beneficiary farmers by KVK well in before taking the demonstration and other crop management practices were timely performed by the beneficiary farmer himself under the close supervision of KVK Scientist. The soil sample from the farmers field were tested before raising the demonstration for fertilizer application. Similar findings have also been observed by Meena *et al*. (2022) [7].

Table 1: Difference between technological interventions and farmers practices of field pea cultivation.

Component	Technological Interventions	Farmer Practices	Gap
Variety	Aman	Local Nondescriptive type	Full gap
Seed rate	75 kg/ha	100 kg /ha	Partial gap
Seed treatment	Trichoderma viridie (2.5 to 4 kg trichoderma was mixed with 100 kg cowdung. Then kept it for 15 days in the shade. At the time of sowing it is used in the line) to keep away from all types of pathogen	No seed treatment	Full gap
Seed inoculation	Rhizobium @ 10 g and phosphate solubolising bacteria (PSB) @ 10 g with 1 kg seed	No Seed inoculation	Full gap
Sowing method	Line sowing	Broadcasting	Full gap
Sowing time	1st week of November	1st week of November	No gap
Spacing	30 X 10 cm	No particular spacing is followed	Full
Fertiliser dose	Balance fertilization as per soil test value 20:60:40 kg NPK/ha	Imbalance use of fertiliser	Partial gap
Irrigation	Irrigation at critical stage	Indiscriminate irrigation not in a particular stage.	Partial gap
Plant protection	Need based chemical insecticide spray for pod borer.	No precautions has been taken for pod borer	Full gap

Field pea yield

Results obtained from four years of study are presented in Table 2. The result revealed that the demonstration on field pea var aman recorded an average seed yield of 1684.49 kg/ha under demonstrated plot as compared to farmers practice (1152.60 kg/ha). The highest seed yield in demonstration plot was 1714.11 kg/ha during 2019-20. The average yield of field pea var. aman increased under demonstration was 46.20% over farmers practice (Table 2). These results clearly indicated that the higher average seed yield in demonstration plots over farmers practice might be due to use of high yielding variety along with integrated crop management practices. Adoption of scientific package of practices like seed treatment with bio-fertilizers and need based right plant protection practices resulted in higher yields. The above findings are similar in lines with Raju *et al*. (2015) [9] and Kishor Zade *et al*. (2020) [3].

Table 2: Yield, technology gap, extension gap and technology index in field pea cultivation during 2018-2019, 2019-2020, 2020-2021

Year	Potential yield kg/ha	Average seed yield (kg/ha)		Percent Increase	Technology gap (kg/ha)	Extension gap ((kg/ha)	Technology index (%)
		Demo	Farmers' practise				
2018-19	1800	1653.24	1143.01	44.64%	146.76	510.23	8.15
2019-20	1800	1714.11	1132.47	51.36%	85.89	581.64	4.77
2020-21	1800	1686.13	1182.33	42.61%	113.87	503.8	6.33
Mean	1800	1684.49	1152.60	46.20%	115.50	531.89	6.42

Technology Gap

The data presented in Table 2 showed the technology gap as a difference between potential yield and demonstrated plot yield. The technology gap observed during different years was 146.76, 85.89 and 113.87 kg/ha during 2018-2019, 2019-2020, 2020-2021 respectively. On an average technology gap observed in three years under cluster front line demonstration implemented in different villages was 115.50 kg/ha. The highest technology gap was observed during 2018-2019 and lowest technology gap was observed in 2019-20. The technology gap reflects the lesser adoption of package and practices by the farmers. Hence, extension activities and location specific technological recommendation apper to be necessary to decline the technology gap. The above findings are similar in lines with Meena *et al*. (2021) [8] and Keshavreddy *et al*. (2018) [2].

Extension Gap

Extension gap is considered as a parameter to know the yield difference between the demonstrated improved technology and farmers practices. Results of the demonstrations (Table 2) showed that extension gap ranging between 503.8 to 581.64 kg/ha was found between demonstrated technology and farmers' practice. The extension gap observed was 510.23, 581.64, 503.8 kg/ha during 2018-19, 2019-20, 2020-21 respectively. On an average extension gap observed in four years under CFLD implemented villages was 531.89 kg/ha. The highest extension gap of 581.64 kg/ha was observed during 2019-2020 followed by 510.23 kg/ha during 2018-19 and 503.8 kg/ha during 2020-21. To enhance the farmers income, there is need to reduce extension gap. Therefore, it is necessary to educate the farmer's through various means of extension for more adoption of recommended improved technologies. The above findings are similar to the findings of Meena *et al*. (2022) [7]; Keshavreddy *et al*. (2018) [2] and Kishor Zade *et al*. (2020) [3].

Technology Index

The technology index is a parameter to show the feasibility of the improved technology at the farmers fields. The technology index of the present study was varied from 4.77 to 8.15%. On an average technology index was 6.42 during the years. This shows the efficiency and effectiveness of the improved technologies as a result of successful technical interventions to increase the yield performance of fieldpea. This will accelerate the adoption of demonstrated technological intervention to increase the yield performance of field pea at farmers field. Similar findings were recorded by Meena *et al*. (2021) [8] and Meena *et al*. (2022) [7].

Table 3: Economic impact of field pea cultivated under FLD and Farmers practice during 2018-2019, 2019-2020, 2020-2021

Year	No. of	Area	Cost of Cultivation		Gross Income		Net Income		B C Ratio	
	Demo	(ha)	Demo	Farmers' Practice	Demo	Farmers' Practice	Demo	Farmers' Practice	Demo	Farmers' Practice
2018-19	25	5	32543.42	31245.31	74395.80	51435.45	41852.38	20190.14	2.29: 1	1.65:1
2019-20	25	5	33563.80	32067.25	77134.95	50961.15	43571.15	18893.90	2.30: 1	1.59:1
2020-21	25	5	34728.20	31763.41	75875.85	53204.85	41147.65	21441.44	2.18: 1	1.67:1
Mean	25	5	33611.80	31691.99	75802.2	51867.15	42181.39	20175.16		

Economics

Economic analysis was done both for demonstrated and farmers' practices on the basis of prevailing rate of market (Table 3). The cultivation of field pea under improved technologies fetches higher net return of Rs. 41852.38, Rs. 43571.15 and Rs. 41147.65/-per ha in comparison to farmers' practices i.e Rs. 20190.14/-, Rs.18893.90/-, Rs. 21441.44/- per ha during the years 2018-19, 2019-20, 2020-21 respectively (Table 3). Similar results were reported by Singh *et al*. (2014) [6]. The benefit cost ratio of demonstrated technology were 2.29:1, 2.30:1, 2.18: 1 during the years 2018-19, 2019-20, 2020-21 respectively while it was 1.65:1, 1.59:1, 1.67: 1 from the farmers' practices over different years. The highest benefit: cost ratio recorded in demo plots might be due to higher yields obtained under improved technologies compared to farmer's practices during all the three years (Table 3). Similar results were observed by Meena *et al*. (2021) [8] and Raju *et al*. (2015) [9].

Conclusion

The front line demonstration programme in the farmers' field was effective in changing skill, attitude and knowledge of beneficiary farmers. The adoption of improved technology helps in increasing yield of field pea and net return of the farmers. There is need to disseminate the improved technologies among the farmers with effective extension activities like trainings and field demonstrations. This also improved the relationship between farmers and scientist and built confidence between them. The selected farmers of the demonstration acted also as a source of information and pure seeds of wider dissemination of high yielding varieties of field pea for the other farmers. The productivity gain under demonstration over conventional practices of field pea cultivation created greater awareness and motivated the other farmers to adopt appropriate recent production and protection technologies of field pea in the district. Farmers should be always encouraged in demonstration of improved technologies of crops and such type of participatory approach are always helpful in disseminating technologies among the other farmers of the district.

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