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Gap analysis and impact of cluster frontline demonstration on pulses (Pigeon pea) in east & south eastern coastal plain zone of Odisha

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Abstract

India is the largest producer and consumer of pulses in the world. Pigeon pea is one of the predominate pulse grown during kharif. Over the years many High Yielding Varieties (HVYs) are released and being implemented in the farmers field by Govt. and private organizations. Despite of initiative from various fronts the low productivity and low rate of adoption in pulses cannot be overlooked. Visualizing into the existing scenario Cluster Frontline Demonstration (CFLD) Pulses progarmme an initiative of National Food Security Mission(NFSM) was carried out in 2022-24 by KVK, Nayagarh for enhancing the productivity of the HYV Pigeon pea crops (PRG 176, LRG 52) involving 47 no of beneficiaries with an area of 20 ha in the district. The said demonstration was supported with critical inputs i.e HYV seeds, seed inoculants, pesticides, weedicide, plant hormones etc. along with capacity building training programme at demonstrated plots followed by field visit and monitoring at regular interval. The cumulative results reveals improved Crop Management practices recorded the highest ean seed yield of 10.75 q ha-1 which was 22.8 percent higher than the yield with farmers practice (8.73 q ha-1) which accounts an additional income of Rs.10698 ha-1The data revels extension gap, technological gap and technology index were recorded 8.25q/ha,2.01q/ha and 43.7 percent respectively. Lower the extension gap & technology index indicates more feasibility of the technology. Demonstrated technology shows a positive impact in terms of gross income gain of Rs.60575 ha-1 which is 21.4 percent higher income over farmers practice. Hence it may be summarized that location specific production technologies to be promoted in CLFD programmes in collaboration with district level extension functionaries to harness pulse productivity and better adoptability.

Keywords: CFLD on pigeon pea, extension gap, technology gap and technology index, Impact

Introduction

India is the largest producer and consumer of pulses in the world, constituting 28 percent of the world's total production and 30 percent of the world's total consumption of pulses in 2020 respectively (Organisation for Economic Cooperation and Development (OECD) and Food Agricultural Organization (FAO), 2021). Being rich in protein, they not only form a vital part of the human diet, but also play a crucial role in balancing the dietary proteins. Pulses play an important role in maintaining soil fertility and offer a hidden advantage to the soil by providing free elemental nitrogen through its fixation by activity of Rhizobia bacterial present in their root nodules. It is estimated that pulses fix around 20 – 40 Kgs. of valuable nitrogen per ha in the soil free of cost.

Pigeon pea, although being native to Africa is widely used in Indian cuisine as Dal. Seeds are rich in iron and iodine, besides essential amino acids like lycine, tyrocene, cyctine and arginine. In Odisha Pigeon pea occupies a major position in terms of area, production and productivity among the pulses. More than 90 per cent of total pulse production in India is contributed by 10 states among which Odisha is one of them. National productivity in pulses is 841kg/ha whereas Odisha stands at 561kg/ha. Pigeon pea is one of the predominate pulse crops in east & south-eastern coastal plain zone during Kharif. Many biotic and abiotic factors are responsible for low productivity of pulses crops and farmers confront with many issues related to production, input, marketing and extension management.

Over a period of time, a number of improved pigeon pea varieties and production technologies have been developed, but the full potential of the varieties as well as technologies could not be exploited due to low rate of adoption and low yield. Thus, factor limiting to productivity cannot be overlooked. Research and extension programme need to be diverted to produce value additive pulse. It may emphasize on quality attributes, adoption and popularization of new agro technologies, better varieties for stress conditions and improving present yield potential with an aim to raise production through transfer of farm technology.

A study by the NCEAR (2014) also reported that growth in pulses production (less than 1% annual growth) was less than half of the growth rate in Indian human population during the past 40 years, resulting in sharp decline in per capita production and availability of pulses in the country.

Cluster front line demonstration (CFLD) is a novel approach to provide a direct interface between researcher and farmer for the transfer of technologies developed by them and to get direct feedback from farming community. The concept of Cluster Frontline Demonstration was put forth under this

mission. The scheme implemented in a mission mode through a farmer centric approach. The basic strategy of the mission is to promote and extend improved technologies, i.e., seed, micronutrient, soil amendments, integrated pest management, farm machinery and implements, irrigation devices along with capacity building of farmers. The project was implemented with main objective to boost the production and productivity of pulse through CFLD with latest and specific technologies.

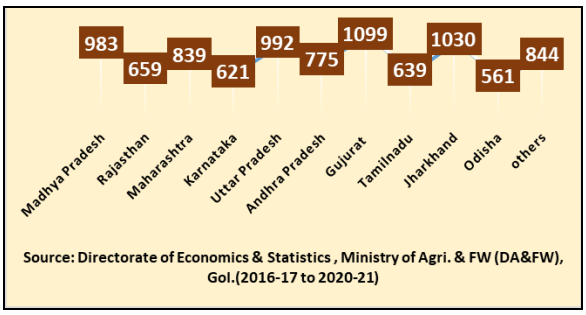

Fig 1: State wise productivity of total pulses (KG/HA)

Materials and Methods

The CFLD programme was carried out during Kharif in the year 2022-23 & 2023-24 with an area coverage of 10 ha per year with total beneficiaries of 47 under these demonstrations. Beneficiaries (farmers/ farmwomen) were identified through district level officials and local FPOs, critical inputs for the technologies like seeds, fungicides, bio-fertilizers, plant protection chemicals, plant hormones were supported by KVK, Nayagarh for the said demonstrations. Off farm training of farmer & farm women followed by regular field visit, monitoring and need based advisories were provided by the scientists of KVK. In case of local check, the traditional practices were followed by using existing local genotype Huda Kandula. In demonstration plots, use of quality seeds of HYV varieties (PRG 176, LRG 52) with line sowing and timely weeding, application of need based chemicals were administered. The basic information was recorded from the demonstration and control plots and analyzed for comparative performance of the cluster frontline demonstrations (CFLDs) and farmer's practice. The yield data were collected both from the demonstration and farmers practice by random crop cutting method and analyzed by using simple statistical tools. The technology gap and technological index (Samui *et. al.*, 2000) [5] were calculated by using following formula as given below.

Increasing yield (%) = Demonstration Yield – Farmers Yield X 100 / Farmers Yield

Technology gap= Potential Yield – Demonstration yield

Extension gap = Demonstration Yield – Farmers yield

Technology index= Potential Yield - Demonstration Yield X 100 / Potential Yield

Table 1: Difference between technological intervention and farmer's practices under CFLD on Pigeon pea

Particulars	Technological intervention in CFLD	Farmers Practices	Gap
Use of HYVs	Pigeon Pea: PRG 176 (Mid-early duration suitable for low rainfall areas) LRG 52 (High yielding variety moderately wilt resistance)	Huda Kandula (Local genotype with bold grain)	Full Gap
Seed rate	20 kg/ha	20-25kg/ha	High seed rate
Sowing method	Line sowing (60*30 cm)	Planting at farm bund, sowing through Broadcasting, uneven plant population	Full Gap
Seed treatment	Rhizobium treatment (5-10ml per kg of seed)	No seed treatment	Full Gap
Fertilizer application	Recommended N:P:K:S (20:40:20:20) kg/ha as basal dose	Fertilizer is not applied	Full Gap
Weed management	Use of Pendimethalin @ 1 kg a.i./ha as pre-emergence (0-3DAS) and Imazethapyr 10 S.L. @ 50 g a.i./ha post-emergence (at 15-20 DAS) followed by Hand weeding at 21 DAS and 42DAS	Hand weeding at 45-60DAS	Partial Gap
Plant protection chemicals for pod borer and leaf webber	Spraying of Emmamectin Benzoate 5%SC (@ 4gml /10lit) to control pod borer infestation. Application of Profeno+ Cypermethrin @1lit/ha to control leaf webber	Injudicious use of insecticides based on advice of input dealers	Partial gap with high cost
Hormone application	Spraying of Planofix @ 4ml/15 lit of water at flower initiation stage.	Hormone is applied as advised by input dealer at(time of application and dose) flowering /pre-flowering stage.	Partial gap with high cost

Table 2: Grain yield and Gap analysis of cluster frontline demonstration on Pigeon Pea

Year	Demonstrated Area (ha)	Sample No.	Average Yield(q/ha)			% increase over FP	Technology gap (q/ha)	Extension gap (q/ha)	Technology Index (%)
			Potential	CFLD	FP				
2022-23	10	22	20	12.4	9.20	34.7	7.6	3.2	38
2023-24	10	25	18	9.1	8.27	10.9	8.9	0.83	49.4
Average	--	--	18	10.75	8.73	22.8	8.25	2.01	43.7

Table 3: Economic analysis of the cluster frontline demonstrations on Pigeon Pea

Year	Total return (Rs. ha-1)		Input cost (Rs. ha-1)		Net return (Rs. ha-1)		Additional return (Rs. ha-1) CFLD	B:C ratio	
	Recommended Practice (RP)	Farmer's Practice (FP)	Recommended Practice (RP)	Farmer's Practice (FP)	Recommended Practice (RP)	Farmer's Practice (FP)		Recommended Practice (RP)	Farmer's Practice (FP)
2022-23	62000	46000	28100	22800	33900	23200	16000	2.2	2.01
2023-24	59150	53755	28920	28400	30230	25355	5395	2.02	1.89
Average	60575	49877.5	28510	25600	32065	24277.5	10697.5	2.11	1.95

Note: Price at local market of Pigeon Pea @Rs 5,000 qt-1 in 2022-23, Rs 6,500 qt^{-1} in 2023-24.

Results and Discussion

Gap Analysis: Data in Table 2 reveals grain yield of 12.4q/ha in the year 2022-23 which is almost 34% higher productivity over the farmer's practices caused due to cultivation of HYV seeds followed with practices of schedule fertilizer application, weed control and pest and disease management. The mean data of two years reveals an increment of 22.8% higher yield over local check which shows a positive impact of demonstrations programme by achieving an incremental yield of 2.02 q/ha. The ultimate objective of the demonstration to narrow down the extension gap and to promote feasible location specific technology for upscaling and out-scaling. In the year 2022-23 the extension gap was 3.2q/ha while in the consecutive year it was narrow down to 0.83q/ha as we can find out there is minimal increase of 10% yield over farmers practice. Besides there is continues stive to shrink down the technology gap and technology index (%) of demonstration, lower the value expresses higher acceptance of the technology. The value of technology Index was 38% and 49.9% in the year 2022-23 & 2023-24 respectively whereas the average value of index was recorded 43.7% which shows the huge gap need to be narrow down with location specific recommendations in terms of suitable HYV with crop management practices coupled with capacity building of farmers for technology execution and adoption.

Impact of Cluster Frontline Demonstrations

CFLD conducted during 2022-24 in different locations revealed that the improved package of practices is more important with technological intervention for productivity and profitability of pulse. From the table 3 it is evident that with an additional average input cost of Rs.2910/ ha the farmers could get an average incremental income of Rs.10697.5/ha which almost three times of the investment of input cost. This surely show a positive impact and constructive change impact among the beneficiaries. The cultivation practices comprised under CFLD viz use of improved variety, seed treatment, line sowing, balanced application of fertilizers, proper weed control and control of pest through insecticide at economic level evidentially proved superiority over farmer's practice (Table 2). The technology gap ranges from 7.6 to 8.9 q ha-1 whereas the extension gap ranges from 3.2 to 0.83 q ha-1, lower the value of technology index indicates more feasibility of the technology. Economic performance of pigeon pea under cluster frontline demonstration presented in table 3. reveals that technologies demonstrated under CFLDs also had positive impact on net return and thereby benefit cost ratio (B:C ration) over farmer's practice. These results are in accordance with the findings of Jha *et al*. (2020) [2] & Singh and Singh (2020) [7] & Tomar *et al*. (2021) [8].

Conclusion

The cluster frontline line demonstrations (CFLDs) conducted by KVK had enhanced the productivity of Pigeon pea and ensured spread of recommended technologies of Pigeon pea production horizontally by implementation of various extension activities like training programmes, field days, exposure visits etc. organized under CFLD programmes in farmer's field. The CFLDs made a positive impact on yield of pigeon pea by 22.8% and addition return of Rs. 10698 ha^{-1}. Attempt should be taken from various forum to minimize technical gap, extension gap and technology index (%) through such demonstrations. Therefore, it is suggested that through CFLD location specific feasible technologies should be vertically spread among the farming community with collaborative efforts from district level extension professionals.

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