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Impact of front line demonstrations (FLD) on the yield of pulses

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Abstract
The study was carried out during kharif, rabi and summer seasons in fifty villages of Mau district, Uttar Pradesh during 2017-18 to 2020-21. All 400 demonstrations on pigeon pea, chick pea, black gram and green gram crops were carried out in area of 160 ha by the active participation of farmers with the objective to demonstrate the improved technologies of pulses production potential. The improved technologies consisting use of modern variety, seed treatment with rhizobium and PSB culture, balanced fertilizer application and integrated pest management. FLD recorded higher yield as compared to farmer's local practice. The improved technology recorded higher yield of 1880 kg/ha, 1480 kg/ha, 880 kg/ha and 927 kg/ha in pigeon pea, chick pea, black gram and green gram, respectively than 1450, 1130, 680 and 711 kg/ha. In spite of increase in yield of pulses, technological gap, extension gap and technology index existed. The improved technology gave higher gross return, net return with higher benefit cost ratio as farmer's practices.

Keywords: Pulses, yield, technology gap, extension gap, technology index

Introduction

Historically India is the largest producer, consumer and importer of pulses. Pulses are a good and chief source of protein for a majority of the population in India. Protein malnutrition is prevalent among men, women and children in India. Pulses contribute 11% of the total intake of proteins in India (Reddy, 2010) [7]. In India, frequency of pulses consumption is much higher than any other source of protein, which indicates the importance of pulses in their daily food habits. Keeping the cheapest source of protein, it is important to increase pulses production to increase balanced diet among the socially and economically backward classes. India accounts for 33% of the world area and 22% of the world production of pulses. About 90% of the global pigeon pea, 65% of chickpea and 37% of lentil area falls in India, corresponding to 93%, 68% and 32% of the global production, respectively (FAOSTAT, 2011) [1]. Although it is the world's largest pulses producer, India is importing 3-4 million tons (MT) of pulses every year to meet its domestic demand. However, during the last decade, growth in pulses production has increased significantly. India achieved a record 18.1 MT pulses production in 2010-11 with in Pigeon pea (3.27 MT), chickpea (8.25 MT), moong (1.82 MT) and urad (1.74 MT). Pulses are grown across the country with the highest share coming from Madhya Pradesh (24%), Uttar Pradesh (16%) and Gujarat (23%).

Even though pulses production increased significantly during the last decade but continuing the faster growth is a bigger challenge for researchers, extension agencies and policy makers to fulfill the domestic demand of its in India. The productivity of pulses in India (694 kg/ha) is lower than most of the major pulse producing countries. In Uttar Pradesh, pulse were cultivated an area (22-24 million ha) with production (2.5 million metric tons) and productivity (757 kg/ha) during the year 2010-11 (DOA, 2011) [1]. Mau area of Uttar Pradesh comes under tribal belt where malnutrition in women and children is common problem. Therefore, this investigation was carried out in this area for popularizing of pulse production with objective of providing nutritive diet and increase availability of pulse per capita.

Materials and Methods

The present study was carried out by the Krishi Vigyan Kendra, Mau, Acharya Narendra Dev University of Agriculture and Technology, Kumarganj, Ayodhya in kharif, rabi and summer seasons in the farmers fields of fifty villages of Mau district during 2017-18 to 2020-21. All 400 front line demonstrations in 160 ha area were conducted in different villages.

Materials for the present study with respect to FLD was on following (i) Improved variety (Pigeon pea-Narendra Arhar-2, Chickpea-Pusa 362, Black gram-Pratap Urd-1, Green gram-Pant Moong-3) (ii) Seed treatment with Trichoderma 10 gm/kg seed, rhizobium and PSB culture with 10 ml/kg seed (iii) Farm manure @ 10 ton/ha (iv) Fertilizers (N:P: S: Zn) 20:40:20:20 kg/ha (v) Adoption of IPM. The improved technology included modern varieties, seed treatment and maintenance of optimum plant population etc. The sowing was done during June-July in Pigeon pea and black gram, Oct.-Nov. in Chickpea and Feb.-March in Green gram. The spacing was 90 x 20 cm, 45 x 10 cm, 45x 10 cm and 45 x 10 cm in pigeon pea, chick pea, black gram and green gram, respectively. The seed rate of pigeon pea, chick pea, black gram and green gram were 20 kg/ha, 80 kg/ha, 20 kg/ha and 20 kg/ha, respectively. The fertilizers were given as per improved practices as basal dose. Hand weeding within lines was done at 25-30 and 50-55 DAS. The crops were harvested at perfect maturity stage in all pulses with suitable method.

In general, soils of the area under study were medium black clay with medium to low fertility status. The average rainfall of this area was 952 mm with 50 rainy days. In demonstration plots, critical inputs in the form of quality seed and treatment, farm manure, balanced fertilizers and agro-chemicals were provided by KVK. For the study, technology gap, extension gap and technology index were calculated as suggested by Samui, *et al*. (2000) [8].

Technology gap = Potential yield- Demonstration yield
Extension gap = Demonstration yield-Farmers yield

$$\text{Technology index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \; 100$$

Results and Discussion

Yield

The average yield of pulses [pigeon pea (1880 kg/ha), Gram (1480 kg/ha), Black gram (880 kg/ha) and Green gram (927 kg/ha)] were much higher than as compared to average yield of farmers practices [pigeon pea (1450 kg/ha), Gram (1130 kg/ha), Black gram (680 kg/ha) and Green gram (711 kg/ha). The average percentage increased in the yield over farmer's practices was 29.7, 31.0, 29.4 and 30.4 for pigeon pea, gram, black gram and green gram, respectively. The results indicated that the front line demonstrations have given a good impact over the farming community of Narmada district as they were motivated by the new agricultural technologies applied in the FLD plots (Table 1). This finding is in corroboration with the findings of Poonia and Pithia (2010)

Technology gap

The technology gap in the demonstration yield over potential yield were 120 kg/ha for pigeon pea, 120 kg/ha for chick pea, 120 kg/ha for black gram and 73 kg/ha for green gram. The technological gap may be attributed to the dissimilarity in the soil fertility status and weather conditions (Mukharjee, 2003) [5] (Table 1).

Extension gap

The highest extension gap of 430 kg/ha was recorded in pigeon pea followed by 350 kg/ha for chick pea and the lowest was observed in 216 kg/ha for green gram and 200 kg/ha for black gram. This emphasized the need to educate the farmers through various means for the adoption of improved agricultural production technologies to reverse this trend of wide extension gap. More and more use of latest production technologies with high yielding variety will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinue the old technology and to adopt new technology (Table 1). This finding is in corroboration with the findings of Hiremath and Nagaraju, (2010) [2].

Technology Index

The technology index shows the feasibility of the evolved technology at the farmer's fields and the lower the value of technology index more is the feasibility of the technology (Jeengar, *et al*., 2006) [3]. The technology index was 6.0 percents for pigeon pea, 7.5 percents for chick pea, 12.0 percents for black gram and 7.3 percents for green gram (Table 1).

Table 1: productivity, technology gap, extension gap and technology Index of pulses under FLDs

Name of pulse	Area (ha)	No. of farmers	Yield (kg/ha			% increase over local check	Technology gap (kg/ha)	Extension gap (kg/ha)	Technology Index
			Potential	Improved Technologies	Farmers Practices				
Pigeonpea	40	100	2000	1880	1450	29.7	120	430	6.0
Chickpea	40	100	1600	1480	1130	31.0	120	350	7.5
Blackgram	40	100	1000	880	680	29.4	120	200	12.0
Greengram	40	100	1000	927	711	30.4	73	216	7.3

Economic return

The inputs and outputs prices of commodities prevailed during the study of demonstrations were taken for calculating gross return, cost of cultivation, net return and benefit: cost ratio (Table 2). The cultivation of pigeon pea, chickpea, black gram and green gram under improved technologies gave higher net return of Rs. 39460, 30800, 19050 and 22432/ha, respectively as compared to farmers practices. The benefit cost ratio of pigeon pea, chickpea, black gram and green gram under improved technologies were 4.49, 3.26, 2.99 and 3.35 as compared to 3.95, 2.95, 2.51 and 2.73 under farmers practices. This may be due to higher yields obtained under improved technologies compared to local check (farmers practice). This finding is in corroboration with the findings of Mokidue *et al*, (2011) [4].

Table 2: Gross return (Rs./ha), Cost of cultivation (Rs./ha), net return (Rs./ha) and B:C ratio as affected by improved and local Technologies

Name of pulse	Gross return Rs/ha		Cost of cultivation Rs/ha		Net Return Rs/ha		B: C ratio	
	Improved technologies	Farmers Practices	Improved technologies	Farmers Practices	Improved technologies	Farmers Practices	Improved technologies	Farmers Practices
Pigeonpea	50760	39150	11300	9910	39460	29240	4.49	3.95
Chickpea	44400	33900	11600	11500	30800	22400	3.26	2.95
Blackgram	28600	22100	9550	8800	19050	13300	2.99	2.51
Greengram	31982	24530	9550	9000	22432	15530	3.35	2.73

Sale Price of pigeonpea@Rs. 27/Kg, Chickpea @ Rs.30/kg, Blackgram @ Rs. 32.5/Kg, Greengram @/34.500Kg

Reason of low yield of pulses at farmer's field

Optimum sowing time is not followed due to non availability of quality seed. More than 90 per cent of farmer pulses seed sowing as broadcast method and most of situation the plant population at farmer's field is very high or two-three times high of the recommended stand. Lack of popularization of seed cum fertilizer drill for sowing and use of inadequate and imbalance dose of fertilizers especially the nitrogenous and phasphatic fertilizers by farmers does not make possible to fetch potential yield. Mechanical weed control is costly and chemical control is quit uncommon in this region.

Specific constraints with marginal/sub marginal farmers

Small Holding: The adoption of well proven technology is constrained due to small size of holding and poor farm resources. Small and marginal farmers have less capability to take risk and do not dare to invest in the costly input due to high risk and the poor purchase capacity of small farmer.

Farm Implements and Tools: Traditional implements and tools are still in practice due to small holding which have poor working efficiency. The lack of simple modern tools for small holding also hinders the adoption of improved technology. Thus, the cultivation of pulses with improved technologies has been found more productive and seed yield might be increase up to

23.2 per cent. Technological and extension gap extended which can be bridges by popularity package of practices with emphasis of improved variety, use of proper seed rate, balance nutrient application and proper use of plant protection measures. Replacement of local variety with the released variety of pulses would be increase in the production and net income by more than fifty six thousand rupees.

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Hence, by conducting front line demonstrations of proven technologies, yield potential of pulse crops can be increased to great extent. This will subsequently increase the income as well as the livelihood of the farming community.

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