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Performance of Pulses Demonstrations in Bundelkhand Zone of Uttar Pradesh, India

KEYWORDS: Pulses demonstrations, Pulses productivity and profitability, Technology gap analysis

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ABSTRACT *Technology demonstrations were conducted on pulses with improved technologies against farmer's practices at farmer's fields during 2008-09 to 2010-11 in district Hamirpur of Bundelkhand zone in Uttar Pradesh. Full package of practices was followed. The demonstrations were conducted on chickpea (687), field pea (435) and lentil (255). The results showed that improved techniques increased seed yield over farmer's practice by the margins of 10.77 q/ha or 113.8 % in chickpea, 8.79 q/ha or 71.5 % in field pea and 6.22 q/ha or 75.2 % in lentil. Net profit of Rs.20665/ha in chickpea, followed by Rs.11440/ha in lentil was realized by the farmers. Lowest of Rs.10745/ha net profit was increased in field pea. There is wide technology gap, which need to bridge by promoting the scientific production and protection technologies in varied condition of rainfed condition.*

Introduction
The pulses are the most important crops grown in varied conditions in Hamirpur district of Bundelkhand zone in Uttar Pradesh. However, the productivity of these crops is much lesser than the state average. The major constraints in crops production are non-availability of improved varieties seed, imbalanced use of fertilizers and lack of adoption improved cultivation techniques by majority of farmers. Most of the farmers in the district are not aware about improved techniques of crops cultivation. If the productivity is increased, the district Hamirpur with sizeable area under these crops has tremendous potential in the production of pulses. Keeping these factors in view, technology demonstrations were organized under different situations on farmer's fields in district Hamirpur to enhance the productivity and profitability per unit area.

Methodology
The selection of farmers was done block wise with the help of block level functionaries and staff of line departments. Only interested farmers were selected for demonstrations on different crops. All type of large, medium and small holding size farmers were included in the study. Through preliminary discussion with selected farmers, causes for low crop yield of pulses were identified and prioritized. Based on the major causes, technological interventions were finalized. Under improved techniques, integrated crop technologies approach demonstrated included interventions viz. use of improved variety with optimum seed rate, rhizobium inoculation, line sowing with optimum spacing, optimum dose of fertilizers application and proper weed management. Under conventional system, farmers used old varieties with low seed rate, without rhizobium inoculation, nominal use of fertilizer and no proper weed control. Critical inputs viz. seed and fertilizers were supplied to the farmers. All demonstrations were conducted on subsidy basis with participatory involvement of farmers. The demonstrations were conducted in the form of half-field demonstration. Each demonstration had an area of 0.4 ha, in which half area (0.2 ha) was kept under conventional system and another half (0.2 ha) under improved techniques of crop production demonstrated side-by-side. In all, 1377 demonstrations during *rabi* season were conducted in whole district during three years of 2008-09 to 2010-11. Demonstrations on chickpea (687), field pea (435) and lentil (255) were laid out. Yield data were recorded in addition economic analysis. Technology gap, extension gap and technology index were calculated by using the following formulae:

Technology gap (Demonstration) : Potential yield – Improved yield

Extension gap : Improved yield (Demonstration) – Farmers yield

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

Results and Discussion
Yield Analysis:
Remarkable change on yield parameter was observed (Table 1). Maximum increase in yield due to improved techniques over conventional system was recorded in chickpea followed by field pea, while lowest yield increase was seen in lentil. On an average, chickpea increased 113.8% yield over conventional system. Technological interventions in terms of improved varieties, integrated nutrients management, integrated pest management, weed management, etc. made a difference on pulses yield. The possibility of increasing yield of chickpea, lentil and field pea per unit area was found in the area at significant level. It might be mainly due to lines sowing with optimum spacing, improved variety with optimum seed rate, rhizobium inoculation, optimum fertilizer application and proper weed control. In case of lentil and field pea farmers sow local seed through broadcasting with lower seed rate without any fertilizer use and no proper weed control, which lead to poor yield. Wide technology and extension gap were observed which need to be minimized by following scientific technological interventions. Ali and Kumar (2007) reported the results of on-farm demonstrations that the yield of chickpea, pigeon pea, lentil and field pea increased by 18.3, 30.2, 25.0 and 26.2% due to only improved varieties; 14.3, 14.0, 17.1 and 16.8% due to fertilizer alone; 12.5, 14.0, 18.1 and 20.6% due to rhizobium inoculation and 26.1, 33.0, 24.5 and 24.4% due to weed management, respectively. The demonstrations conducted on lentil with improved varieties and technologies showed a yield advantage of about 33% over local check as reported by Kokate, *et. al.* 2013.

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Table 1: Yield and gap analysis of rabi pulses in Hamirpur district, Uttar Pradseh

Crop	Variety	No. of demo.	Potential yield (q/ha)	Average yield (q/ha)		% Increase in yield over local	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
				Local	Demo.				
Chickpea	Avarodhi	687	28	9.46	20.23	113.8	7.77	10.77	27.75
Field pea	Sapna	435	30	12.30	21.09	71.5	8.91	8.79	29.7
Lentil	NL-1	255	20	8.27	14.49	75.2	5.51	6.22	27.55

Economic Analysis:

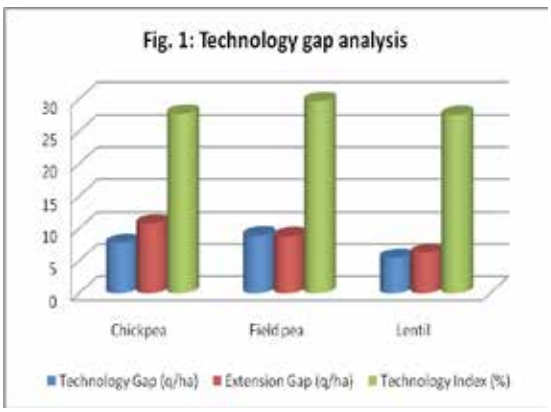
Cost of cultivation on pulses crops has been raised due to higher rates of inputs per unit area. Increase in expenditure due to improved techniques over farmer's practices was lowest of Rs.4732/ha in lentil to highest of Rs. 6835/ha in field pea. The use of improved techniques increased net economic gain from all pulses under demonstrations considerably. Maximum increase of Rs. 20665/ha in net profit was observed in chickpea followed by lentil with net profit of Rs. 11440/ha, while lowest of Rs. 10745/ha net profit was found in field pea (Table 2). It might be attributed to percent wise lowest increase in seed yield with improved techniques over conventional system of field pea. However, percent yield increase due to improved interventions was highest in chickpea and in yield increase was lowest in lentil. Return per rupee invested on improved techniques was worked out highest of Rs. 4.30 in chickpea followed by Rs. 3.42 in lentil, while lowest of only Rs. 2.57 in field pea. These results showed that investment on improved cultivation techniques is more profitable on chickpea and lentil in Hamirpur district of Bundelkhand zone. In case of chickpea, almost similar results on farmer's fields studied in Hamirpur district have also been reported by Singh, *et al*. (2004). The increase in crop profitability (Rs./ha/day) due to improved techniques of chickpea, field pea and lentil was recorded Rs. 140.58, Rs. 88.07 and Rs. 83.50, respectively. Kokate, *et. al*. 2013 reported a net return of Rs. 34400 per ha which was 46% higher to local check in lentil in Bundelkhand zone of Uttar Pradesh.

Table 2: Economic analysis of rabi pulses in Hamirpur district, Uttar Pradesh

Crops	Increase with improved techniques over conventional in					
	Seed yield (q/ha)	Gross income (Rs./ha)	Expenditure (Rs./ha)	Net profit (Rs./ha)	Return (per rupee invested)	Profitability (Rs./ha/day)
Chickpea	10.77	26925	6260	20665	4.30	140.58
Field pea	8.79	17580	6835	10745	2.57	88.07
Lentil	6.22	16172	4732	11440	3.42	83.50

Technology Gap Analysis:

The data depicted in Table 1 and Fig. 1 revealed that the chickpea, field pea and lentil produced average yield of 20.23 q/ha, 21.09 q/ha and 14.49 q/ha under demonstrations as against the potential yield of 28.0 q/ha, 30.0 q/ha and 20.0 q/ha, respectively. Thus, there is a wide gap between the demonstration yield and potential yield. The highest technology gap of 8.91 q/ha was recorded in field pea followed by chickpea (7.77 q/ha), while minimum gap was found in lentil (5.51 q/ha). There is highest gap existing between the potential yield and demonstration yield (improved technologies) in field pea followed by chickpea and lowest was in lentil. However, demonstrations were conducted under close supervision of field staff but the technology gap was found there. It might be due to varied agro-ecosystems of the area. In addition, it was also observed that the reasons responsible for the technology gap was lack of adoption of complete or thoroughly recommended package of practices at demonstration fields under improved technologies due to non-availability of some important inputs at the time of requirement, high cost of inputs and insufficient technological advise.



The highest extension gap of 10.77 q/ha was recorded in chickpea followed by field pea (8.79 q/ha) and lowest was in lentil (6.22), which indicates that there is a gap existed between the yield of demonstrations and local check/farmer's practice. In comparison between the improved technologies and conventional system, it was observed that the farmers did not applied nutrients and plant protection measures properly, area specific varieties were sown without seed inoculation and optimum plat population, which was not maintained under conventional system. Thus, the farmers were failed to adopt recommended package of practices under conventional system and led to extension gap. The extension gap in the yield indicates that there is big scope to increase the yield of pulses at farmer's fields by adopting the recommended package of practices. Therefore, to bridge the extension gap, there is a need to be give more emphasis on transfer of improved technologies and management practices of chickpea as compared to field pea and lentil through strengthening of extension network. The extension gap for all pulses was higher as compared to the technology gap, which also indicates that there is need to train and educate the farmers about improved technologies.

Technology index ranging from 29.3 to 38.46 % indicates of higher scope for further improvement in productivity of pulses in Bundelkhand zone of Uttar Pradesh.

Conclusion

Technology demonstrations conducted on chickpea (687), field pea (435) and lentil (255) were performed better. The results showed that improved techniques increased average yield over farmer's practice by the margin of 10.77 q/ha or 113.8 % in chickpea, 8.79 q/ha or 71.5 % in field pea and 6.22 q/ha or 75.2 % in lentil. Net economic gain of Rs.20665/ha in chickpea followed by Rs.11440/ha in lentil was realized by the farmers. Lowest of Rs.10745/ha net gain was increased in field pea. There is wide technology gap, which need to be bridged by promoting the scientific production and protection technologies in varied rainfed condition. Major attention on district and area specific technology modules should be developed for enhancing the productivity of pulses in varied conditions and agro-eco systems. Capacity building programme of extension functionaries and farmers is again an urgent need.

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