

# EVALUATION OF FRONTLINE DEMONSTRATION OF LENTIL (*LENS CULINARIS* L.) IN SOUTH EASTERN PLAIN ZONE OF RAJASTHAN

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**Abstract :** Studies were undertaken in agro-climatic zone-V (Humid South Eastern Plain) of Rajasthan situated in between 25°45' and 26°33' N latitudes and 75°27' and 77°26' E longitude at an altitude of 273 m from mean sea level, to evaluate the yield and economic feasibility of improved technology transfer in lentil through front line demonstrations conducted during 2007-08 to 2009-10. Adoption of improved technology had significant impact on seed yield and economic return in lentil. Improved technology enhanced lentil seed yield from 775 kg/ha (farmers' practice) to 999 kg/ha (improved technology), an overall increase of 28.81 %. Among the critical inputs, weed management ranked first (38.45 %), followed by varietal improvement (29.16 %), whole package technology (24.70 %) and nutrient management (23.64 %). The comparative profitability due to improved technology was fetched higher to the tune of Rs. 4896/ha over farmers' practice. The benefit: cost ratio was also higher and recorded 2.04 compared to the farmers' practice. Thus, to further bridge up the gap between technologies developed and technology transferred, there is need to strengthen the extension network besides emphasis on specific local recommendation.

**Keywords :** Improved technology, Front line demonstration, Lentil, Net return, B: C ratio

## INTRODUCTION

Pulses being an inseparable ingredient in the diet of the vast majority of vegetarian population and mainstay of sustainable crop production, it continue to be an important component of the rainfed agriculture since time immemorial. The production of total pulses in India is presently about 17.29 million tonnes covering an area of about 25.51 million hectare (Anonymous, 2010-11), which is all times high and make India the largest producer of pulses in the world but India is also the largest consumer and importer of pulses and hence, per capita availability of pulses is 33 g/day in the year 2009-10, doubling its import (from 1.27 to 2.35 million tones) and resulting in skyrocketing prices. In order to ensure self sufficiency, the pulse requirement in the country is projected at 32 million tonnes by the year 2030 which necessitates an annual growth rate of 4.2 % (Nadrajana 2011). Though, majority of which falling under rainfed, resource poor and harsh environments frequently prone to drought and other abiotic stress condition. Lentil is the most important grain legume crop of *rabi* season after chickpea and widely grown in arid and semi-arid parts of the country. It is the most drought tolerant crop among the grain legumes. In India, it is grown in an area of 1.48 million hectares, mostly confined to Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Rajasthan and Jharkhand with a production of 1.03 million tonnes (Anonymous, 2010-11). The Rajasthan state has a sizeable area 44.1 thousand hectares with annual production of 38.5 thousand tonnes and average productivity was only 872 kg/ha (Anonymous, 2010-11). Farmers generally apply sub-optimal doses of fertilizers, insecticides and limited irrigations for pulses after meeting the requirements of wheat, rice and vegetable crops. Therefore, wide gaps also exist

between yields realized in experimental plots, frontline demonstration plots and farmers' fields. Large-scale on-farm demonstrations conducted in the last 5 years have clearly shown superiority of new technologies over the local practices. Full package technology of lentil crop hold promise to increase productivity by 41.9 % followed by weed management 24.7 %, whereas improved varieties comprised of 23.6 % yield advantage over the farmers' practices in a large number of frontline demonstrations conducted across the country and overall adoption of these technologies can increase lentil production by at least 13–42 % in the country reported by Ali and Gupta, 2012. Improved production technologies like line sowing, seed treatment with *Rhizobium*, application of sulphur @ 20 kg/ha, pre-emergence application of pendimethalin @ 1–1.25 kg/ha, foliar spray of 2% urea/DAP, and bio-intensive IPM modules have been advocated after experimentation and large-scale frontline demonstrations. The productivity of lentil per unit area could be increased by adopting recommended scientific and sustainable management practices of whole package technology. Taking into account the above considerations, frontline demonstrations were carried out in a systematic manner on farmers' field to show the impact of improved production technology for enhancing the lentil productivity.

## MATERIAL AND METHOD

Frontline demonstrations under AICRP on MULLaRP were conducted at farmers field during *rabi* seasons of three consecutive years (2007-08 to 2009-10) with the objectives to optimize lentil yield through the use of improved technology along with farmers practices. A total of 65 front line demonstrations were organized on farmers field to

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demonstrate the impact of research emanated production technology on lentil productivity. The improved whole package of practices included short/medium duration improved varieties (DPL-62, L-4076, JL-3 & IPL-81), recommended seed quantity (60 kg/ha), seed treatment with vitavax fungicide (2.0 g /kg seed) and inoculated with bio-fertilizers (*Rhizobium* & *PSB* culture each @ 600 g/ha), recommended dose of fertilizers (20 kg N, 17.5 kg P, 25 kg K/ha and 5 kg Zn), weed management (pendimethalin 1.0 kg/ha) and insect-pest management (if required).

The performance of lentil under these demonstrations were compared with farmers practice which included 80 kg seed/ha, use of own seed of own variety and use of imbalanced fertilizer especially nitrogen and phosphorus. The results were economically evaluated in terms of net returns and B: C ratio to re-establish the viability of improved technologies. Each frontline demonstration was laid out on 0.4 ha area, adjacent to it 0.4 ha was considered as control for comparison (farmers' practices). Majority of demonstrations during three years were sown between 15<sup>th</sup> October-10<sup>th</sup> November. If irrigation facility was there, then one irrigation was applied at 45-50 days after sowing. During the course of demonstrations, front line demonstrations were also taken as component based technology e.g. varietal improvement (35 nos.), nutrient management (16 nos.), weed management (5 nos.) and whole package (9 nos.) etc. The selection of farmers was done on the basis of participatory rural appraisal (PRA) action plan and care has been taken to layout the demonstrations on road side to facilitate the demonstration on technology. The yield and economic data was obtained for 65 respondents from 15 selected lentil growing villages for a period of three years.

## RESULT AND DISCUSSION

The results of three years (2007-08 to 2009-10) frontline demonstrations conducted on farmers' field under real farm conditions in Kota, Bundi and Jhalawar districts indicated that improved technology could lead to average seed yield levels in the range of 900 to 1196 kg/ha as compared to 726 to 867 kg/ha under farmers practice (Table 1). The highest level of yield in these demonstrations was recorded in the range of 945 to 1265 kg/ha. Average yield of 65 demonstrations worked out to 995 kg/ha from improved technology where as the average yield obtained in case of farmers practice was 782 kg/ha. This revealed that the adoption of improved production technology of lentil cultivation is capable of enhance the productivity by 27.28 per cent over farmers' practices. The 33.8 per cent increase in mungbean yield over farmers' practice reported by Siag *et al.* (2005) whereas, Dhaka *et al.* (2010) observed 26.7 per cent increase in maize yield over local check. Similarly, yield enhancement in lentil

crop up to 30.0 per cent in front line demonstrations has amply been documented by Kumar *et al.* (2011). Among improved varieties (Table 1) variety DPL-62 gave the maximum (1265 kg/ha) yield in the year 2007-08. The next best was JL-3 (1225 kg/ha) yield in the year 2007-08) followed by L-4076 and IPL 81 (both 1125 kg/ha) in the same year. Variety IPL-81 (1050 kg/ha) in the year 2008-09 and DPL 62 (990 kg/ha) in the year 2009-10 and thus recorded 31.51, 37.95, 31.04 in the year 2007-08, 24.48 in the year 2008-09 and 18.18 in the year 2009-10 per cent respectively higher seed yield under recommended package of practices over local varieties with farmers practice. From these results it is evident that the performance of improved varieties was found superior than the local checks.

The variations in the seed yield of lentil was observed year to year and varied from 945-1265 kg/ha in case of improved practices and 726-867 kg/ha in farmers practice (Table-1), it could partly be accounted for the interaction between the weather fluctuations and performance of lentil varieties. On the basis of average the minimum yield 878 kg/ha (improved technology) and 726 kg/ha( farmers practice) was recorded in JL-3 and DPL-62 must have affected the yield level of new lentil varieties JL-3 and DPL-62 and thus suppressed the yield of varieties in the said crop season.

The productivity of lentil ranged from 990 to 1265 kg/ha with highest mean yield 1094 kg/ha under recommended improved production and protection technologies. Data (Table -2) indicated that seed yield of 1094, 925 and 978 kg/ha could be obtained with improved technology as compared to 822, 741 and 761 kg with farmers practices in respective years. Thus in comparison to farmers practices there was an increase of 33.09, 24.83 and 28.51 per cent in productivity from the demonstrations plots during *rabi* 2007-08, 2008-09 and 2009-10 respectively. The higher seed yield of lentil could be attributed due to adoption of high yielding improved varieties, line sowing, weed management, balance use of fertilizers and life saving irrigation at proper time. These results are supported by Dhaka *et al.* (2010).

The economic evaluation mode on the basis of prevailing market rate (Table -3) showed that all the demonstrations gave higher net return of Rs. 18561, 21966 and 35840 per hectare in improved technology as compared to Rs. 13889, 17532 and 30260 per hectare under farmers practices in the corresponding seasons. There was an additional increase of Rs. 4672 in *rabi* 2007-08, Rs. 4434 in *rabi* 2008-09 and Rs. 5580 in *rabi* 2009-10 per hectare with respective increment benefit: cost ratio of 2.05, 1.83 and 2.24 respectively.

The lentil yield was fluctuated from season to season and recorded highest yield 1092 kg/ha in the year 2007-08 and per cent increased was 33.66 over farmers' practices (Table-5). However, in the year 2008-09 also reported higher yield in improved

technology and per cent increased was 25.42 compared to farmers' practices and lower yield was recorded in the year 2009-10 and per cent increased in lentil yield under improved technology was only 18.44 over farmers' practices. Economic viability of improved technology were evaluated based on prevailing market rate on critical inputs and selling price of produce, maximum additional net return Rs. 5580/ha was recorded in the year 2009-10 with ICBR 2.24 followed by Rs. 4672/ha with 2.05 in the year 2007-08 and Rs. 4434/ha with 1.83 in the year 2008-09 compared to the farmers' practices (Table-5)

Thus on the basis of average of three years (Table-6) the per hectare gross returns obtained in demonstration plots of improved technology as

compared to farmer's practice was Rs. 22122 resulting in additional return of Rs. 1562, Thus it was 7.60 per cent higher on the farmer's practice (Rs. 20560).

**CONCLUSION**

Thus the results of frontline demonstration of lentil have clearly showed that growing of improved lentil varieties with improved technologies including proper seed rate, weed management, recommended fertilizer doses, plant protection measures, seed treatment and timely irrigation proved more productive and remunerative over traditional farmer practice.

**Table 1 :** Performance of improved lentil varieties against local varieties at farmers fields

Years	Variety	No. of demo.	Yield (kg/ha)			Additional yield over FP (kg/ha)	Increase in yield over FP (%)
			Improved technology		Farmers practice		
			Max.	Avg.	Avg.		
2007-08	DPL-62	9+5	1265	1081	822	259	31.51
	L-4076	5	1125	1047	799	248	31.04
	JL-3	4	1225	1196	867	329	37.95
	IPL-81	5	1125	1053	802	251	31.30
2008-09	DPL-62	11+7	945	900	726	174	23.97
	IPL-81	5+1	1050	956	768	188	24.48
	JL-3	1+2	945	920	730	190	26.02
2009-10	DPL-62	2+2	990	923	781	142	18.18
	JL-3	3+3	965	878	740	138	10.21

IT-Improved technology; FP-Farmers' practice

**Table 2:** Performance of year wise component technology on productivity of lentil at farmers field

Year	Component wise improved technologies	No. of FLD	Max.	Min.	IT Avg.	FP Avg.	% increase
2007-08	Varietal Improvement	18	1225	985	1080	825	30.77
2008-09	Varietal Improvement	17	1050	835	914	738	23.79
<b>Mean</b>		<b>35</b>	<b>-</b>	<b>-</b>	<b>1010</b>	<b>782</b>	<b>29.16</b>
2007-08	Nutrient Management	5	1125	965	1053	802	31.29
2008-09	Nutrient Management	6	945	890	916	751	22.00
2009-10	Nutrient Management	5	910	785	840	718	17.70
<b>Mean</b>		<b>16</b>	<b>-</b>	<b>-</b>	<b>936</b>	<b>757</b>	<b>23.64</b>
2007-08	Weed Management	5	1265	985	1143	824	38.45
<b>Mean</b>		<b>5</b>	<b>-</b>	<b>-</b>	<b>1143</b>	<b>824</b>	<b>38.45</b>
2008-09	Whole Package	4	945	890	916	703	30.47
2009-10	Whole Package	5	990	905	952	795	19.77
<b>Mean</b>		<b>9</b>	<b>-</b>	<b>-</b>	<b>934</b>	<b>749</b>	<b>24.70</b>

**Table 3:** Yield of lentil in improved and farmer's practices through frontline demonstration under real farm station

Year	No. of demonstration	Seed yield (kg/ha)				Increase in seed yield over FP (%)
		Improved Technology			FP	
		Max.	Min.	Mean	Mean	
2007-08	28	1265	965	1094	822	33.09
2008-09	27	1050	835	925	741	24.83
2009-10	10	990	965	978	761	28.51
<b>Mean</b>		<b>1102</b>	<b>922</b>	<b>999</b>	<b>775</b>	<b>28.81</b>

**Table 4:** Performance of component technology on productivity of lentil at farmers' field

Year	Improved Technologies	No. of FLD	Seed yield (kg/ha)		IT Avg.	FP Avg.	% increase over FP
			Max.	Mini.			
2007-08	Varietal Improvement	18	1225	985	1080	825	30.77
	Nutrient Management	5	1125	965	1053	802	30.29
	Weed Management	5	1265	985	1143	824	38.45
<b>Mean</b>		<b>28</b>	<b>-</b>	<b>-</b>	<b>1092</b>	<b>817</b>	<b>33.66</b>
2008-09	Varietal Improvement	17	1050	835	914	738	23.79
	Nutrient Management	6	945	890	916	751	22.00
	Weed Management	4	945	890	916	703	30.04
<b>Mean</b>		<b>27</b>	<b>-</b>	<b>-</b>	<b>915</b>	<b>731</b>	<b>25.42</b>
2009-10	Nutrient Management	5	910	785	840	718	17.10
	Whole Package	5	990	905	952	795	19.77
<b>Mean</b>		<b>10</b>	<b>-</b>	<b>-</b>	<b>896</b>	<b>757</b>	<b>18.44</b>

**Table 5:** Economical evaluation of frontline demonstration of lentil at farmers' field

Year	Cost of cultivation (Rs./ha)		Net return (Rs./ha)		Additional cost of cultivation (Rs/ha)	Additional net Return (Rs/ha)	ICBR ratio
	IT	FP	IT	FP			
2007-08	10850	8530	18561	13889	2320	4672	2.05
2008-09	11241	8783	21966	17532	2458	4434	1.83
2009-10	11388	8900	35840	30260	2488	5580	2.24
<b>Mean</b>	<b>11160</b>	<b>8738</b>	<b>25456</b>	<b>20560</b>	<b>2422</b>	<b>4896</b>	<b>2.04</b>

Sell of price @ Rs. 1700/q for the year 2007-08 & 2008-09 and Rs. 2400/q for 2009-10

**Table 6:** Comparative economics of improved technology on lentil demonstrated at farmers' field

Particulars	Improved technology	Farmer's Practice	Actual increase over FP	increase over FP (%)
Average Yield (kg/ha)	999	775	224	28.81
Gross return (Rs/ha)	22122	20560	1562	7.60
Cost of cultivation	11160	8738	2422	27.72
Additional benefit (Rs/ha)	4895	-	-	-

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