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# Performance Appraisal of Lentil Demonstrations in Varied Conditions of Uttar Pradesh, India

Agriculture

**KEYWORDS :** Lentil in varied conditions, Technology adaptation model for harnessing pulses, Productivity, Profitability

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## ABSTRACT

*The technology assessment and demonstration programme on lentil was carried by KVKs for demonstrating production potential of newly developed technologies of lentil at farmers' fields in the country. 596 demonstrations on lentil were organized in different conditions of 17 districts of Uttar Pradesh. Technology modules were prepared including all the recommended package of practices. Technology performance in respect to productivity and per unit area profitability from lentil was taken up as important intervention. On an average 15.75 q/ha yield was realized by the farmers under demonstration which was significantly higher as compared to local check, state and national average yield. More than 18 q/ha yield was provided by L-4076, KL-320 and HUL-57 varieties of lentil. More than Rs. 40000 per ha of net return was obtained with the cultivation of L-4076, KL-320 and DPL-62 cultivars. On an average, 43% increased income was accrued to the farmers as compared to local check. The technology dissemination model developed and utilized for scientific demonstrations of lentil, played a great role for enhancing productivity and net return to the farmers along with creating a platform for interface with different stakeholders. This paper discusses performance of lentil in different agro-eco and cropping systems.*

Self sufficiency in pulse production in the country had been one of the major objectives of the Indian agriculture since long. Pulses are very important in Indian agriculture both in terms of enriching soil health and for food and nutritional security of country's ever growing population. Pulses being predominantly rainfed crop grown in constrained and limiting factor environment, the increase in productivity had remained a major challenge for several decades. There has not been remarkable increase in area and productivity of pulses as witnessed in other commodities over the years. There has been number of technological breakthroughs with promise to raise the productivity levels which need to be demonstrated at farmers' fields with their active participation so as to build their confidence in new technologies. India produced 17.21 million tonnes of pulses from an area of 24.78 million hectares (Directorate of Economics and Statistics Department of Agriculture and Cooperation-2012 and Nadarajan, 2013), major contributors being Madhya Pradesh (4.16 million tonnes), Uttar Pradesh (2.43 million tonnes) and Rajasthan (2.36 million tonnes) in 2009-10. According to the fourth advanced estimate of DAC pulses productivity of the year 2012-13 is 18.45 million tonnes which is an all time high level (Nadarajan, 2013). However, about 3 million tonnes of pulses are imported annually to meet the domestic consumption requirement (Chaturvedi, *et al* 2010).

Uttar Pradesh accounts 40% of area and 45% of the total lentil production of the lentil with highest average productivity of 7.15 q/ha (Kokate, *et.al.*, 2013). Therefore, raising productivity may be the important option to deal with it.

The technology assessment and demonstration programme on lentil was carried by KVKs for demonstrating production potential of newly developed technologies and varieties of pulses at farmers' fields as to bring in enhanced application of modern technologies to address the issues related to production of pulses in the country. Technology performance in respect to productivity and per unit area profitability from lentil was taken up as important intervention. This paper discusses performance of lentil in different agro-eco and cropping systems.

**Materials and Methods**

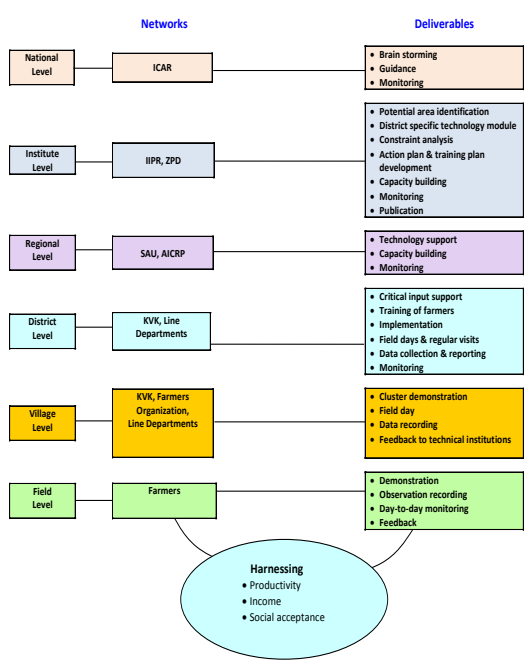
The programme on lentil was organized in 17 districts of Bundelkhand zone, Vindhyan zone, Central Plain zone, Eastern Plain and North Eastern Plain zone of Uttar Pradesh during 2010-11 and 2011-12. Technology modules were prepared including all the recommended package of practices. Analysis of agro-ecosystems was made.

The cropping systems followed are rice-lentil, maize-lentil and fallow-lentil. The prevalent varieties grown are K-75, DPL-62 and NL-1 in the study area. The technology module introduced included:

**Seed rate:** 16 kg seed/acre. Seed treatment with fungicides like Thirum / Captan / Carbendazim @ 3.0 gram / kg seed. Application of rhizobium culture @ one packet per 10 kg seed and seed treatment with Trichoderma @ 4.0 g / kg seed. **Sowing time:** 15th October to 15th November. **Cultivars:** HUL 57, KLS 218, Narendra Masoor 1, Pl 639, PL 4, PL 5, DPL 62, JL 3, L 4076, IPL 81. **Irrigation:** One at flower initiation stage. Fertilizer dose and plant protection measures were followed as per locations of the district.

The sample included 17 districts and 596 farmers of 5 agroclimatic zones of Uttar Pradesh. Critical inputs were provided to the participating farmers. Training of participating farmers and extension workers were orgainized through KVKs. Statistical techniques like percentage, weighted mean, yield gap analysis, technology index were used. The technology gap, extension gap and technology index were estimated using the following formula:

Fig. 1: **Technology Adaptation Model for Harnessing Productivity**



Technology gap = (Potential yield) - (Demo. yield)
Extension gap = (Demo. yield) - (Farmer's yield)

$$\text{Technology index} = \frac{Pi - Di}{Pi} \times 100$$

where

Pi=Potential yield of $i^{th}$ crop.

Di=Demonstration yield of $i^{th}$ crop.

A technology dissemination model evolved by Singh & Singh, 2013 was used for effective delivery of district specific technology modules (Fig. 1). This model indicates representation of networks and deliverables.

**Results and Discussion**

Mainly the crop lentil (*Lens esculenta L.*) is grown in the crop rotation of rice-lentil and maize-lentil in central and eastern part of Uttar Pradesh wherein the Bundelkhand region it is grown as fallow-lentil rotation. A total of 596 demonstrations were conducted with average productivity of 15.75 q/ha which was about 32.80% higher to local check, 120.28 % to state and 148.82 % to national average. Annual Report (2013) reported 14.80 q/ha of lentil productivity in demonstrations which was 42.17 % higher than local check (10.41 q/ha) in Uttar Pradesh. The average net return of Rs. 35419 per ha was realized against Rs. 24840 per ha from local check. In some of the districts, average returns were obtained in terms of Rs. 40000 per ha. About 43% net economic gain was higher under demonstrations as compared to local check. The encouraging results of crop productivity and net returns are attributed to skill training provided to the farmers, extension workers and application of improved varieties and package of technologies. Agro-climatic area-wise yield performance of lentil cultivars are given below.

**Rainfed condition:** Under rainfed situation (Bundelkhand and Vindhyan Zone), 252 demonstrations organized (198.70 acre) in 6 districts. On an average, 15.45 q/ha yield was realized by the farmers which was 35.88 % higher over local check, 116.08 % over state and 144.08 % over national average with net return of Rs. 34503 per ha which was 56% higher over farmer's practice. More than 15 q/ha yield was obtained by all the demonstrating cultivars like DPL-62, K-75 and NL-1 (Table 1 and Fig. 2).

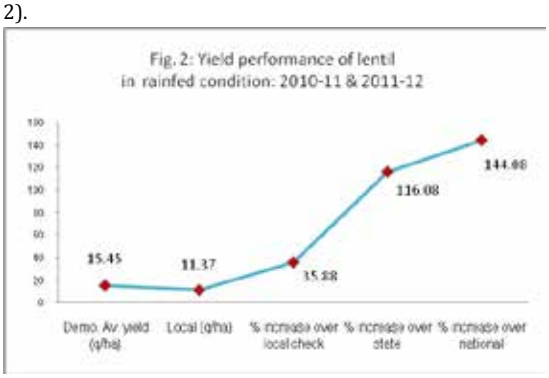



**Table 1: Performance of Lentil demonstrations in rainfed condition**

| Varieties | Districts | No. of Farmers | Area (acre) | Yield (q/ha) | | % Increase | Net Return (Rs./ha) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Demo | Check | | Demo. | Local Check | % Increase |
| DPL-62 | Chitrakoot, Hamirpur, Jalaun, Jhansi, Lalitpur | 166 | 127.80 | 15.04 | 10.99 | 36.85 | 31262 | 21190 | 63.00 |
| K-75 | Jhansi, Lalitpur | 32 | 29.30 | 15.40 | 11.07 | 39.11 | 37057 | 24451 | 54.00 |
| NL-1 | Sonbhadra | 54 | 41.60 | 16.73 | 12.77 | 31.01 | 42663 | 30896 | 38.00 |
| Wt. Mean/Total | | 252 | 198.70 | 15.45 | 11.37 | 35.88 | 34503 | 23703 | 56.00 |

Central Plain Zone: In this zone, 3 districts (Auraiya, Sitapur and Hardoi) were included for technology demonstration under rice-lentil, maize-lentil cropping systems with the participation of 31 farmers on 11.15 acre area. On an average, 18.72 q/ha yield was achieved under demonstration which was 21.88 % higher over farmers practice, 161.82 % over state and 195.73 % over national average. The net profit of Rs. 40270 per ha was realized by the farmers which was 51 % higher as compared to local check. L-4076 cultivar provided higher yield (21.33 q/ha) with maximum net profit of Rs. 47143 per ha (Table 2 and Fig. 3).

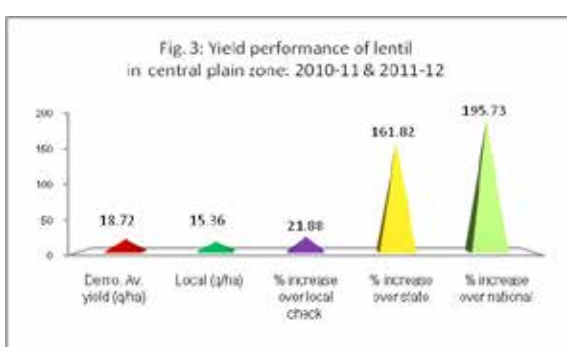



**Table 2: Performance of Lentil demonstrations in Central Plain Zone**

| Varieties | District | No. of Farmers | Area (acre) | Yield (q/ha) | | % Increase | Net Return (Rs./ha) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Demo | Check | | Demo. | Local Check | % Increase |
| KL-320 | Auraiya, Hardoi | 22 | 8.00 | 18.59 | 16.13 | 15.25 | 40142 | 28232 | 44.00 |
| L-4076 | Auraiya | 03 | 0.75 | 21.33 | 11.37 | 87.88 | 47143 | 18283 | 157.85 |
| HUL-57 | Sitapur | 6 | 2.4 | 18.36 | 14.00 | 31.14 | 38573 | 27681 | 39.35 |
| Wt. Mean/Total | | 31 | 11.15 | 18.72 | 15.36 | 21.88 | 40270 | 27452 | 51.00 |

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**Eastern Plain Zone:** In this agroclimatic zone, 4 districts (Ballia, Chandauli, SRD Nagar and Sultanpur) were included under demonstrations with the involvement of 187 farmers on 135.50 acre area. The average yield of 16.34 q/ha was attained by the farmers which was 28.76 % higher over local check, 128.53 % over state and 158.14 % higher over national average (Table 3). The net return of Rs. 36706 per ha was realized by the participating farmers which was 37 % more as compared to local check (Fig. 4).

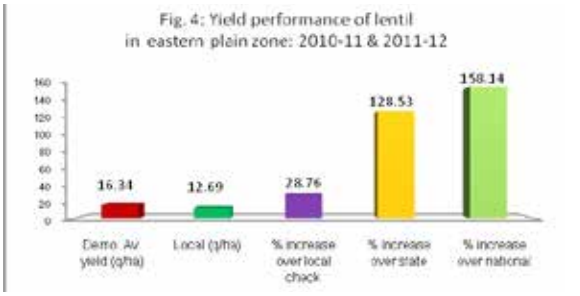



**Table 3: Performance of Lentil demonstrations in Eastern Plain Zone**

| Varieties | District | No. of Farmers | Area (acre) | Yield (q/ha) | | % Increase | Net Return (Rs./ha) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Demo | Check | | Demo. | Local Check | % Increase |
| NL-1 | Ballia, Chandauli | 165 | 132.00 | 16.33 | 12.72 | 28.38 | 36641 | 27059 | 36.00 |
| HUL-57 | SRD Nagar | 18 | 2.5 | 16.85 | 11.52 | 46.26 | 36560 | 18105 | 101.93 |
| DPL-62 | Sultanpur | 4 | 1.0 | 16.5 | 11.4 | 44.70 | 45700 | 29920 | 52.74 |
| Wt. Mean/Total | | 187 | 135.50 | 16.34 | 12.69 | 28.76 | 36706 | 26915 | 37.00 |

**North Eastern Plain Zone:** In this agro-climatic zone, 4 districts (Bahraich, Kushinagar, Siddharthnagar and Balrampur) were included under demonstrations with the involvement of 126 farmers on 65.00 acre area. The average yield of 14.90 q/ha was attained by the farmers which was 34.84 % higher over local check, 108.39 % over state and 135.39 % higher over national average (Table 4). The net return of Rs. 34750 per ha was realized by the participating farmers which was 48 % more as compared to local check (Fig. 5).

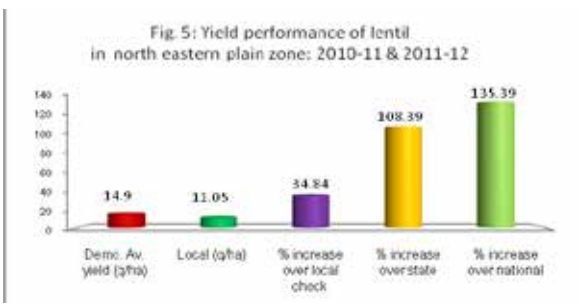
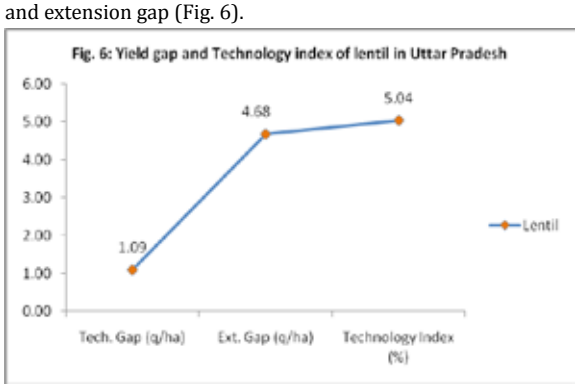



**Table 4: Performance of Lentil demonstrations in North Eastern Plain Zone**

| Varieties | Districts | No. of Farmers | Area (acre) | Yield (q/ha) | | % Increase | Net Return (Rs./ha) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Demo | Check | | Demo. | Local Check | % Increase |
| NL-1 | Bahraich, Kushinagar, Siddharthnagar | 101 | 55.00 | 14.66 | 10.95 | 33.88 | 35535 | 23822 | 50.00 |
| DPL-15 | Balrampur | 25 | 10 | 16.2 | 11.6 | 30.17 | 30139 | 22009 | 36.94 |
| Wt. Mean/Total | | 126 | 65.00 | 14.90 | 11.05 | 34.84 | 34705 | 23543 | 48.00 |

Singh, et al (2005) reported that on an average 13 q/ha yield was obtained by the farmers in eastern districts. Lentil yield ranging between 10.40 to 15.20 q/ha was observed in the demonstrations.

The yield gap of 4.68 q/ha was obtained between demonstrated and local check condition. The technology gap of 1.09 q/ha was also observed between potential and demonstrated yield of chickpea. Technology Index (5.04%) was computed for different lentil cultivars which show a significant difference of technology and extension gap (Fig. 6).




There is a great scope for enhancing productivity of lentil with reduction in yield gap and technology gap. It may be possible by adoption of district specific technology modules, advance planning, critical monitoring, observation recording, critical input support, organization of field days, etc. related to demonstrations. Feedback to the technical institutions may play an important role to make further corrections in technology demonstration mechanism. The technology dissemination model followed during demonstrations can be adapted for other commodities for the benefit of farmers.

**Conclusion**

Technology demonstrations on lentil organized included special attention on planning, capacity building, district specific technology modules development, observations recording, regular monitoring and implementation. On an average 15.75 q/ha yield was realized by the farmers under demonstration which was significantly higher as compared to local check, state and national average yield. More than 18 q/ha yield was provided by L-4076, KL-320 and HUL-57 varieties of lentil. More than Rs. 40000 per ha of net return was obtained with the cultivation of L-4076, KL-320 and DPL-62 cultivars. On an average, 43% increased income was accrued to the farmers as compared to local check. Wilt infestation is one area which needs regular monitoring and proper solution. The technology dissemination model developed and utilized for scientific demonstrations of lentil, played a great role for enhancing productivity and net return to the farmers along with creating a platform for interface with different stakeholders. This paper discusses performance of lentil in different agro-eco and cropping systems.

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