Journal of AgriSearch, 9 (4): 350-352
An Open Access International Peer Reviewed Quarterly

ISSN : 2348-8808 (Print), 2348-8867 (Online)
https://doi.org/10.21921/jas.v9i04. 11602

Yield Gap and Economics Analysis of Lentil Production under Rainfed Condition of Chandel District of NEH Region, Manipur

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ABSTRACT

The study aimed at assessing the impact of lentil (*Lens culinaris Medik.*) production under Cluster Frontline Demonstration (CFLD) in terms of yield, extension gap, technological gap and economic gains in Chandel district, Manipur during Rabi season of 2018-19 to 2021-22. The present cluster front line demonstration was carried out by Krishi Vigyan Kendra, Chandel, ICAR-Manipur Centre at different villages in 50 hectares. The result indicated that average seed yield of lentil in demonstration practices ranged between 9.20 to 10.25 q/ha whereas in Farmers practices, it was 6.85 to 7.28 q/ha during demonstrated years. The per cent increased in yield with demonstration Practices over Farmers' Practices was ranged between 33.43 to 40.79. The technological and extension gap were from 7.75 to 8.80 and from 2.35 to 2.97 q/ha respectively. Similarly, technological index were decreased from 48.89 to 43.06 per cent during the study period. The benefit cost ratio was 2.58 to 2.88 under demonstration, while it was 1.87 to 2.10 under farmer practices. By conducting cluster front line demonstration on improved practices with HYV of proven technologies in farmers' field, yield potential of lentil enhanced to a great extent which increased in cropping intensity, the income level of farmers and improved livelihood of farming community in the region by reducing the technology gaps.

Keywords: Yield gap, Technology gap, Extension gap, Technology index, Cluster Frontline demonstration

ARTICLE INFO

Received on	:	18.10.2022
Accepted	:	05.12.2022
Published online	:	29.12.2022

INTRODUCTION

Pulses in India have long been considered as the poor man's only source of protein. Pulses are grown on 22-23 million hectares of area with an annual production of 13-15 million tonnes (mt). India accounts for 33% of the world area and 22% of the world production of pulses. Pulses are the cheapest source of protein and, therefore, occupy an important position in balancing human dietary needs. Furthermore, pulses enrich soil fertility by adding nitrogen to the soil and also improve soil structure by their deep root system. Due to the plant type and ideal maturity duration, most of the pulses can be grown as intercrop. Newly developed short duration varieties of pulses fit in the multiple cropping systems and thereby the cropping intensity can be increased manifolds. Numerous initiatives have been pioneered in the shape of several flagship programmes to bridge the gap between production and consumption and make the country self-sufficient, in light of the urgent need to boost pulse production to satisfy the ever-increasing demand of a burgeoning population. Therefore, it always matters for the researcher and the policy makers that real potential of pulses are harvested at the farmers' field. In the real situation, however, a gap is observed between projection of the potential yield of certain crop variety during its evolution in the research field and obtained yield on organized farm demonstration and further with the harvested by the farmers themselves.

Lentil is gaining an importance in Chandel district of Manipur as rice fallow crop during rabi season. It is raised mostly as a rainfed rabi crop, being sown from October to November. The farmers mainly depend on rain for their crop cultivation. Due to lack of irrigation facilities and poor alternative cropping pattern in rain fed areas like Chandel district the farmers have been adopted to cultivate lentil crop in rice fallows after the interventions by KVK Chandel, ICAR-Manipur Centre.

Chandel district of Manipur has a sizeable area under lentil cultivation however, with the available improved technologies, it is possible to bridge the yield gap and increase the productivity up to the potential level 10.25 q/ha. The reasons for low productivity are poor knowledge about newly introduced crop production and protection technologies and their management practices in the farmers' field. KVK, Chandel has conducted various demonstrations on lentil using high yielding variety HUL-57 with the objectives of showing the production potential of the new production technologies under actual farm situation. Keeping the above points in view, the study attempts to assess the nature and extent of yield gap of lentil in terms of technology gap, extension gap and technology index in Chandel, Manipur.

MATERIAL AND METHODS

The study was carried out by KVK Chandel during *Kharif 2018*-19, 2019-20, 2020-21 and 2021-22 in the farmers' field for 50 hectares of land. During these four years of CFLDs, an area of 50 ha was covered involving 125 practicing farmers. Scientific package of practices like line sowing, nutrient management, seed treatment and whole package were used in the demonstrations and lentil seed variety HUL-57 was taken

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under CFLD (Table 1). In general, soils of the area under study were clay loam and medium to low in fertility status. The seeds of lentil were sown to ensure recommended plant spacing within a row because excess population adversely affects growth and yield of crop. Sowing was done in the last week of Oct. to last week of Nov. in rice fallows with a seed rate of 40 kg/ha. The yield data from both the demonstration and farmers practice were recorded and their technology gap, extension gap and the technology index were worked out using methods developed by Samui *et al.* (2000) as stated below:

Tech. gap = Potential yield – Demo. Plot yield

Ext. gap = Demo. Plot yield – Farmer's plot yield

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

Where

Pi= Potential yield; Di= Demonstration yield.

Table 1: Comparison of demonstration package and farmers practices under CFLD on Lentil

Particulars	Demonstration	Farmers practice
Variety	HUL-57	Local
Time of sowing	Last week of Oct. to last week of Nov.	Last week of Oct. to 1st week of Dec.
Seed rate	40 kg	50 kg
Fertilizer dose (NPK)	20:40:20 kg N:P:K per ha.	No scientific package of practices
Plant protection	Need based application	No plant protection
Interculture	One weeding at 30-35 DAS	No weeding

RESULTS AND DISCUSSION

Results of 123 nos. of CFLDs conducted during 2018-19 to 2021-22 in 50 ha area on farmer's field of Chandel district indicated that the yield of lentil var. HUL-57 was substantially higher than the variety grown by the farmers during all the four years (Table 2). The yield of lentil in different demonstration plots ranged between 9.20 to 10.25 q/ha over the study period which was 34.30 to 40.79 per cent higher over farmer's variety. On an average 37.03 per cent increase in yield was obtained in the demonstration plots whereas average yield in farmer's practice was recorded only 7.13 q/ha. The maximum yield in demonstration plots was recorded (10.25 q/ha) during 2021-22 and minimum yield of 9.20 q/ha was recorded in the year 2018-19. These results are in conformity with the findings of Kumar *et al.* (2021). The poor productivity in farmers practice might be mainly due to factors like use of non-descript local variety, late sowing and low level of agronomic management in addition to non-availability of resources in time. The result clearly depicts the positive effects of CFLDs over the existing practices towards enhancing the yield of lentil in Chandel district. The technology gap was 8.80, 8.50, 7.88 and 7.75 q/ha during 2018-19, 2019-20, 2020-21 and 2021-22, respectively. The average technology gap was recorded 8.23 q/ha during the period of study. The technology gap ranging between 7.75 to 8.80 q/ha reflected the farmer's participation in conducting CFLDs.

The variation in technology gap observed might be due to dissimilarity in soil fertility and management factors. Benefit Cost ratio was recorded higher (2.58 to 2.88) under demonstration plots compared to farmer's plot (1.87 to 2.10) in all the years of study. Hence, higher B:C ratios proved economic viability of the interventions made under CFLD. Similar finding was reported by Meena *et al.* (2020). Therefore, to exploit the potential of improved production and protection technologies efforts through CFLDs ought to be increase awareness among the farmers. The extension gap ranging between 2.35 to 2.97 q/ha during the period of study emphasizes the need to educate the farmer through various means for adoption of improved agricultural production to reverse the trend of wide extension gap. To increase the productivity and production of lentil, seed replacement of non-descriptive varieties by HYVs is very much essential. In this context, cluster front line demonstrations are playing an important role in popularizing the HYV of lentil in the study area.

The present study indicated reduction in technology index from 48.89 per cent during 2018-19 to 43.06 per cent during 2021-22 which exhibited the feasibility of demonstrated technology in the study areas (Table 2). The lower value of technology index, the more is the feasibility of technology. As such fluctuation in technology index (ranging between 43.06-48.89 per cent) during the study period, might be attributed to the dissimilarity in soil fertility status and little use of proper agronomic practices, weather conditions, non-availability of

Table 2: Productivity, technology gap, extension gap and technology index in lentil var. HUL-57 under CFLDs

Year	Area	No. of demo	Yield (q/ha)			% increase over control	Tech gap (q/ha)	Ext. gap (q/ha)	Tech. index %	B:C ratio	
			P	D	FP					D	FP
2018-19	20	50	18	9.20	6.85	34.30	8.80	2.35	48.89	2.58	1.87
2019-20	10	25	18	9.50	7.12	33.43	8.50	2.38	47.22	2.67	2.05
2020-21	10	25	18	10.12	7.25	39.58	7.88	2.87	43.78	2.84	2.09
2021-22	10	25	18	10.25	7.28	40.79	7.75	2.97	43.06	2.88	2.10
Total	**50**	**125**	**-**	**39.07**	**28.5**	**-**	**-**	**-**	**-**	**-**	**-**
Mean	**-**	**-**		**9.76**	**7.13**	**37.03**	**8.23**	**2.64**	**45.73**	**2.74**	**2.03**

P= Potential D= Demonstration FP= Farmers' practice

irrigation water and insect pest attack in the crop. Similar trends have been observed by Verma *et.al.* (2021).

CONCLUSION

Cluster front line demonstration is an effective method for increasing the acreage, production and productivity of lentil and changing the knowledge, attitude and skills of farmers which helped them increased the yield as well as can reduce the technology gap to a considerable extent thus leading to increased productivity of lentil in the district. Hence, there is a need to disseminate the improved technologies among the farmers with effective extension methods like training and demonstrations. The farmers' should be encouraged to adopt the recommended package of practices including HYV to revert the trend of wide extension gap and for realizing higher returns.

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Citation:

Chongloi KL and Singh D.2022. Yield Gap and Economics Analysis of Lentil Production under Rainfed Condition of Chandel District of NEH Region, Manipur. *Journal of AgriSearch* **9**(4):350-352