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Adoption of urdbean production technologies in Lalitpur district of Bundelkhand region

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ABSTRACT
Lalitpur is one of the district of Uttar Pradesh state of India. Lalitpur district is a part of Jhansi Division.The district occupies an area of 5,039 km^2.The district lies between latitude 24°11' and 25°14' (North) and longitude 78°10' and 79°0' (East). The climate of the district is sub-tropical, which is characterized by a very hot dry summer and a cold winter. Among the agronomic crops, pulses are the dried edible seeds of certain plants in the Fabaceae family. Pulses are very high in protein and fibre, and are low in fat. Pulses are also nitrogen-fixing crops which improves the environmental sustainability of annual cropping system. Urdbean were grown in the district during last year of 2018 in the area of 1, 68,284 ha, production obtained 76906 Metric tonne with productivity of 4.57 q/ha. ClusterFront Line Demonstrations (CFLDs) on urdbean were undertaken by the Krishi Vigyan Kendra, Lalitpur in the district for 2018 during Kharif season in 9 villages spreading over 2 blocks for dissemination of improved technologies of urdbean (Vigna mungo L. Hepper) to increase productivity and to assess the economic viability and technological feasibility of the recent urdbean production technologies over the existing one. The average highest seed yield (720 kg ha^{-1}) was recorded under CFLDs in the year 2018over500 kg ha^{-1} under farmers' practices. Forty four percent increase in the yield were observed under CFLDs over farmers' practice. The economic viability and profitability showed that the benefit cost ratio (B: C) was higher in case of improved agro-technologies (CFLDs) with 2.64 against 2.00 in farmers' practice (FP). The net return from improved agro-technologies (CFLDs) was Rs. 25030 ha^{-1}which is significantly higher thanfarmers' practices (Rs. 14056 ha^{-1}). The variation in agro-climatic parameters as well as locations of CFLDs programme was effective in changing the attitude, skill and knowledge of the farmers for adoption of improved technology/ HYV of urdbean and further wide scale diffusion to the other farmers. It also improved the relationship between farmers and scientists and built confidence among them.

Keywords: *Cluster frontline demonstrations, Lalitpur, Urdbean*

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INTRODUCTION

District Lalitpur of Bundelkhand region of Uttar Pradesh having gross cropped area of 5,30,131 ha and Net cropped area of 3,01,113 ha. Out of this total gross cropped area, 2,22,623 ha area under *kharif* cultivation. The district is administratively divided into 6 blocks with 5Tehsils, 48 Nayay panchayat, 416 Gram Panchyat and 764 villages.Dubey *et al.* [2]reported that pulses play an important role in rainfed as well as partially irrigated agriculture by improving physical, chemical, and biological properties of soil and are considered excellent crops for natural resource management, environmental security, crop diversification and consequently for viable agriculture. At the same time, the nutritional importance of pulses are numerous. Veeramani *et al.* [11] said that pulses have great

importance in Indian agriculture as they are rich source of protein from 17 to 25 % as compared to that of cereals from 6 to 10 %. Among the pulse crop, urdbean (*Vigna mungo* L. Hepper) is one of the important kharif pulse crop grown in Lalitpur district. Being a leguminous crop, urdbean has the capacity to fix biological nitrogen and thus helps in restoring the soil fertility for the sustainable agriculture. It also acts as cover crop and its deep root system protects the soil from erosion. The data in the Table 4 indicated the Lalitpur district covers 1, 68, 284 ha of land under urdbean cultivation with a total production of 76,906 Metric tonne and average productivity of 457 kg/ha in Bundelkhand region of Uttar Pradesh. The productivity of urdbean continues to be quite low in district Lalitpur on account of several biotic and abiotic factors besides unavailability of quality seeds of improved varieties in time and poor crop management due to unawareness and non adoption of recommended production and plant protection technologies. Therefore, it is very essential to demonstrate the high yielding varieties, resistant to biotic and abiotic stresses and other pulse production technologies in which the farmers generally do not adopt and simultaneously the FLDs are best tool for the adoption of newer technologies[10]. Keeping above facts in consideration, Krishi Vigyan Kendra, Lalitpur conducted Cluster Front Line Demonstrations (CFLDs) on urdbean at farmers' fields during *kharif* 2018 keeping with objectives **(i)** to exhibit the performance of recommended high yielding varieties of urdbean for harvesting higher crop yields, **(ii)** to compare the yield levels of local check (farmers' field) and CFLDs fields, and **(iii)** to collect feedback information for further improvement in research and extension programme.

MATERIALS AND METHODS

Location and Climate

Lalitpur is one of the district of Uttar Pradesh state of India. Lalitpur district is a part of Jhansi Division.The district occupies an area of 5,039 km^2.The district lies between latitude 24˚11' and 25˚14' (North) and longitude 78º10' and 79º0' (East). Geographical climatic and edaphic characteristics of the district determine the type of farming system to be followed. The climate of the district is the Central India type sub-tropical and may be characterized by a very hot dry summer and cold winter. Like other districts of the Bundelkhand region, this also shows four distinct seasons. Summer being from March to mid-June, Monsoon from mid-June to September, post-monsoonal transition between October and November while the winter months are December to February. Erratic rainfall distribution and dry spells are common. The climate of the district is characterized by long and intensive hot summer, low and regular rainfall and short mild winter. The minimum and maximum temperature during April, 2018 to March, 2019 varied from 8.0 to 28.0 ºC and 24.0 to 44.0 ºC, respectively. Annual rainfall of the district during April, 2018 to March, 2019 was reported 1202 mm.

Soil

In district Lalitpur, soil strata is rocky, terrain is undulating and slope ranges between 0.5 to 10 % and hillocks spreading here and there. Soils are grouped into two types, viz. red and black soils. Red soils are generally light shallow, low water retentive, deficient in nutrients mixed with the coarse sand and easily workable, whereas, black soils are deep, highly water retentive, highly productive but deficient to work in rainy season[6].

Cluster Front Line Demonstrations on Urdbean

The present study was the part of cluster frontline demonstrations (CFLDs) on pulses being implemented by Indian Council of Agricultural Research (ICAR), New Delhi, India at KVK, Lalitpur during *kharif* 2018.Front line demonstration is an appropriate means for demonstration as well as transfer of improved agricultural innovations to the farming community. These demonstrations are conducted under the close supervision ofscientists of Krishi Vigyan Kendras, SAUs and their Regional Research Stations. Fielddemonstration is a long term educational activity conducted in a systematic manner at farmers' fields toshow worth of a new technology on "seeing is believing" idea. Traditional or farmers' practices are nolonger sustainable towardspulses production as it shows unambiguous gap between traditional andscientific production technologies.Lakshmi *et al.* [5]found thatconstant efforts are needed to bridge this gap through transfer oftechnology. To make stronger the extension services for educating the cultivators in the implementationof improved technology with availability of quality seed in time is the need of hour.

Cluster Front line demonstrations (CFLDs) on high yielding variety and improved agro-technology of urdbean was conducted by KVK, Lalitpur during *Kharif*, 2018 in two blocks namely, Birdha [In four villages-Nayagaon, Pipariabansa, Maikhuana and Tenga] and Jakhaura[in five villages-Khiriamishra, Silgan, Dawani, Mahespura and Pataurakalana] of Lalitpur district of Uttar Pradesh . The total 65 farmers were associated under this programme. In total of 30.0 ha of area were covered during Kharif, 2018 of demonstration. Regular visits by the KVK scientists to demonstration fields were ensured and made to guide the farmers. These visits were also utilized to collect feedback information's for further improvement in research and extension programme. Field days and trainings were also organized at the demonstration sites to motivate other farmers to grab the benefits of demonstrated technologies. The critical inputs were duly supplied to the farmers by the KVK. In each demonstration, one control plot was also kept where farmers' practices were carried out. The technologies demonstrated and farmers' practices are shown intable 1.

Table 1:Details of demonstration packages and farmers' practice under CFLDs on urdbean

S. No.	Particulars	Demonstration packages	Farmer's practices (Local check)
1	Variety	Shekhar 2	Local
2	Seed rate (kg ha^{-1})	15	20
3	Seed treatment	*Rhizobium*	Nil
4	Sowing method	Line sowing (30 cm x 10 cm)	Broadcasting
5	Sowing time	1st week to Mid July, 2018	1st week of June to Mid July, 2018
6	Nutrient management	18 kg N and 46 kg P	No nutrient
7	Plant protection	Need based fungicide (Zineb 75 % WP) and insecticide (Imidacloprid 17.8 % SL)	Nil

The qualitative data were converted into quantitative form and expressed a per cent increase in yield and was calculated by using following formula:

% increase in yield = [(Demonstration yield – Farmer's yield) / Farmer's yield] x 100
Technology gap = Potential yield – demonstration yield
Extension gap = Demonstration yield – farmer's yield
Technology index (%) = [Technology gap) / (Potential yield] x 100
Data were collected from the CFLDs farmers and analyzed with the suitable statistical tools to compare the yields of farmers' fields and CFLDs fields. For the study, technology gap, extension gap and technology index were calculated as suggested by Samui *et al.* [9].

RESULT AND DISCUSSION

Results of 65Cluster Front Line Demonstrations indicated that the cultivation practices comprised under CFLDs, viz. use of improved varieties, balanced fertilizers application, and integrated pest management, produced on an average 44 per cent more yield of urdbean as compared tolocal check, which indicated that the Cluster front line demonstrations have given a good impact over the farming community of Lalitpur district as they were motivated by the new agricultural technologies applied in the CFLDs plots(Table 2). Results are in accordance with the findings ofKirar *et al.* [4].

Technology gap

The technology gap in the potential yield over demonstration yield was 3.8q/ha for black gram. The technological gap may be attributed to the dissimilarity in the soil fertility status and weather conditions[8].Therefore, variety specific recommendations need to be advocated to minimize the technology gap for yield level in different situations.

Extension gap

The highest extension gap of 2.2 q/ha was recorded. This emphasized the need to educate the farmers through various means for the adoption of improved agricultural production technologies. More use of latest production technologies with high yielding variety will subsequently change this alarming trend. The new technologies will eventually lead to discontinue the old technologies and to adopt newtechnologies by the farmers.

Technology index

The technology index shows the feasibility of the evolved technology at the farmers' fields, as lower the value of technology index more is the feasibility of the technology [3].The technology indexwas 34.54 per cent for black gram.The value of technology index 34.54 per cent exhibited that there is scope for feasibility of technology demonstrated(Table 2).

Table 2: Exploitable productivity, technology gaps, technology index and extension gaps of urdbean as shown under Cluster Front Line Demonstrations and existing practices

Season and Year	Variety	Area under CFLDs (ha)	No. of CFLDs	Yield (q ha^{-1})		% increase over existing	Extension gap (q ha^{-1})	Technology gap (q ha^{-1})	Technology index (%)
				CFLDs	FP				
Kharif, 2018	Shekhar 2	30.0	65	7.2	5.0	44	2.2	3.8	34.54

Table 3:Economics of urdbean production under Cluster Front Line Demonstrations and existing practices

Season and Year	Yield (q ha^{-1})		Cost of cultivation (Rs. ha^{-1})		Gross returns (Rs. ha^{-1})		Net returns (Rs. ha^{-1})		B:C ratio	
	CFLDs	Existing practice	CFLDs	Existing practice	CFLDs	Existing practice	CFLDs	Existing practice	CFLDs	Existing practice
Kharif, 2018	7.2	5.0	15290.0	13944.0	40320.0	28000.0	25030.0	14056.0	2.63	2.00

Table 4: Year wise area, production and productivity of urdbean in Lalitpur, Uttar Pradesh

S. No.	Year	Area (ha)	Production	Productivity
1	2015	180311	19474	1.08
2	2016	160811	87642	5.45
3	2017	168284	76906	4.57
4	2018 (Target)	201234	96391	4.79

Economic return

The comparative profitability of urdbean cultivation with year wise adoption of improved technology and farmers practices has been presented in table 4.The input and output prices of commodities prevailed during the demonstrations were taken for calculating gross return, cost of cultivation, net return and benefit/ cost ratio. With the adoption of improved technology under CFLDs recorded higher gross returns (Rs.40,320.0 ha^{-1}), net returns (Rs. 25,030.0 ha^{-1}) and B: C ratio (2.63) compared to farmers practice. This may be due to higher yields obtained under improved technologies compared to local check (farmers' practice). Similar results are reported by Mokidue *et al.* [8] and Veeramani *et al.*[11]. Hence, by conducting Cluster Front Line Demonstrations of proven technologies, yield potential of urdbean can be increased to a great extent. This will subsequently increase the income as well as the livelihood of the farming community.

CONCLUSION

In the cluster frontline demonstrations there was an increase of 44.0 per cent in grain yield over the local check. Benefit: cost ratio (2.63) was sufficiently high to motivate the farmers for adoption of the technologies. These demonstration trails also enhance the relationship and confidence between farmers and KVK scientists. The recipient farmers of FLDs also play an important role as source of information and quality seeds for wider dissemination of the improved varieties of blackgram for other nearby farmers. It is concluded that the CFLDs programme is a successful tool in enhancing the production and productivity of blackgram crop through changing the knowledge, attitude and skill of farmers.

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