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Rohit Maurya
Subject Matter Specialist, Krishi Vigyan Kendra Turki, Muzaffarpur, RPCAU Pusa Samastipur, Bihar, India

Pushpa Singh
Professor, Entomology RPCAU Pusa Samastipur, Bihar, India

ML Meena
Head, Krishi Vigyan Kendra Turki, Muzaffarpur, RPCAU Pusa Samastipur, Bihar, India

Dhiru Kumar Tiwari
Subject Matter Specialist, Krishi Vigyan Kendra Madhopur, West Champaran, RPCAU, Pusa, Samastipur, Bihar, India

Rahul Kumar Verma
Subject Matter Specialist, Bihar Agricultural University, Sabour Bhagalpur, Bihar, India

Saloni Kumari
PG-Scholar, RPCAU, Pusa, Samastipur, Bihar, India

Corresponding Author:
Rahul Kumar Verma
Subject Matter Specialist, Bihar Agricultural University, Sabour Bhagalpur, Bihar, India

Assessment of the enhanced bottle gourd variety and its production methods using front line demonstrations

Rohit Maurya, Pushpa Singh, ML Meena, Dhiru Kumar Tiwari, Rahul Kumar Verma and Saloni Kumari

Abstract
The objective of this research was to determine the effectiveness of enhanced cultivars in terms of bottle gourd output, productivity, and profitability utilizing realistic tools and techniques. In order to assess the success of the Narendra Shankar Lauki-4 of bottle gourd and obtain input from farmers, frontline demonstrations were held in the Sakra and Kudhani blocks of the district Muzaffarpur in 2020-2021 and 2021-2022. The results showed that from the 248 and 260 q/ha recorded in farmer practice to the 302 and 323 q/ha during frontline demonstrations, the average bottle gourd production increased by 21.77 and 24.23 percent, respectively. During the course of subsequent study blocks, it was found that the benefit-to-cost ratios (B:C) for proposed practices were 2.11 and 2.13 as opposed to 1.89 and 1.88 in Farmers' practices. The typical extension gap was 58.5 q/ ha, while an average technology gap was 57 q/ ha. The results so clearly demonstrate that the frontline demonstration program's use of superior varieties, packaging, and techniques combined with scientific intervention increased the productivity and profitability of vegetables in the state of Bihar.

Keywords: Bottle gourd, FLD, NDBGH-4, technology gap, extension gap, economic return

Introduction
A member of the Cucurbitaceae family and one of the maximum crucial cucurbitaceous vegetation in India is the bottle gourd, Lagenaria siceraria [Mol.] Standl. As its miles grown as a summer season and rainy season crop, keeps serve its fruits during the yr spherical. In India, it's also called "bad man's vegetable." This delectable vegetable having additional name as quash, calabash gourd, doodhi and lauki, birdhouse gourd, trumpet gourd, and white flowered gourd, in line with Thakur *et al*. (2015) [10]. Bottle gourd may be utilized to make burfi, juice, raita, kaporkand, pickles, kofta, and doodhi halwa, amid other meals. Constipation is treated, the frame is cooled, and it has diuretic and aerobic-tonic homes. Everyday use of this vegetable provides remedy from used for diabetic patients' blood sugar management and others who have stomach problems. Bottle gourd has a high nutritional price per one hundred g of safe to eat portion, in keeping with Singh and Singh (2014) [7], which incorporates 96.1% moisture, zero 0.2 g of proteins, zero. 1 g of fats, 0.5 g of minerals, zero.7 mg of fibre, 2.5 g of carbohydrates, 12 kcal of strength, 20 mg of calcium, 10 mg of phosphorus, 0.2 mg of niacin, 0.01 mg of riboflavin, and 0.03 g 0. The top generating states for bottle gourds in India are Bihar, Uttar Pradesh, Madhya Pradesh, Haryana, and West Bengal [1] (Anon, 2021-22). In Muzaffarpur, Bihar, Krishi Vigyan Kendra executed the frontline demonstrations on bottle gourd. Cv Narendra Shankar Lauki-four in 2020, 2021, and 2022 in summer time. Farmer's had planted 28 specific bottle gourd plants on a 2-hectare stretch of his land. FLDs were used to analyzed the discrepancy among the prospective yield (365 q/ha), demonstration yield, extension gap, and era index. Records were recorded regarding the manufacturing of each regional and enhanced bottle gourd plots. The farmers received recommendations from KVK professionals concerning a sequence of practices for use at some stage in the crop season. According to the advice given by Samui *et al*. in 2000 [6], the technology gap, extension gap, and technology index were calculated using the formula below.

$$\text{Increase Yield (\%)} = \frac{\text{Demonstration Yield} - \text{Farmers Yield}}{\text{Farmers Yield}} \times 100$$

$$\text{Technology Index (\%)} = \frac{\text{Potential yield} - \text{Demonstration Yield}}{\text{Potential yield}} \times 100$$

Table 1: Package of practices followed by farmers under FLD and in general

Particulars	Technological interventions	Farmer's Activity
Cultiver	Narendra Shankar Lauki-4	Local variety
Seed rate (Kg/ha)	3.0 kg/ha	5 kg/ha
Seed treatment	Treated with *Trichoderma viride* 4 gm	No use of treatment
Time of sowing	Last week of January	Last week of February
Method of sowing	Dibbing method at a spacing of 2m x 2m on ridge	no direction of sowing
Fertilizer management (Kg/ha)	100: 60: 60 (N:P:K) kg/ha	Either no use of fertilizers or use only DAP
Weed management	30 days after planting first weeding is done. Subsequent weeding is done at a monthly interval.	No use of intercultural oprations
Water management	Irrigate the field before dibbling the seeds and thereafter once a week.	No use, flooded the field after sowing
Plant protection	Spraying with cypermethrin @250 ml/ha for controlling Red pumpkin beetle.	ash dusting on plants

Table 2: Performance of the FLD during 2020-21 and 2021-22

Year	Crop (Cultivar)	Area (ha)	Yield (q/ha)			increased yield in percentage of over local check	Technology gap (q/ha)	Extension gap (q/ha)	Technology Index (%)
			Potential yield of variety	Yield of FLD	Farmers Practices				
2020-21	NDBGH-4	1.0	365	302	248	21.77	62	54	17.26
2021-22	NDBGH-4	1.0	365	323	260	24.23	42	63	11.50
Average		1.0	365	312.5	254	23.00	57	58.5	14.38

Result and discussion

Data of two years presented in table -2. In 2021-22, the yield was higher than in 2020-21 both on the farmer's plot (260 q/ha) and on the sample plot (323 q/ha). However, the average yield of the sample plots was 21.77 and 24.23 percent higher than that of the farmer in both years 2020-21-2021-22. The data show that the use of the proposed technique allows to increase the yield of bottle gourd. Diwedi *et al*. (2010) [2] and Ray *et al*. (2020) [5] argued adoption of new technology is critical to enhancing crop output. The average yield of two years of sample production was 312.5 q/ha higher than the cultivation methods (254 q/ha).

Technology Gap

Potential yield and yield differences of sample plots were 62 and 42 q/ha in 2020-21 and 2021-22 as followed. The average technology deficit in the less than two-year FLD program was 57 q/ha. This can be due to the fertility of the soil, the management skills of the individual farmer and the climatic conditions of the region. Therefore, site-specific recommendations are needed to address these deficiencies. These findings are similar to those of Singh *et al*. (2011) [8] Misra *et al*. (2014) [3].

Extension Gap

Surprisingly, the widened yield gap was 54.0 to 63.0 q/ha greater than the technology yield gap during the study period. This indicates that agricultural extension workers' knowledge of bottle gourd production technology should be technologically updated either through special field training or short-term refresher training and visits to research stations. Agricultural extension workers must also be trained in technology transfer so that knowledge can be effectively converted into potential returns. Another approach can also be regular training of farmers in Krishi Vigyan Kendra for production of bottle gourd. Singh *et al*. (2014) [7] in their study on expansion also agree with this conclusion

Technology Index

The technological index shows the practicality of the introduced technology in the farmer's field. The technology index ranged from 11.50 to 17.26%, indicating that there was a small gap between technology development and technology adoption by farmers. Raj *et al*. (2013) found a similar result (Table 2). During the two years of the FLD program, an average technology rate of 14.38 percent was observed, indicating the effectiveness of technical measures. This accelerates the adoption of proven technical measures to increase the productivity of bottle gourd.

Economic Return

In addition to control, some economic indicators such as cost of cultivation, net yield and B:C ratio were developed to determine the economic viability of the demonstration technologies.. The economic profitability of the improved proven technology compared to the farmer's practice was calculated depending on the price of the prevailing input and output costs and presented as a B:C ratio (Table 3). It was observed that the cost of producing bottle gourd on display was between Rs. 71267 to 73210/ha with an average of Rs. 7,238 compared to 68,775 to 69,985 with an average of Rs. 69380 under control. Cultivation of bottle gourd with improved technology gave a higher net return of Rs. 79733/ha and Rs. 83290/ha in 2020-21 and 2021-22 with an average net return of Rs. 81511.5/ha which was higher than Rs. 61620/ha in agricultural activities. The benefit-to-cost ratio for bottle gourd varied from 2.11 to 2.13 in sample plots and from 1.89 to 1.88 in farmer practice areas during the two sample years, with an average of 2.12 in sample plots and 1.88 in farmer practice areas. This may be due to higher yields and lower cultivation costs obtained with improved techniques compared to local control (farmers' practices). This finding is similar to that of Singh *et al*. (2011) [8], Misra *et al*. (2014) [3] and Ray and others (2020) [5]. The B:C ratio was found to be higher than that demonstrated in relation to the control group in all study years. The scientific method of cultivating bottle gourd can significantly reduce the technological gap, leading to increased productivity of bottle gourd in the region, which will improve the economic status of farmers in the long run. In addition, district extension offices should provide adequate technical support to farmers through various training and extension methods to increase the extension gap to achieve better production of bottle gourd.

Table 3: Economics of FLD and farmers practices

Year	Cost of cultivation (Rs./ha)		Gross return (Rs./ha)		Net Return (Rs/ha)		B:C Ratio	
	Farmers practices	under FLD	Farmers practices	under FLD	Farmers practices	under FLD	Farmers practices	under FLD
2020-21	68775	71267	130000	151000	61225	79733	1.89	2.11
2021-22	69985	73210	132000	156500	62015	83290	1.88	2.13
Average	69380	72238.5	131000	153750	61620	81511.5	1.88	2.12

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Conflict of interest: none.

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