International Journal of Statistics and Applied Mathematics 2023; SP-8(5): 608-610

International Journal of Statistics and Applied Mathematics

ISSN: 2456-1452
Maths 2023; SP-8(5): 608-610

https://www.mathsjournal.com
Received: 25-07-2023
Accepted: 30-08-2023

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Assessment of Okra (*Abelmoschus esculentus* L. Moench) var. 'Kashi Kranti' in Muzaffarpur District of Bihar

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Abstract
The major constraint for the low productivity of okra in the Muzaffarpur District of Bihar is the non-adoption of a recommended package of practices and an improved high-yielding variety. To replace this old technology, high-yielding okra var. 'Kashi Kranti' was conducted in the field of 20 farmers by Krishi Vigyan Kendra, Turki Muzaffarpur RPCAU Pusa, Samastipur during the pre-kharif seasons of 2019 and 2020. The demonstration used the recommended package of practices. An average yield of okra in ranged from 135.70 to 140.0 q/ha, whereas in local practices 80.80 and 85.88 q/ha during the year 2019 and 2020, respectively. A 67.94% (year 2019) and 63.46% (year 2020) increase in yield was recorded compared to local farmers. Similarly, the extension gap was also noticed at 54.90 and 55.00 q/ha during 2019 and 2020, respectively.

Keywords: Okra, FLD, the extension gap, technology gap, technology index

Introduction

Okra [*Abelmoschus esculentus* (L.) Moench] is an annual vegetable crop belonging to the Malvaceae family. The center of origin is the tropical and subtropical regions of the world. Okra is a warm-season crop considered to have originated in India (Rao, 1989) [6]. It called 'Bhinda' or 'Bhindi' in India and very important summer vegetable. Fruits are also canned for green or dried for use in off-season. The roots and stems of okra plants are used to clean cane juice in the manufacture of Jaggery and Sugar (Chauhan 1972) [2].

Okra has a high nutritional value and grows very quickly at high temperatures, which lends its production to tropical parts of the world (Costa *et al*., 1981) [13]. Okra seeds are a source of oil and protein and are also used as a coffee substitute, whereas ground-up okra seeds have been used as a substitute for aluminum salts in water purification (Camciuc *et al*., 1998) [3]. The nutritional value of 100 g of edible portion of okra contains 1.9 g of protein, 0.2 g fat, 6.4 g carbohydrate, 0.7 g minerals and 1.2 g fiber (Tiwari *et al*., 1998) [11] and iodine (Chauhan, 1972) [2].

It is an important vegetable in India that can be gauged from the fact that India accounts for 43.4% of world acreage and 73.2% of world production (NHB 2021-22). In India, there are 5, 23,000 ha, and the production is 6416000 MT (NHB 2021-22). Among the states, West Bengal is the leading okra-producing state, with a production of around 893.96 thousand tones followed by Bihar (794.10 thousand tonnes) and M.P. (754.09 thousand tonnes). Okra crops require long, warm growing seasons and are susceptible to frost. The optimum day temperature for its better growth is between 25 °C and 40 °C and that of the night is over 22 °C. Okra is attacked by a number of insect pests, of which the shoot and fruit borer is one of the major constraints in achieving potential yield. Infested fruits are unfit for human consumption, resulting in a 30.81% decrease in yield (Ghosh *et al*., 1999) [4]. The farmers of Bihar mostly save their own seeds for okra cultivation. However, old traditional cultivars and poor seed quality often result in poor yields and, ultimately, lower productivity (Meher *et al*., 2016) [5].

The application of pesticides as plant protection measures to overcome pest problems causes pesticide residue problems in harvested products and is hazardous to consumers. Considering the limitations of chemical control, the use of natural plant resistance against pest attacks can overcome this problem. In the Northern region of Bihar, okra is cultivated in almost all the districts. However, the productivity of these areas is not as high as that of other okra-growing regions. There is a considerable gap between the yield of farmers and that of the experimental field. Low yield per unit area can be attributed to a number of yield-affecting factors such as low fertility of land, lack of knowledge of technology on the part of okra growers, and ultimately low adoption of recommended cultivation technologies.

Materials and Methods

Selection of site

The farmer's field selected on the basis of low water flooding area because this district mostly affected by the flood every year. A total of 20 demonstrations were conducted on the selected farmers' fields of two blocks of districts in five villages covering an area of 4.0 ha. The soil in Muzaffarpur District generally has a neutral pH. The electrical conductivity is low. The organic carbon, nitrogen, and phosphorus contents of the soil were moderate, whereas the potassium content was high. Therefore, overall, soil fertility indices are suitable for agriculture point of view.

Selection of variety

In the present study, the performance of the okra variety 'Kasi Kranti' against local checks was evaluated at farmers' fields during the pre-Khaif seasons of 2019 and 2020 by Krishi Vigyan Kendra and Turki Muzaffarpur. The seeds were planted in 2nd fortnight of February.

The demonstration was conducted to study the gaps between the potential and demonstration yields, extension gap, and technology index. In the present evolution study, data on the output of okra cultivation and data on the local variety adopted by the farmers in this region were also collected. However, other critical inputs, such as recommended doses of fertilizers, agrochemicals, and other agronomical practices, were similar. The demonstrations at farmers' fields were monitored by KVK scientists in performing field operations, such as sowing, spraying, weeding, harvesting, and grading, by imparting diagnostic field visits. The technologies demonstrated were maintained and compared with those of the local variety. The technology gap, extension gap and technological index (Samui *et al*., 2000) [7] were calculated by using following formula as given below equations [Eq. 1-4]:

$$\text{Increase Yield (\%)} = \frac{\text{Demonstration Yield} - \text{Farmers Yield}}{\text{Farmers Yield}} \times 100 \qquad \text{Eq. 1}$$

$$\text{Technology gap} = \text{Potential yield} - \text{Demonstration Yield} \qquad \text{Eq. 2}$$

$$\text{Extension gap} = \text{Demonstrated yield} - \text{Yield under existing practice} \qquad \text{Eq. 3}$$

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demonstrated yield}}{\text{Potential yield}} \times 100 \qquad \text{Eq. 4}$$

Results and Discussion

The results of 20 demonstrations conducted in two blocks (Sakra and Kudhni) in Muzaffarpur district indicated that the 'Kashi Kranti,' in a plant spacing (60 cm × 30 cm), recommended dose of fertilizer (N:P:K at 100:50:50 kg/ha), and timely inter-culturing operations such as weeding and control of pests and diseases through recommended chemicals at the economic threshold level performed very well. The average yield was recorded to be 135.70 and 140.00 q/ha during 2019 and 2020, respectively, which were found increasing to 67.94 and 63.46% respectively, during 2019 and 2020 over local check. The data further show that the yield of okra in 2019 increased successively, which clearly indicates the positive impact of okra (Table 1).

The results indicate that 'Kashi Kranti' has a positive impact on farming communities in Muzaffarpur district, as they were motivated by the newly recommended high-yielding okra variety. Moreover, from the first year onwards, farmers cooperated enthusiastically in carrying out demonstrations, leading to encouraging results in the second year. Similar results of yield enhancement in chick peas in front-line demonstrations with good package of practices were documented by Singh *et al*. (2014) [10].

The technological gap (4.3 and 0.00 in the year 2019 and 2020, respectively) reflected the farmer's cooperation in carrying out such demonstrations with encouraging results in the subsequent year. The observed technology gap may be attributed to the variability in soil fertility status and agro-climatic conditions. The existing gap, which ranged from 54.9 to 55.00 q/ha during the study period, emphasized the need to aware farmers through various means for the adoption of improved agricultural technologies to reserve this trend of wide extension gap. Further adoption of recent production technologies with high-yielding varieties will subsequently change this alarming trend, galloping the extension gap.

The technology index shows the feasibility of the evolved technology in the fields of farmers. The lowest value of the technology index indicates the feasibility of the technology. As such, a decrease in the technology index from 3.07 to 0.00% indicated that the demonstrated technology was feasible (Table 1). The benefit cost ratio of the demonstration (Table 2) revealed that the B:C ratio from the recommended practice was subsequently higher than the local check during both years of the demonstration. The average net return per hectare from the demonstration was Rs 1, 16,090.00, Rs. 1, and 19,090.00, whereas from the local check, Rs. 60,850.00 and Rs. 61,180.00 in 2019 and 2020, respectively. The benefit cost ratios of the demonstration and local check were observed to be 3.15, 3.38, and 1.70, 1.69, respectively, during the demonstration years 2019 and 2020, respectively. Sharma (2003) [8] reported a similar finding in moth beans.

Conclusion

The present study of okra var. 'Kashi Kranti' demonstration in farmer's field resulted in a positive result and provided an opportunity to by demonstration for improvement of the productivity and profitability of the farmers. The results convincingly indicated that the yield of okra could be increased with intervention of high-yielding varieties. From the findings below, it can also be concluded that the use of okra var. 'Kashi Kranti' for cultivation greatly reduced the extension and technological gap. This will aid in increasing the income of farmers in the Muzaffarpur district of Bihar.

Table 1: Productivity, technology gap, technology index, extension gap of okra as grown under FLD and local variety

Years	Area	No. of FLDs	Demonstration Yield (q/ha)			Yield of Local check (q/ha)	Potential yield (q/ha)	Increased yield (%)	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
			Highest	Lowest	Average						
2019	2.0	20	137.48	133.92	135.7	80.80	140	67.94	54.9	4.3	3.07
2020	2.0	20	138.00	142.00	140.00	85.88	140	63.46	55.0	00	00

Table 2: Economic Impact of Okra as yield under FLD and traditional package of practices

Year	Cost of Cultivation (Rs./ha)		Gross Return (Rs./ha)		Net Return (Rs./ha)		B:C ratio	
	Demo.	Local check	Demo.	Local check	Demo.	Local check	Demo.	Local check
2019-20	36800	35700	152890	96550	116090	60850	3.15	1.70
2020-21	38300	39700	160990	99480	119090	61180	3.38	1.69

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