



## Impact of Improved Technologies on Productivity and Profitability of Vegetables on Farmers Fields in Hamirpur District, Bundelkhand Tract of Uttar Pradesh

### KEYWORDS

Improved techniques, Technology gap analysis, Vegetables demonstration, Vegetables productivity and profitability

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**ABSTRACT** Technology based demonstrations were conducted on vegetables with improved technologies against farmers practices on farmer's fields during 2009-10 to 2011-12 in Hamirpur district of Bundelkhand zone in Uttar Pradesh. Improved techniques included mainly the region specific improved crop varieties, proper sowing methods and maintenance of optimum plant stand, optimum fertilizer application, plant growth regulator spray, effective plant protection practices and proper weed control. The demonstrations were conducted on tomato (100), okra (335) and french bean (75). The results showed that improved techniques increased yield over farmers practices by the margins of 139.28 q/ha or 53.11 % in tomato, 30.80 q/ha or 44.35 % in okra and 23.31 q/ha or 58.23 % in french bean. Net profit of Rs. 138286/ha in tomato, followed by Rs. 33562/ha in okra was realized by the farmers. Lowest of Rs. 25200/ha net profit was increased in french bean. Return per rupee invested on improved techniques was worked out highest of Rs. 5.79 in tomato followed by Rs. 3.58 in french bean and lowest of Rs. 3.42 in okra. There was wide technology and extension gap, which need to bridge by promoting the scientific production and protection technologies in varied condition. These results indicate that there are great possibilities of increasing productivity and profitability of above crops with adoption of improved techniques in dry environment of Hamirpur district, Bundelkhand zone of Uttar Pradesh.

### Introduction

The vegetables are the emerging important crops grown in Hamirpur district of Bundelkhand zone in Uttar Pradesh. However, the productivity of these crops is much lesser than the other part of state. The major constraints in crops production are non-availability of improved varieties seed, imbalance use of fertilizers and lack in adoption of improved cultivation techniques by majority of farmers. Most of the farmers in the district are not aware about improved techniques of crops cultivation. If the productivity is increased, the sizeable area under these vegetable crops has tremendous increased in the production of vegetables under dry environment of Hamirpur. Keeping these factors in view, technology demonstrations were organized under different situations on farmer's fields in Hamirpur district with the objective to enhance the productivity and profitability per unit area. The area, production and productivity of tomato, okra and total vegetable crops in India as well as Uttar Pradesh depicted in Table 1(A, B&C).

**Table 1(A): Area, production and productivity of vegetables in India.**

Year	Particulars	Crop		Total Vegetables
		Tomato	Okra	
2010-11	Area (in '000ha)	865.0	498.0	8495
	Production (in '000MT)	16826.0	5784.0	146554
	Productivity (in MT /ha)	19.5	11.6	17.3
	Share of total vegetable Production	11.5 %	3.9 %	--
2011-12	Area (in '000ha)	907.1	518.4	8989
	Production (in '000MT)	18653.3	6259.2	156325
	Productivity (in MT/ha)	20.6	12.1	17.4
	Share of total vegetable Production	11.9 %	4.0 %	--
2012-13	Area (in '000ha)	879.6	530.8	9205
	Production (in '000MT)	18226.6	6350.3	162187
	Productivity (in MT/ha)	20.7	12.0	17.6
	Share of total vegetable Production	11.2 %	3.9 %	--

**Table 1(B): Area, production and productivity of vegetables in Uttar Pradesh.**

Particulars	2010-11	2011-12	2012-13	Share of U.P. in India (2012-13)
Area (in '000ha)	829.40	852.09	912.66	9.9 %
Production (in '000MT)	17679.40	18563.75	19571.56	12.1 %
Productivity (in MT/ha)	21.3	21.8	21.4	--

**Table 1(C): Area, production and productivity of tomato and okra in Uttar Pradesh (2012-13)**

Particulars	Tomato	Okra
Area (in '000ha)	8.79	12.44
Production (in '000MT)	102.47	159.30
Productivity (in MT/ha)	11.66	12.8
Share of total vegetable Production	NA	3.0 %

### Methodology

The selection of farmers was done block wise with the help of block level functionaries and staff of line departments. Only interested farmers were selected for demonstrations on different crops. Large, medium and small holding size farmers were included in the study. Through preliminary discussion with selected farmers, causes for low crop yield of tomato, okra and french bean were identified and prioritized. Based on the major causes, technological interventions were finalized. Under improved techniques, recommended integrated crop technologies approach demonstrated included interventions viz. use of improved/hybrid variety with optimum seed rate, seed treatment, line sowing with optimum spacing, optimum dose of fertilizer application in conjunction with F.Y.M., use of plant growth regulator, IPM practices and proper weed management. Under conventional system, farmers used old varieties with high seed rate, without seed treatment, imbalance use of fertilizer application, without plant growth regulator and no proper weed control. The tomato was sown in second fortnight of September in nursery and

after about 25-30 days of sowing, the single seedling was transplanted in main field. Okra and french bean were sown in the month of June–July and between end of the October to mid November, respectively. All demonstrations were conducted on subsidy basis with participatory involvement of farmers. Each demonstration had an area of 0.2 ha, in which half area (0.1 ha) was kept under conventional system and another half (0.1 ha) under improved techniques of crop production demonstrated side-by-side. In all, 510 demonstrations were conducted in whole district during three years of 2009-10 to 2011-12. Demonstration on tomato (100), okra (335) and French bean (75) were laid out. Yield data were recorded in addition economic analysis. Technology gap, extension gap and technology index were calculated by using the following formulae:

$$\begin{aligned} \text{Technology gap} &: \text{Potential yield} - \text{Demonstration yield} \\ \text{Extension gap} &: \text{Demonstration yield} - \text{Farmers practice yield (Local check)} \\ \text{Technology index (\%)} &= \frac{\text{Technology gap}}{\text{Potential yield}} \times 100 \end{aligned}$$

**Results and Discussion**

**Yield analysis:**

Impact of improved techniques was observed remarkable on yield over conventional system during all the three years of demonstration (Table 2). Maximum increase in yield due to improved techniques over conventional system was recorded in tomato followed by french bean, while lowest yield increase was recorded in okra. On an average, tomato, french

bean and okra increased by 53.11 %, 58.23 % and 44.35 % yield, respectively, over conventional system. Technological interventions in terms of improved varieties, integrated nutrients management, integrated pest management, weed management, etc. made a difference on tomato, french bean and okra yield. The possibility of increasing yield of tomato, french bean and okra per unit area was found in the area at significant level. It may be due to genetic variability of varieties with optimum seed rate, seed treatment, line sowing with optimum plant stand, optimum fertilizer application, plant growth regulator spray, IPM practices and proper weed control. Under conventional system, farmers sowed local seed with higher seed rate, dense spacing, highly imbalance fertilizer use and no proper weed as well as disease and insect control, which lead to poor yield. Higher margin of yield increase in tomato (139.28 q/ha) might be associated with its higher responsiveness to improved variety, proper spacing, optimum fertilizer application and weed control. All these three crops seem to be neglected at farmer's level as they use improper practices and imbalance inputs in these crops. Thus, there are bright chances to increase the yield of tomato, okra and french bean crops by adopting improved techniques with using fewer inputs. The front line demonstrations conducted on chilli (green) with hybrid variety and improved technologies showed a yield advantage of 69.47 % over local check as reported by Balai et al. (2014). Almost similar results of demonstrations on different crops have been reported by Singh et al. (2014), Mishra et al. (2009) and Hiremath et al. (2009).

**Table 2: Year wise yield of vegetables in Hamirpur district, Uttar Pradesh**

Crops	Years of demonstration						Mean		Increase in yield with improved over conventional technologies	
	2009-10		2010-11		2011-12					
	Conv.	Imp.	Conv.	Imp.	Conv.	Imp.	Conv.	Imp.	(q/ha)	(%)
Tomato	247.56	393.27	270.32	416.26	268.92	395.12	262.27	401.55	139.28	53.11
Okra	74.12	105.52	61.16	92.34	73.03	102.86	69.44	100.24	30.80	44.35
French bean	45.32	67.56	31.68	57.06	43.08	65.39	40.03	63.34	23.31	58.23

Conv.- Conventional system ; Imp.- Improved techniques

**Economics analysis:**

The use of improved techniques required more cost for crops production than farmers practice in all crops (Table 3). Increase in expenditure due to improved techniques over conventional system was lowest of Rs. 9765/ha in french bean to highest of Rs. 28850/ha in tomato. The use of improved techniques increased net economic gain from all crops under demonstrations considerably. Maximum increase of Rs. 138286/ha in net profit was observed in tomato followed by okra with Rs. 33562/ha, while lowest of Rs. 25200/ha net profit was found in french bean. It might be attributed to quantity wise highest increased in yield with improved techniques over conventional system of tomato. In case of french bean, the percent wise yield increased due to improved interventions was high as compared to okra, however, net profit was lowest. It might be attributed to quantity wise lowest increase in yield of french bean. Return per rupee invested on improved techniques was worked out highest of Rs. 5.79 in tomato followed by Rs. 3.58 in french bean, while lowest of Rs. 3.42 in okra. These results showed that investment on improved cultivation techniques is more profitable on tomato in Hamirpur district of Bundelkhand zone. In case of chilli crop, Singh (2000) has also reported almost similar results on farmers fields studied in Baran district of Rajasthan. The above findings are in conformity with the findings of Singh, et al. (2004), Balai et al. (2013) and Rajiv and Singh (2014). The increase in crop profitability (Rs./ha/day) due to improved techniques of tomato, okra and french bean was recorded by Rs.909.78, Rs. 329.04 and Rs. 208.26, respectively. The crops, which gave higher profitability, proved economically

beneficial.

**Table 3: Economic analysis of vegetables in Hamirpur district, Uttar Pradesh**

Crops	Increase with improved techniques over conventional system in					
	Yield (q/ha)	Gross income (Rs./ha)	Expenditure (Rs./ha)	Net profit (Rs./ha)	Return (per rupee invested)	Crop profitability (Rs/ha/day)
Tomato	139.28	167136	28850	138286	5.79	909.78
Okra	30.80	47432	13870	33562	3.42	329.04
French bean	23.31	34965	9765	25200	3.58	208.26

**Technology gap analysis:**

The data depicted in Table 4 revealed that the tomato, okra and french bean produced average yield of 401.55 q/ha, 100.24 q/ha and 63.34 q/ha under demonstrations as against the potential yield of 500 q/ha, 120 q/ha and 80 q/ha, respectively. Thus, there is a wide gap between the demonstrations yield and potential yield. The highest technology gap of 98.45 q/ha was recorded in tomato followed by okra (19.76 q/ha), while minimum gap was found in french bean (16.66 q/ha). There is highest gap existing between the potential yield and demonstration yield (improved technologies) in tomato followed by okra and lowest was in french bean. However, demonstrations were conducted under close supervision of field staff but the technology gap was found there. It might

be due to varied agro-ecosystems of the area. In addition, it was also observed that the reasons responsible for the technology gap were lack of adoption of complete or thoroughly recommended package of practices at demonstration fields under improved technologies due to non-availability of some important inputs at the time of requirement, high cost of inputs and insufficient technological advice.

The highest extension gap of 139.28 q/ha was recorded in tomato followed by okra (30.80 q/ha) and lowest was in french bean (23.31 q/ha), which indicates that there is a gap existed between the yield of demonstrations and local check/farmer's practice. In comparison between the improved technologies and conventional system, it was observed that the farmers did not applied balance nutrients, herbicide, plant growth regulator and plant protection measures properly, local varieties were sown without seed treatment and optimum plant population, which was not maintained under conventional system. Thus, the farmers were failed to adopt recommended package of practices under conventional system and lead to extension gap. The extension gap in the yield indicates that there is big scope to increase the yield of tomato, okra and french bean at farmers fields by adopting the recommended package of practices. Therefore, to bridge the extension gap, there is a need to give due emphasis on transfer of improved technologies and management practices of tomato and okra as compared to french bean through strengthening of extension network. The extension gap for all crops was higher as compared to the technology gap, which also indicates that there is a need to train and educate to the farmers about improved technologies.

**Table 4: Yield and gap analysis of vegetables in Hamirpur district, Uttar Pradesh**

Crop	No. of demo.	Potential yield (q/ha)	Average yield (q/ha)		% increase in yield over local	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			Local	Demo.				
Tomato	100	500	262.27	401.55	53.11	98.45	139.28	19.69
Okra	335	120	69.44	100.24	44.35	19.76	30.80	16.47
French bean	75	80	40.03	63.34	58.23	16.66	23.31	20.83

Technology index was minimum in okra (16.47%) compared to tomato (19.69%) and french bean (20.83%). Technology index shows the feasibility of the demonstrated scientific technological interventions at the farmer's field. Therefore, technology index ranging from 16.47 to 20.83 % indicates of higher scope for further improvement in productivity of tomato, okra and french bean in Bundelkhand zone of Uttar Pradesh. Similar findings were also observed by Singh et al. (2014) at Azamgarh, U.P. on yield gap analysis of field pea under front line demonstrations.

#### Conclusion:

Technology demonstrations conducted on tomato (100), okra (335) and french bean (75) were performed better. The results showed that improved techniques increased yield over farmers practices by the margins of 139.28 q/ha or 53.11 % in tomato, 30.80 q/ha or 44.35 % in okra and 23.31 q/ha or 58.23 % in french bean. Net economic gain of Rs.138286/ha in tomato, followed by Rs. 33562/ha in okra was realized by the farmers. Lowest of Rs. 25200/ha net gain was increased in french bean. Return per rupee invested on improved techniques was worked out highest of Rs. 5.79 in tomato followed by Rs. 3.58 in french bean and lowest of Rs. 3.42 in okra. . There is wide technology gap, which need to be bridged by promoting the scientific production and protection technologies in varied condition. Major attention under area specific technology development of modules should be given for enhancing the productivity of tomato, okra and french bean in varied conditions and agro-eco systems of Hamirpur district of Uttar Pradesh.

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