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Research Article

IMPACT OF FRONT-LINE DEMONSTRATIONS ON THE YIELD AND ECONOMICS OF TOMATO IN HARDOI DISTRICT OF UTTAR PRADESH

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Abstract: The present study was carried out at Hardoi district of Uttar Pradesh during *rabi* 2020-21. Front line demonstrations were conducted on tomato by the active participation of the farmers with the objective of improved technologies of tomato production potential. The improved technologies like hybrid varieties (Himsona and US-3383), balanced fertilizer application (soil test based) and need based integrated pest and disease management *etc.* were provided to the selected farmers. The data related to the cost of cultivation, production, productivity, gross return, and net return were collected as per schedule and analyzed. Results of the present study revealed that higher yield in the demonstrations was recorded (335 q/ha) in US 3383 and (295 q/ha) in Himsona variety as compared to farmers practice (275 q/ha) using local materials. The percentage increase in the yield over farmer's practice 19.6 was recorded in US 3383 than 9.3 in Himsona variety. The extension gap, technology gap and technology index were computed 5.0 q/ha, 20.0 q/ha and 1.67% in Himsona and 15.0 q/ha, 60.0 q/ha and 5.6% in US 3383 variety respectively. The demonstrated field gave highest net return Rs.193000 and B:C ratio 1:3.57 in US 3383.The results of the study indicated that F1 hybrid US 3383 found suitable for the district Hardoi to meet out maximum gain. The gap existed in the potential yield and demonstration yield is due to soil fertility and variable biotic factors. Present results clearly showed that the gain in yield and return of tomato var. US 3383 can be boost up by adopting recommended package and practices.

Keywords: *Tomato, Front Line, Demonstration, farmer's practice, Yield*

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Introduction

Tomato (*Lycopersicon esculentum* Mill.) is an important vegetable crop grown almost throughout the world including tropical and temperate regions. It is cultivated both in the green houses on protective structures as well as under natural conditions [1]. It ranks first among processed vegetables. Tomato is labeled as a vegetable for nutritional purposes a rich source of vitamins A and C and is referred to as "poor man's orange". It adds variety of colours to the food. Its nutritional contents support healthful skin, weight loss and heart health. It contains key carotenoids such as lutein and lycopene. These can protect eye against light induced damage. Tomato is cultivated extensively for its edible fruits. Tomato is a very good appetizer and its soup is said to be a good remedy for patients suffering from constipations. Additionally, a large percentage of the world's tomato crop is used for processing; products *viz.*, ketchup, sauces, puree, paste, powder, juice soup, "sun-dried" tomatoes or dehydrated pulp and chutney *etc.* Tomato is short duration crop and it is fitted in different cropping system of cereals, grain, pulse, and oilseeds and gives higher yields hence is of high economic value.

The major tomato growing countries are China, India, Pakistan, Turkey, and USA. India ranks second in area and production after China. India contributes about 11.4 per cent to world tomato production. In India tomato is the third largest vegetable next to only potato and brijnal with the production of about 19.78 Mt [2]. Andhra Pradesh is highest tomato producer followed by Madhya Pradesh with sharing percentage of 14.21 and 12.81 [3]. Tomato is an important vegetable crop of the Uttar Pradesh (UP) and promotes the economic condition of farmers of UP. The area, production and productivity of tomato were 21.24 mha, 841.61 mt and 39.62 q ha^{-1} respectively. Tomato is a major commercial vegetable crop in Hardoi district of Uttar Pradesh and farmers of the district are facing problems of low yield of tomato due to use of old varieties, lack of knowledge, poor fertilizer management, no use of IPM techniques, simple intercultural operations, and fluctuations in market prices *etc.* These above constraints increase the risk of tomato cultivation and thereby keeping these in view Frontline demonstrations were conducted to increase in productivity and knowledge up gradation of farmers regarding tomato cultivation.

A field trial was carried out at the ten farmer's field at Hardoi district of Uttar Pradesh comes in Agro-climatic zone of Uttar Pradesh V Mid Plain. The region temperature varies from minimum 5.5 to maximum 45°C, receives on an average 863 mm of rainfall; the soil is Alluvial, PH Normal to slightly alkaline and organic matter in medium quantity. There is lot of scope of tomato growing in this area. The main objective of Front line Demonstration (FLD) is to introduce suitable agriculture practices like high yielding varieties, seed treatment, spacing, timely sowing, nutrient management including micronutrients, pest and disease management *etc.* among the farmers along with organizing extension programs like field day for horizontal dissemination of the technologies. FLD is playing a very important role for transfer of technologies and creates environment among farmers by seeing and believing principle. In order to have better impact of the demonstrated technologies for farmers and field level extension functionaries the FLDs were conducted at farmer's field in a manner to showcase the high yielding hybrid varieties for convincing farmers about the

potential of improved production technologies for enhancing tomato yield. There is always gap between the recommended technology and its modified form at the farmer's level which is major issue in the efforts of increasing agricultural production in the country. There is urgent need to minimize the technological gap at field level. In view of the above facts, front-line demonstrations were undertaken in a systematic manner on farmer's field to show the worth of improved cultural practices and convincing farmers to adopt these technologies in their farming system [4,5].

Table-1 Yield, technology gap and technology index of demonstration

Variables	Yield (q/ha)	Increase (%) over farmers practice	Technology gap (q/ha)	Extension Gap (q/ha)	Technology Index (%)
Farmers Practice	275	-			
Demonstration (Himsona with full package of practices)	295	7.3	5	20	1.67
Demonstration (US 3383 with full package of practices)	335	19.6	15	60	5.6

Table-2 Economics of front-line demonstrations

Variables	Yield q/ha.	Cost of Cultivation (Rs/ha.)	Gross return (Rs/ha.)	Net return (Rs/ha.)	Benefit: cost ratio
Farmers practice	280	68000	220000	152000	3.23
Demonstration (US 3383)	335	75000	268000	193000	3.57
Demonstration (Himsona)	295	270	236000	161000	3.15

Materials and Methods

The present study was conducted in Hardoi district of Uttar Pradesh during *rabi* 2020-21. The Himsona and US-3383 F_1 tomato hybrid seeds were distributed among ten selected farmers. All the participating farmers were trained on various aspects of tomato production technologies. The field was prepared by deep ploughing and harrowing. The seeds were sown in well prepared raised bed during first week of October.

All the recommended practices *i.e.*, seed treatment by carbandazim 50 % W.P. @ 2g/kg seed, transplanting of one month old seedlings with erect permanent structures, maintaining row spacing of 120cm and 30 cm spacing within rows. Recommended dose of manure and fertilizers. (10 tonnes FYM, N:P:K 60:60:60 kg/ha. respectively) as basal application before transplanting and remaining 60 kg nitrogen by three split doses 30, 45 and 60 days after transplanting. Weed management, need based plant protection chemicals were used to manage the biotic stresses. The yield and economic performance of front-line demonstrations, the data on output were collected from FLDs as well as local plots from all selected farmers and finally the fruit yield, cost of cultivation, net returns with the benefit cost ratio were worked out. An average of cost of cultivation, yield, net returns of different farmers was analyzed by the formula.

Average = $[F_1+ F_2+F_3.....F_n]/N$

F_1 = Farmer

N = No. of Farmers (10)

In the present study, technology index was operationally defined as the technical feasibility obtained due to implementation of front-line Demonstrations in tomato. To estimate the technology gap, extension gap and technology index following formula used by Samui *et al*., (2000) [6], Sagar and Chandra (2004) [7] have been used.

Technology Gap = Pi (Potential Yield) – Di (Demonstration Yield)

Extension Gap = Di (Demonstration Yield) – Fi (Farmers yield)

Technology index – [(Potential Yield – Demonstration yield/potential yield) X 100]

Results and Discussion

Performance of FLD

A comparison of productivity levels between demonstration and farmers practice is shown in [Table-1]. It is evident from results that under the demonstrated plots, performance of tomato (yield) was sustainable higher than in the local check. During the period of study, it was recorded that front line demonstrations tomato Hybrid varieties US 2338 recorded higher yield (335 q/ha) than farmers practice (275 q/ha). The percentage increase in the yield (19.6) over farmers practice was recorded. Similarly, yield enhancement in potato crop in front line demonstrations were documented by Mishra *et al*., (2009) [8].

From these results it is evident that the performance of the technology demonstrated was found to be better than the farmers practice under same environment conditions. The farmers were motivated by seeing the results in term of productivity and they are adopting the technologies. The yield of the front-line demonstrations and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology index and technology gap. The technology gap shows the difference between potential yields over demonstration yield of the technology. The potential yield of the variety is 500 q/ha. The technology gap 15 q/ha was recorded [Table-1].

The front-line demonstration was laid down under the supervision of Krishi Vigyan Kendra scientists at the farmer's field, there exist a gap between the potential yield and demonstration yield. This may be attributed due to dissimilarities in soil fertility and other climatic factors in demonstration area. Hence, location specific recommendations may become necessary to narrow down the gap.

Comparative high extension gap (60) [Table-1] emphasizes the need to educate the farmers and help them for optimizing the yield by adopting improved practices. Greater use of the latest improved production technologies applied to high yielding varieties can subsequently bridge this extension gap between demonstration yield and farmer's yield. Technology index shows the feasibility of the variety/technology at the farmer's field. The lower the value of technology index (5.6 %), more is the feasibility of the technology [Table-1]. It means the technology is suitable for the Hardoi district of Uttar Pradesh. The results of the present study are in consonance with the finding and Hiremath and Nagaraju (2009) [9] in onion, Dhaka *et al*., (2015) [10] in coriander.

Economics of frontline demonstrations

Economics of tomato production under front line demonstrations was recorded and the results of the study have been presented in [Table-2]. The results of economic analysis of tomato production revealed that front line demonstration recorded higher gross return (268000 Rs/ha) and net return, (193000 Rs.). With higher benefit cost ratio (1:3.57) as compared to farmer's practice. These results are in accordance with findings of Hiremath *et al.,* (2007) [11], Dhaka *et al.,* (2015) and Hiremath and Nagaraju (2009). Based on above finding in present study, it is concluded that front line demonstrations of improved technology reduce technology gap to a considerable extent, thus leading to increased productivity of tomato in Hardoi district of Uttar Pradesh. This also improved linkages between farmers and scientists, and built confidence for adoption of the improved technology.

Application of research: Productivity enhancement under FLD's over farmers practices of tomato cultivation created a greater awareness and motivated other farmers not growing tomato to adopt improved technologies as well as growing tomato to get more return.

Research Category: Frontline demonstration

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Author Contributions: All authors equally contributed

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Study area / Sample Collection: Hardoi district of Uttar Pradesh

Cultivar / Variety / Breed name: Tomato (*Lycopersicon esculentum* Mill.)

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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