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Impact of frontline demonstration in adoption of production technology and economics of tomato at farmers field of Tumakuru district

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ABSTRACT : The studies were conducted on impact of frontline demonstrations in adoption of production technology and economics of tomato at farmer's field of Tumakuru district, Karnataka state during the year 2012-13 to 2014-15. The main objective of front line demonstrations (FLDs) was to demonstrate newly released crop production and protection technologies and its management practices at the farmer's field under different agro-climatic regions and farming situations. Observation was found that the total yield gap between potential yield and actual yield of tomato was 44.44 per cent, in which 16.21 per cent of yield gap was between demonstration plot and actual farmers plot yield and 28.23 per cent of technological gap. The maximum number of farmers were adopted recommended spacing (80.00 %), seed treatment (80.00 %) followed by training of plants at right stage (78.33 %). The increased in adoption per cent of important package of practices were found to more in application of vegetable special (43.33 %) followed by training of plants at right stage (41.67 %), raising and selection of quality seedling from nursery (40.00 %) and timely irrigation (33.34 %). Whereas, the package of practices *viz*., plant protection measures to control pest and diseases (11.67 %), recommended dose of fertilizer application (13.33 %) and weed management (20.00 %) were found to less increased in adoption per cent after FLD. There was significant difference in tomato yield before and after conduct of frontline demonstrations programme, increased the yield of tomato per hectare by 29.18 per cent in demonstrated plots over farmers practice. Net return and B:C ratio were found to increased in demonstrated plot as compared to farmers practice. The adoption of different package of practices even though after FLD programme, which shows positive impact of FLD on adoption of demonstrated production technology.

KEY WORDS : Adoption, Frontline demonstration, Impact, Production technology, Tomato

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The main aim of the Krishi Vigyan Kendra is to reduce the time lag between generation of technology at the research institution and its transfer to the farmers for increasing productivity and income from the agriculture and allied sectors on sustained basis. KVKs are grass root level organizations meant for application of technology through assessment, refinement and demonstration of proven technologies under different 'micro farming' situations in a district (Das, 2007). Front line demonstration (FLD) is an appropriate tool to demonstrate recommended technology among the farmers. The technologies developed at the agricultural universities and research stations through research activities are demonstrated in farmers field

through FLDs. This is one of the most powerful tools of extension because farmers in general are driven by the perception that 'seeing is believing'. The main objective of FLDs is to demonstrate newly released crop production and protection technologies and its management practices at the farmer's field under different agro-climatic regions and farming situations.

Tomato (*Solanum lycopersicum* L. Solanaceae.) is an important vegetable crop occupies an area of 8.82 lakh hectares in India with production of 187.36 lakh tones. Andhra Pradesh, Karnataka, Madhya Pradesh, Odisha, Gujarat, West Bengal and Bihar are leading states in tomato cultivation in India. Karnataka occupied with an area (0.57 L ha) and production (19.17 L tones) during 2013-14 (Anonymous, 2015). The tomato is cultivated all season of the year in Tumakuru district, which gives good returns to the farmers. Krishi Vigyan Kendra, Konehalli, Tiptur conducted frontline demonstrations at farmers field with the objectives of convincing farmers and extension functionaries together about tomato production technologies for further wide scale diffusion. Keeping in view of an effective extension approach of frontline demonstrations for dissemination of tomato production technology, its impact of FLDs conducted to be assessed. Therefore, the present study was conducted with the specific objectives to evaluate the FLD in terms of adoption of recommended production technology in tomato and to know the impact of FLD on tomato growing farmers.

Main objective :

– To study the extent of adoption of recommended package of practices in tomato before and after frontline demonstration.

Table A : Demonstrated package of practices and farmers practice for ICM in tomato

Sr. No.	Package of practices (Technology intervention)	Frontline demonstration (Demonstrated package)	Farmers practice (Local/check)
1.	Selection of variety /hybrid	Arka Rakshaka – Triple disease resistant hybrid variety, resistance to leaf curling, bacterial wilt and blight disease	Local or unknown private hybrid/variety, no information.
2.	Seed treatment	Seed treated with fungicide Carbendizim	Not known
3.	Raising the seedling in nursery	Pro-tray method of raised seedling in 50 % shade net house and covers sides with 50 mesh insect proof nylon net and selected good quality seedling	Purchased seedling from pro-tray method of raised seedling in private shadenet house without nylon mesh and selected unknown poor quality seedling
4.	Spacing	90 cm x 45 cm (High plant population per unit area)	120 cm x 45 cm (Low plant population per unit area)
5.	Growing trap crops	Transplanting 16:1 ratio of tomato and marigold	Not grown any trap crops
6.	Application of FYM (Approximately)	Applied FYM 38 t/ha before 3 week of transplanting	Applied FYM 3 tractor load or 15 t/ha during ridges and furrow preparation (2-3 day before transplanting)
7.	Application of recommended dose of fertilizer	250 kg N + 250 kg P_2O_5 + 250 kg K_2O per ha (50 % N + 100 % PK at the time of transplanting and remaining 50 % N applied at 4 week after transplanting)	After transplanting, applied 17:17:17 NPK + 20:20:0 NPK mixed chemical fertilizer (Approx. 10-12 g/plant) 2- 3 times during crop period
8.	Application of vegetable special/ micro-nutrient	Foliar spray of vegetable special 75 g + 15 lit. water + 1 lemon + 1 shampoo (Rs.1)	Not applied any micro-nutrient
9.	Irrigation	Drip or furrow method of irrigation at once in a 4-7 days interval depend upon soil condition	Once/twice in a week
10.	Weed management	Pre-emergence herbicide butachlor @1.5 lit./ha, followed by hand weeding depend upon weed intensity	Hand weeding 3 to 4 times
11.	Training of plants	– Stake the plants 30 days after planting with 1.2 - 1.5 m tall stakes. – Remove the side branches upto 30 cm from ground level.	Stake the plants at the flowering stage and not removed the side branches upto 30 cm from ground level
12.	Plant protection measures for control of insect pest and diseases	Need based application for control: Whitefly, thrips and sucking pest - spraying with diamethoate (30 EC) 1.7 ml/lit. of water. Fruit borer: Spay NPV (250 LE/ha). Control of leaf curling – spraying with imidaclopride 0.3 ml/lit. of water for vector control. Early blight – spraying of mancozeb 2g/lit. of water. Fussarium wilt – Drunching with copper oxy chloride (COC) 3 g/lit. of water.	Not followed, irrespective of disease and pest used plant protection chemical combined together without compatibility of chemicals and not identified pest and disease for spraying.
13.	Harvesting	Manual	Manual

– To study yield gap identified in tomato production in Tumakuru district.

– To study the yield and economics of tomato production before and after frontline demonstration.

RESEARCH METHODS

The front line demonstrations were conducted on integrated crop management (ICM) in tomato at farmer's field of Tumakuru district, Karnataka state during the year 2012-13 to 2014-15, selected 150 farmers for demonstrating the ICM in tomato through FLDs at Tiptur, Turvekere and Gubbi taluks of Tumakuru district under ICAR and RKVY-IFSD project. The critical inputs were supplied to farmers and applied as per the package of practices for tomato crop recommended by University of Horticultural Sciences, Bagalkot (Anonymous, 2013) and Indian Institute of Horticultural Science, Hessaraghatta, Bengaluru. Demonstrations at farmer's fields were regularly monitored by scientists of Krishi Vigyan Kendra, Konehalli, Tiptur from sowing to harvesting and marketing. Randomly twenty farmers from each taluk were selected to making a total sample size of sixty.

Basic data of the respondents were collected from KVK. The data were collected after FLD by personal interview technique with the help of interview schedule developed for the study. The interview schedule was developed through discussion with experts, scientist and extension officers working in the district. Under these FLDs at 60 farmer's field with an area of 12 ha was covered. The information on demonstrated package of practices and farmers practices followed as mentioned in Table A. The data were analysed with appropriate statistical procedures.

Data were collected on absolute maximum potential yield of the tomato in a given situation. Besides this, demonstrated plot yield was obtained using the data from front line demonstrations conducted in the farmers field under the close supervision of scientists from KVK in different locations of the district. Further, information on actual yield obtained by the farmers on their farms under their own management practices was collected. Using these data the differences between potential yield and demonstration plot yield (Yield gap-I), difference between demonstration plot yield and actual yield (Yield gap- II) and difference between potential yield and actual yield (Total yield gap) were worked out.

Potential yield - Demonstration plot yield = Technological gap (yield gap-I)

Demonstration plot yield - Actual yield = Extension gap (yield gap- II)

Potential yield - Actual yield = Total yield gap

RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Yield gap in tomato production:

The realized yield and estimated yield gaps are presented in Table 1. The potential yield of tomato was found to be 75.00 t/ha and the demonstration plot yield obtained through frontline demonstrations was 53.83 t/ha. The actual yield realized by the farmers on their farm with their own resources and management practices was 41.67 t/ha. The magnitude of technological gap (yield gap-I) was 21.17 t/ha, which was 28.23 per cent less than the maximum attributable yield. Extension gap (yield gap-II) refers to the difference between demonstration plot yield and actual yield and it was 12.16 t/ha. There was 16.21 per cent reduction in yield compared to demonstration plots yield. A sizable total yield gap of 33.33 t/ha was observed and it accounted for 44.44 per cent. These findings are in agreement with that of Kaur *et al.* (2013) and Mitra and Samajdar (2010).

The causes for such a large total yield gap may be attributed to environmental differences between research stations, extension worker and farmers fields and non adoption of production technology (Mishra *et al*., 2007

Table 1 : Yield gap identified in tomato production

Particulars	Yield (t/ha)	Percentage gap
Potential yield	75.00	--
Demonstration plot yield	53.83	--
Actual yield (Farmers practice)	41.67	--
Technological gap (Yield gap I)	21.17	28.23
Extension gap (Yield gap II)	12.16	16.21
Total yield gap	33.33	44.44

and Kiran, 2003). It could be reduced through considerable co-ordination between researchers, extension workers and farmers. These findings are with in line those of Hiremath and Hilli (2012) and Jadav and Solanki (2009).

Adoption of recommended package of practices :

The data presented in Table 2 indicated that more number of farmers adopted recommended spacing (80.00 %), seed treatment (80.00 %) followed by training of plants at right stage (78.33 %) and harvesting at proper stage (76.67 %). Whereas lesser adoption such as plant protection measures to control pest and diseases (30.00 %), growing trap crops (35.00 %) and recommended dose of fertilizer application (43.33 %). This is due to that simple production technology adopted more number of farmers compared to complicated technology. Similar results were reported by Alagukannan *et al*. (2015); Singh *et al*. (2014) and Changadeya *et al*. (2012).

The increased in adoption per cent of important package of practices were found to more in application of vegetable special (43.33 %) followed by training of plants at right stage (41.67 %), raising and selection of quality seedling from nursery (40.00 %) and timely irrigation (33.34 %). Whereas, the package of practices *viz*., plant protection measures to control pest and diseases (11.67 %), recommended dose of fertilizer application (13.33 %) and weed management (20.00 %) were found to less increased in adoption per cent after FLD. This might be due to that causes for major reduction of yield, simple production technology adopted more number of farmers compared to complicated technology (Mehta *et al*., 2012) and high cost of inputs of fertilizers, pesticides and non-availability of labour causes for adopted less number of farmers. These findings are in conformity with the results reported by Meena and Gupta (2015); Thakor and Patel (2006) and Aski *et al*. (2010).

Table 2 : Extent of adoption of recommended package of practices in tomato before and after front line demonstration (FLD) (n = 60)

Sr. No.	Package of practices (Technology intervention)	Adoption (Before FLD)		Adoption (After FLD)		Increased in adoption	
		No.	Per cent	No.	Per cent	No.	Per cent
1.	Selection of high yielding variety/ hybrid with pest and disease resistance/tolerance	18	30.00	37	61.67	19	31.67
2.	Seed treatment	34	56.67	48	80.00	14	23.33
3.	Raising and selection of quality seedling from nursery	17	28.33	41	68.33	24	40.00
4.	Recommended spacing	35	58.33	48	80.00	13	21.67
5.	Growing trap crops	02	3.33	21	35.00	19	31.67
6.	Recommended quantity of FYM application (Approx.)	14	23.33	27	45.00	13	21.67
7.	Recommended dose of fertilizer application	18	30.00	26	43.33	08	13.33
8.	Application of vegetable special /micro-nutrient	06	10.00	32	53.33	26	43.33
9.	Timely irrigation	23	38.33	43	71.67	20	33.34
10.	Weed management	28	46.67	40	66.67	12	20.00
11.	Training of plants at right stage	22	36.67	47	78.33	25	41.67
12.	Plant protection measures to control pest and diseases	11	18.33	18	30.00	07	11.67
13.	Harvesting at proper stage	34	56.67	46	76.67	12	20.00

Table 3 : Yield of tomato before and after front line demonstration (FLD) (n= 60)

Average yield of green tomato (t/ha)		Per cent increase over local
Before FLD (Farmers practice)	After FLD (Demonstrated production)	
41.67 t/ha	53.83 t/ha	29.18 %

Table 4 : Economics of tomato production before and after front line demonstration

Sr. No.	Items	Before FLD	After FLD
1.	Cost of cultivation (Rs./ha)	1,05,400	1,02,500
2.	Yield of tomato (t/ha)	41.67	53.83
3.	Gross return (Rs./ha)	2,50,020	3,22,980
4.	Net return (Rs./ha)	1,44,620	2,20,480
5.	B:C ratio	2.37	3.15

Impact of FLD on yield of tomato :

The information regarding the impact of FLD on yield has been presented in Table 3. The data revealed that the yield of tomato per hectare increased by 29.18 per cent in FLD plots. This yield indicates the significant difference in yield before and after conduct of FLD. It means that even after FLD, there was wider adoption of demonstrated technologies. These findings are in line with research of Yadav *et al.* (2004).

Impact of FLD on economic of tomato production:

The economic impact of demonstrated tomato production technology was worked out by calculating total cost of cultivation, gross return, net return and B:C ratio (BCR) of before FLD plot and after FLD plot. Total cost of cultivation was calculated by total sum of expenditure of land preparation, seed, manure and fertilizers, plant protection measures, irrigation and labour component. The data in Table 4 revealed that before FLD the yield of tomato was obtained 41.67 t/ha, while yield after FLD the was 53.83 t/ha. The farmers sold tomato at farmer field was Rs. 600 per quintal and on that base profitability was calculated (Balaji *et al.,* 2013 and Samui *et al.*, 2000). Which shows that net returns from tomato before FLD was Rs. 1,44,620/ha, while the net returns from tomato after FLD was Rs. 2,20,480/ha. The B:C ratio for before FLD was 2.37, which was increased to 3.15 after FLD. It is evident from the results that B:C ratio of tomato FLD is higher than before FLD. This might be due to higher adoption of all the package of practices recommended for tomato crop production in the region (Yadav *et al.,* 2004). However, increased in B:C ratio after FLD plot was due to adoption from 30.00 per cent to 80.00 per cent adoption of different package of practices even after FLD programme. This might be due to good extension contact by FLD farmers with the scientist and extension workers. Similar results were reported by Patel and Patel (2014); Shinde (2011) and Sharma *et al.* (2004).

Conclusion :

Front line demonstration programme was effective changing of farmers towards the adoption of production technology. Most of the farmers became aware about recommended production practices of tomato after conducting the front line demonstration on farmers field. More number of farmers were found to increased in adoption per cent of important package of practices such as application of vegetable special /micro-nutrient, training of plants at right stage and raising and selection of quality seedling from nursery after FLD as compared to before FLD. Yield of tomato, net return and B:C ratio were found to increased in demonstrated plot as compared to farmers practice. The adoption of different package of practices even though after FLD programme, which shows positive impact of FLD on adoption of demonstrated technology. The concept of Front line demonstration may be applied to all farmer categories including progressive farmers for speedy and wider dissemination of the recommended practices to other members of the farming community.

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