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RESEARCH ARTICLE

Effect of integrated crop management on yield and economics of green chilli (*Capsicum annuum* L.) at farmer's field of Tumkuru district

■ **Nagappa Desai, B. Mamatha and Chandru Patil**

SUMMARY

The frontline demonstrations were conducted to study the effect of integrated crop management on yield and economics of green chilli at farmer's field of Tumkuru district, Karnataka state during the year from 2011-12 to 2013-14. The data revealed that the total yield gap between potential yield and actual yield of green chilli was 47.14 per cent, in which 15.00 per cent of yield gap between demonstration plot and actual farmers plot yield and 32.14 per cent of technological gap. The maximum number of farmers adopted recommended spacing (93.33 %) followed by timely irrigation (90.00 %) and harvesting at right stage (90.00 %). The increased in adoption per cent of package of practices were found to more in use of growth regulator for control of flower drops (50.00 %), recommended spacing (43.33 %) and plant protection measures to control pest and diseases (40.00 %). There was significantly increased the yield of green chilli (28.38 %) after conducted the frontline demonstration programme. The 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 demonstrations programme, which shows positive impact of integrated crop management on yield and economics of green chilli through adoption of demonstrated technology.

Key Words : Adoption, Chilli, Frontline demonstration, Impact, Production technology

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MEMBERS OF THE RESEARCH FORUM

Author to be contacted :
Nagappa Desai, Krishi Vigyan Kendra (UAS), Konehalli, Tiptur Taluk, Tumkuru (Karnataka) India
Email : agridesai@gmail.com

Address of the Co-authors:
B. Mamatha, Krishi Vigyan Kendra (UAS), Konehalli, Tiptur Taluk, Tumkuru (Karnataka) India

Chandu Patil, Department of Horticulture, College of Horticulture (UAHS), Hiriyur, Chitradurga (Karnataka) India

Chilli (*Capsicum annuum* L.) is an important spice crop occupies an area of 8.34 lakh hectares in India with production of dry chilli 8.47 lakh tones. Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu and West Bengal are leading states in chilli cultivation in India. Karnataka stands second in area (2.37 L ha) and production (1.31 L tones), whereas eighth ranks in productivity with an average yield of 744 kg of dry chilli per hectare (Anonymous, 2015). The chilli is cultivated

all season of the year in Tumkuru district, which gives good returns to the farmers. Krishi Vigyan Kendra, Konehalli, Tiptur conducted frontline demonstrations at farmers' field. The main objective of frontline demonstration 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, and also convincing farmers and extension functionaries together about the chilli production technologies for further wide scale diffusion. Keeping in view of an effective extension approach of frontline demonstrations for dissemination of chilli production technology, its impact of FLDs conducted to be assessed. Therefore, the present study was conducted with the specific objectives to evaluate the frontline demonstration in terms of adoption of integrated crop management in green chilli through frontline demonstration technology and to know the impact of FLD on chilli growing farmers.

Main objective :

– To study the extent of adoption of integrated crop management in chilli production technology before and after conduct of frontline demonstration.

– To study yield gap identified in chilli production in Tumkuru district.

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

MATERIAL AND METHODS

The frontline demonstrations were conducted on effect of integrated crop management (ICM) in green chilli at farmer's field of Tumkuru district, Karnataka state during the year from 2011-12 to 2013-14. The selected 90 farmers for frontline demonstration of ICM in green chilli at Ramanahalli, Nagathihalli, Bommalapur village of Tiptur taluks in Tumkur district under ICAR and RKVY-IFSD project. The critical inputs were supplied to farmers and applied as per the package of practices for chilli crop recommended by University of Agricultural Sciences, GKVK, Bengaluru (Anonymous, 2015). Demonstrated plot at farmer's fields were regularly monitored by scientists of Krishi Vigyan Kendra, Konehalli, Tiptur from sowing to harvesting and marketing. Randomly ten farmers from each village were selected to making a total sample size of thirty. The basic data of the respondents were collected before and after

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

Particulars	Frontline demonstration (Demonstrated package)	Farmers practice (Local check)
Selection of variety /hybrid	Arka Haritha – Hybrid variety, tolerance to sucking pest and viral disease	Local or unknown private variety, no information
Seed treatment	Seed treated with fungicide carbendizim	Not followed
Pro-tray method of raising the seedling in the nursery	Pro-tray method of raised seedling in shadenet house with Nylon mesh and selected good quality seedling	Pro-tray method of raised seedling in shadenet house and selected unknown poor quality seedling
Spacing	75 cm x 45 cm	75 cm x 60 cm
Application of farm yard manure	Applied 25 t/ha FYM before 3 week of transplanting	Applied 3 tractor load FYM (4-5 t/tractor load) during ridges and furrow preparation (2-3 day before transplanting)
Application of recommended dose of fertilizers	150 kg N + 75 kg P_2O_5 + 75 kg K_2O per ha (50 % NPK at the time of transplanting and remaining 50 % NPK applied at 6 week after planting)	After transplanting, applied 17:17:17 NPK + 20:20:0 NPK mixed chemical fertilizer (Approx. 10-12 g/plant) 3 – 4 times during crop period
Irrigation	Drip or furrow method of irrigation once in 3-5 days depend upon soil condition	Furrow method of irrigation once/twice in a week
Weed management	Pre-emergence herbicide - butachlor @1.5 L/ha and hand weeding	Hand weeding 3 to 4 times
Use of growth regulator for control of flower drops	Sprayed with 50 ppm NAA (Planofix)	Not followed
Plant protection measures to control pest and diseases	Need based application for control: Aphids and Thrips – Sprayed diamethoate (30 EC) @1.7 ml/L of water. Spayed dicofol @ 2.5 ml/L of water at 7^{th} and 11^{th} week after transplanting for control of mites. Control of powdery mildew - hexaconazol @ 0.5ml/L of water. Fruit rot – carbendizim @ 1 g/L of water Leaf curling – Imidaclopride @ 0.3 ml/L of water.	Not followed, irrespective of disease and pest, used plant protection chemical combined together with growth regulator without knowing compatibility of chemicals and not identified pest and disease for spraying.
Harvesting	Manual	Manual
Yield of green chilli	23.75 t/ha	18.50 t/ha

initiation of frontline demonstration 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 of horticultural department in the district. 30 farmer's field with an area of 12 ha was selected under these FLDs. The information on demonstrated package of practices and farmers' practices followed as mentioned in Table A. The data were analysed with appropriate statistical procedures.

The data collected on potential yield of the green chilli in a given situation. The demonstrated plot yield was recorded from frontline demonstrations conducted in the farmers field under the close supervision of scientists from Krishi Vigyan Kendra, Konehalli 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. The technological gap (Yield gap-I) obtained by the differences between potential yield and demonstration plot yield, difference between demonstration plot yield and actual yield as extension gap (yield gap- II) and total yield gap obtained by difference between potential yield and actual yield were worked out.

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

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

Potential yield - Actual yield = Total yield gap

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Yield gap in green chilli production:

The yield gaps are presented in Table 1. The potential yield of green chilli was found to be 35.00 t/ha and the demonstrated plot yield obtained through frontline demonstrations was 23.75 t/ha. The actual yield obtained by the farmers on their farm with their own resources and management practices was 18.50 t/ha. The magnitude of technological gap (yield gap-I) was 11.25 t/ha, which was 32.14 per cent lesser than the maximum attributable yield. Extension gap (yield gap-II) refers to the difference between demonstration plot yield and actual yield and it was 5.25 t/ha. There was 15 per cent reduction in yield as compared to demonstration plots yield. A sizable total yield gap of 16.50 t/ha was observed and it accounted for 47.14 per cent. These findings are in agreement with that of Kaur *et al.* (2013) and Mitra and Samajdar (2010).

Table 1 : Yield gap identified in green chilli production

Particulars	Yield (t/ha)	Percentage gap
Potential yield	35.00	--
Demonstration plot yield	23.75	--
Actual yield (Farmers practice)	18.50	--
Technological gap (Yield gap I)	11.25	32.14
Extension gap (Yield gap II)	5.25	15.00
Total yield gap	16.50	47.14

The large total yield gap may be due to attributed by environmental differences between research stations, extension worker and farmer's fields and also non adoption of production technology (Mishra *et al*., 2007 and Kiran, 2003). It can be reduced through considerable co-ordination between researchers, extension workers and farmers. These findings are similar with those of Hiremath and Hilli (2012) and Jadav and Solanki (2009).

The adoption level of package of practices in ICM of green chilli:

The data found that (Table 2) that maximum respondents was adopted recommended production practices such as spacing (93.33 %) followed by timely irrigation (90.00 %), harvesting at right stage (90.00 %), selection of high yielding variety/ hybrid with pest and disease tolerance (86.67 %) and weed management (86.67 %). Whereas lesser adoption of recommended fertilizer dose (63.33 %), plant protection measures to control pest and diseases (66.67 %) and use of growth regulator for control of flower drops (70.00 %). This might be due to that more number of farmers adopted a simple production technology compared to complicated technology. Similar results were reported by Singh *et al*. (2014); Changadeya *et al*. (2012) and Jadav and Solanki (2009).

The increased in adoption per cent package of practices were found to more in use of growth regulator for control of flower drops (50.00 %), recommended spacing (43.33 %) and plant protection measures to control pest and diseases (40.00 %). Whereas, the package of practices *viz*., harvesting at right stage, timely irrigation, weed management and application of recommended quantity of farm yard manures for chilli were found to lesser increased in adoption per cent after frontline demonstration (Mehta *et al.*, 2012). This might

be due to that causes for high reduction in yield. These findings are in conformity with the results reported by Alagukannan *et al.*(2015), Aski and Hirevenkanagoudar (2010) and Thakor and Patel (2006).

Impact of ICM on yield of green chilli:

The information regarding the impact of integrated crop management on yield of green chilli through frontline demonstration are presented in Table 3. The data revealed that the increased in yield of green chilli per hectare by 28.38 per cent in FLD plots. The yield of green chilli was significantly differences 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 Meena and Gupta (2015); Patel and Patel (2014) and Yadav *et al.* (2004).

Economics of green chilli production:

The economic impact of demonstrated production practices of green chilli was worked out by calculating total cost of cultivation, gross return, net return and B:C ratio (BCR) of before and after frontline demonstrated plot. Total cost of cultivation was calculated by total sum of expenditure of land preparation, seed, manure and fertilizers, weeding, plant protection measures, irrigation, labour component and harvesting. The data (Table 4) revealed that yield of green chilli was obtained 18.50 t/ha before FLD and 23.75 t/ha after FLD. The farmers sold green chilli Rs. 1000 per quintal at farmer field and base on that profitability was calculated (Balaji *et al.*, 2013 and Samui *et al.*, 2000). Which shows that net returns Rs. 1,06,500/ha from green chilli before FLD, while the net returns Rs. 1,55,940/ha from green chilli after FLD. The B:C ratio for before FLD was 2.36, which was increased to 2.91 after FLD. It was evident from the results that B:C ratio of green chilli in FLD was higher than before FLD. This might be due to higher adoption of all the package of practices recommended for green chilli production in the region. However, increase in B:C ratio after FLD plot was due to adoption of production technology from 66.33 per cent to 93.33 per cent. This might be due to good extension contact by FLD farmers

Table 2 : The adoption level of package of practices in ICM of green chilli **(n=30)**

Sr. No.	Package of practices	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 tolerance	16	53.33	26	86.67	10	33.34
2.	Seed treatment	17	56.67	25	83.33	07	26.66
3.	Selection of quality seedling from nursery	13	43.33	24	80.00	10	36.67
4.	Recommended spacing	15	50.00	28	93.33	13	43.33
5.	Recommended quantity of FYM application (Approx.)	14	46.67	22	73.33	09	26.66
6.	Application of recommended dose of fertilizer	09	30.00	19	63.33	10	33.33
7.	Timely irrigation	21	70.00	27	90.00	06	20.00
8.	Weed management	19	63.33	26	86.67	07	23.34
9.	Use of growth regulator for control of flower drops	06	20.00	21	70.00	15	50.00
10.	Plant protection measures to control pest and diseases	08	26.67	20	66.67	12	40.00
11.	Harvesting at right stage	22	73.33	27	90.00	05	16.67

Table 3 : Yield of green chilli before and after frontline demonstration **(n= 30)**

Average yield of green chilli (t/ha)		Per cent increased in yield
Before FLD (Farmers practice)	After FLD (Demonstrated production)	
18.50 t/ha	23.75 t/ha	28.38

Table 4 : Economics of green chilli production before and after frontline demonstration

Sr. No.	Particular	Before FLD	After FLD
1.	Cost of cultivation (Rs./ha)	78,500	81,560
2.	Yield of green chilli (t/ha)	18.50	23.75
3.	Gross return (Rs./ha)	1,85,000	2,37,500
4.	Net return (Rs./ha)	1,06,500	1,55,940
5.	B:C ratio	2.36	2.91

with the scientist and extension workers. Similar results were reported by Patel and Patel (2014); Shinde (2011) and Sharma and Sharma (2004).

Conclusion :

The effective changing of farmers towards the adoption of integrated crop management in green chilli through frontline demonstration. The most of the farmers became aware about recommended package of practices for production of chilli crop after conducting the frontline demonstration at farmer's field. The more number of farmers were found to increased in adoption per cent of important package of practices such as use of growth regulator for control of flower drops, recommended spacing, plant protection measures to control pest and diseases, application of recommended fertilizer dose and selection of quality seedling from nursery after FLD as compared to before FLD. Yield of green chilli, net return and B:C ratio were found to increase in demonstrated plot as compared to farmers practice. The adoption of package of practices for production of green chilli even though after FLD programme, which shows positive impact of integrated crop management in green chilli through adoption of demonstrated technology. The concept of frontline demonstration may be applied to all farmers including progressive farmers for speedy and wider dissemination of the recommended practices to other members of the farming community.

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