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Effect of Integrated Crop Management on Yield and Economics of Mango through Frontline Demonstration in Tumkuru District, Karnataka, India

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A B S T R A C T

The effect of integrated crop management on yield and economics of mango through frontline demonstration at farmer's field of Tumkuru district, Karnataka state during the year from 2017-18 to 2019-20. The data revealed that the total yield gap between potential yield and actual yield of mango was 37.25 per cent, in which 16.00 per cent of yield gap between demonstration plot and actual farmers plot yield and 21.25 per cent of technological gap. The maximum number of farmers was adopted growing legumes as intercropping (86.67 %) followed by recommended quantity of farm yard manure application (83.33%), The increased in adoption per cent of package of practices were found to more in of mango special spraying (56.67 %) and growth regulators spaying (46.67 %). There was significantly increased the yield of mango (25.50 %) 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 mango through adoption of demonstrated technology.

Introduction

The Mango (*Mangifera indica* L) is belongs to family Anacardiaceae and commercially cultivated in more than 80 countries like Brazil, China, Egypt, India, Indonesia, Mexico, Pakistan, Phillipines, Thailand and Vietnam, among these countries the India is ranking number one in mango production, It is called "the king of fruits" on account of its nutritive value, taste, attractive fragrance and health promoting qualities (Banarjee, 2011).

In India, the major mango growing states are Andhra Pradesh, Uttar Pradesh, Karnataka, Bihar, Gujarat and Tamil Nadu and it occupied about 46 per cent of the global area and 40 per cent of the global production (Palanivel *et al.,* 2015)**.** Mango cultivated over an area of 2258 thousand hectares with an annual production of 21822 thousand metric tones in India during 2017-18 (Horticulture statistics at glance 2018, GOI).

The need of present era is to increase the productivity of each and every crop. This could be achieved by adopting improved production practice, high yield varieties and new technologies of crop. 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 mango production technologies for further wide scale diffusion. Keeping in view of an effective extension approach of frontline demonstrations for dissemination of mango 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 and economics of mango through frontline demonstration technology and to know the impact of FLD on mango growing farmers.

Main objective

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

To study yield gap identified in mango production in Tumkuru district.

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

Materials and Methods

The frontline demonstrations were conducted on effect of integrated crop management (ICM) and economics of mango at farmer's field of Tumkuru district, Karnataka state during the year from 2017-18 to 2019-20. The mango (Alphonso variety) orchards of uniform age (14-16 years old) were selected at different villages of Gubbi taluks in Tumkur district under ICAR project. To create awareness among the mango growers and to upscale their knowledge, KVK conducted capacity building programmes (On and Off campus training programmes), workshops as part of frontline demonstrations (FLD). The critical inputs were supplied to farmers and applied as per the package of practices of new technology for mango crop recommended by University of Agricultural Sciences, GKVK, Bengaluru and IIHR, Bengaluru (Anonymous. (2015). Demonstrated plot at farmer's fields were regularly monitored by scientists of Krishi Vigyan Kendra, Konehalli, Tiptur from vegetative to flowering, harvesting and marketing every year in selected 10 mango grower's orchards of the district.

The basic data of the respondents were collected before and after initiation of frontline demonstration by personal interview technique with the help of interview schedule developed for the study. 30 farmer's field with an area of 6 ha was selected under these FLDs. The information on demonstrated package of practices and farmers practices followed as mentioned in Table 1. The data were analysed with appropriate statistical procedures. The demonstrated plot yield was recorded from frontline demonstrations conducted in the farmer's 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.

Results and Discussion

Yield gap in mango production

The yield gaps are presented in Table 2. The potential yield of mango was found to be 120.00 q/ha and the demonstrated plot yield obtained through frontline demonstrations was 94.50 q/ha. The actual yield obtained by the farmers on their farm with their own resources and management practices was 75.30 q/ha. The magnitude of technological gap (yield gap-I) was 25.50 q/ha, which was 21.25 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 19.20 q/ha. There was 16 per cent reduction in yield as compared to demonstration plots yield. A sizable total yield gap of 44.70 q/ha was observed and it accounted for 37.25 per cent. These findings are in agreement with that of Amandeep Kaur *et al.,* (2013) and Biplab and Tanmay (2010).

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 with Hiremath and Hilli (2012) and Jadav and Solanki (2009).

The adoption level of package of practices in ICM of mango

The data found that (Table 3) that maximum respondents was adopted recommended production practices such as growing legumes as intercropping (86.67 %) followed by recommended quantity of farm yard manure application (83.33%), Whereas lesser adoption of application of paclobutrazol (50.00 %), 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 *et al.,* (2009). The increased in adoption per cent package of practices were found to more in spraying of mango special (56.67 %) and spaying of growth regulators (46.67 %). Whereas, the package of practices *viz*., growing legumes as intercropping, Water management and application of recommended quantity of farm yard manures for mango 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) and Aski *et al.,* (2010)

Table.1 Demonstrated package of practices and farmers practices for ICM in mango

Sl. No.	Technologies	Frontline demonstration (Demonstrated package)	Farmers practices (Local check)
1	Pruning and canopy management	Removed the dried, infested and dense canopy after harvesting of previous mango fruits.	Not followed
2	Recommended quantity of farm yard manure application	Applied 25 kg per tree per year	Applied 2-3 bucket or basket per tree per year
3	Recommended dose of inorganic fertilizer application	730 g N + 180 g P_2O_5 + 680 g K_2O per tree per year (50 % NPK after harvesting and remaining 50 % NPK applied at Oct-Nov.) based on soil sample analysis report	Applied one time 17:17:17 NPK + 20:20:0 NPK mixed chemical fertilizer (Approx. 500 g/tree/year)
4	Water management	Drip irrigation	Irregular
5	Growing legumes as intercropping	Grown green gram as intercrop for additional income and also improved the soil fertility	Growing Ragi/fodder crops as intercrops.
6	Spraying with Mango special (micronutrient)	Sprayed IIHR Mango special at 75 g in 15 litre of water with one lemon juice and one shampoo sachet (Rs.1/-) during Sept. Oct. Nov. & December month	Not sprayed any micronutrients
7	Application of Paclobutrazol	Applied of Paclobutrazol drenching @ 5 ml/ 10 liter of water for inducing regular bearing	Not followed
8	Spaying of growth regulators for reduce flower and fruit drops	Sprayed 20 ppm NAA for reduce flower and fruit drops	Sprayed unknown chemicals
9	Plant protection measures to control pest and diseases	1) Mango hopper management: Sprayed Imidaclopride @ 0.3 ml/L of water. 2) Fruit fly management: used pheromone traps 10 No./ha. 3) Powdery mildew management: Sprayed Hexaconazol 5 EC @ 1 ml/L of water 4) Anthracnose**:** Sprayed Carbondizim @ 1 g/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.
10	Harvesting method	Used UAS Bengaluru improved mango harvester	Local harvester caused damaging the fruits

Table.2 Yield gap identified in mango production

Particulars	Yield (q/ha)	Percentage gap
Potential yield	120.00	--
Demonstration plot yield	94.50	--
Actual yield (Farmers practice)	75.30	--
Technological gap (Yield gap I)	25.50	21.25
Extension gap (Yield gap II)	19.20	16.00
Total yield gap	44.70	37.25

Table.3 The adoption level of package of practices in ICM of mango

(n=30)

Sl. No.	Package of practices	Adoption (Before FLD)		Adoption (After FLD)		Increased in adoption	
	Technologies	No.	Per cent	No.	Per cent	No.	Per cent
1.	Pruning and canopy management	04	13.33	16	53.33	12	40.00
2.	Recommended quantity of farm yard manure application	17	56.67	25	83.33	08	26.66
3.	Recommended dose of inorganic fertilizer application	12	40.00	21	70.00	09	30.00
4.	Water management	15	50.00	23	76.67	08	26.66
5.	Growing legumes as intercropping	19	63.33	26	86.67	07	23.34
6.	Spraying with Mango special (micronutrient)	05	16.67	22	73.33	17	56.67
7.	Application of Paclobutrazol	02	6.67	15	50.00	13	43.33
8.	Spaying of growth regulators	06	20.00	20	66.67	14	46.67
9.	Plant protection measures to control pest and diseases	11	36.67	22	73.33	11	36.67
10.	Harvesting method by harvester	16	53.33	24	80.00	08	26.66

Table.4 Yield of mango before and after frontline demonstration

(n= 30)

Average yield of mango (q/ha)		Per cent increased in yield
Before FLD (Farmers practice)	After FLD (Demonstrated production)	
75.30 q/ha	94.50 q/ha	25.50

Table.5 Economics of mango production before and after frontline demonstration

Sl. No.	Particular	Before FLD	After FLD
1.	Cost of cultivation (Rs/ha)	54,500	58,600
2.	Yield of mango (q/ha)	75.30	94.50
3.	Gross Return (Rs/ha)	1,35,540	1,70,100
4.	Net Return (Rs/ha)	81,040	1,11,500
5.	B:C ratio	2.49	2.90

Impact of ICM on yield of mango

The information regarding the impact of integrated crop management on yield of mango through frontline demonstration are presented in Table 4. The data revealed that the increased in yield of mango per hectare by 25.50 percent in FLD plots. The yield of mango 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 *et al.,* (2015) and Patel *et al.,* (2014).

Economics of mango production

The economic impact of demonstrated production practices of mango 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. The data (Table 5) revealed that yield of mango was obtained 75.30 q/ha before FLD and 94.50 q/ha after FLD. The farmers sold mango at average rate Rs. 1800 per quintal at farmer field and base on that profitability was calculated (Balaji *et al.,* 2013). Which shows that net returns Rs. 81,040/ha from mango before FLD, while the net returns Rs. 1,11,500/ha from mango after FLD. The B:C ratio for before FLD was 2.49 which was increased to 2.90 after FLD. It was evident from the results that B:C ratio of mango in FLD was higher than before FLD. This might be due to higher adoption of all the package of practices recommended for mango production in the region and good extension contact by FLD farmers with the scientist and extension workers. Similar results were reported by Patel *et al.,* (2014) and Shinde (2011).

The effective changing of farmers towards the adoption of integrated crop management in mango through frontline demonstration. The most of the farmers became aware about recommended package of practices for production of mango 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 mango special spraying, growth regulators spraying after FLD as compare to before FLD. Yield of mango, net return and B:C ratio were found to increased in demonstrated plot as compared to farmers practice. The adoption of package of practices for production of mango even though after FLD programme, which shows positive impact of integrated crop management in mango 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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