Journal of Scientific Research and Reports

Volume 30, Issue 12, Page 990-996, 2024; Article no.JSRR.129868
ISSN: 2320-0227

Assessment of Integrated Crop Management for Enhancing Mango Yield through Front Line Demonstrations in Sangareddy District, Telangana, India

K. Saritha [a*], K. Rahul Viswakarma [a], Rekha Manoj [a] and R. Uma Reddy [a]

[a] *Professor Jayashankar Telangana Agricultural University, India.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jsrr/2024/v30i122772

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/129868

Original Research Article

Received: 28/10/2024
Accepted: 30/12/2024
Published: 31/12/2024

ABSTRACT

The study assessed the impact of Integrated Crop Management (ICM) practices on mango yield and profitability through frontline demonstrations conducted in Sangareddy district, Telangana, during 2020–2021 and 2021–2022. The findings revealed a total yield gap of 63.5% between potential and actual mango yields, comprising a 27.75% gap between demonstration plots and farmers practice plots and a 35.8% technological gap. High adoption rates were recorded for key

**Corresponding author: E-mail: sarayuu.saritha@gmail.com;*

Cite as: *Saritha, K., K. Rahul Viswakarma, Rekha Manoj, and R. Uma Reddy. 2024. "Assessment of Integrated Crop Management for Enhancing Mango Yield through Front Line Demonstrations in Sangareddy District, Telangana, India". Journal of Scientific Research and Reports 30 (12):990-96. https://doi.org/10.9734/jsrr/2024/v30i122772.*

practices, such as water management during flowering and fruiting (93.3%), harvesting methods (90.0%), the recommended dose of inorganic fertilizers (83.3%), cultivating legumes as intercrops (80.0%) and applying the recommended amount of farmyard manure (76.6%). Additionally, adoption rates for mango-specific sprays (70.0%) and growth regulator sprays (40.0%) increased significantly following the demonstrations. The demonstration showed a 43.0% increase in mango yield, with demonstration plots outperforming traditional practices in both productivity and profitability. Economic analysis showed higher net returns and benefit-cost (B:C) ratios in the demonstration plots compared to farmers conventional practices. These results underscore the positive impact of ICM practices on mango productivity and profitability, emphasizing the need for adopting improved technologies to promote sustainable mango cultivation.

Keywords: Demonstrations; mango; technology; yield.

1. INTRODUCTION

Mango (*Mangifera indica* L.), a member of the family Anacardiaceae, is commercially cultivated in over 80 countries, India leads global mango production and is popularly known as the "king of fruits" due to its rich nutritional value, delectable taste, appealing aroma, and health benefits (Khan, 2022, Banarjee, 2011). “Major mango-producing states in India include Andhra Pradesh, Uttar Pradesh, Karnataka, Bihar, Gujarat, and Tamil Nadu, contributing about 46% of the global mango cultivation area and 40% of total production” (Palanivel *et al*., 2015, Khan *et al.*, 2020; Nagappa *et al*., 2021). “In India during 2022-23, Mango acreage decreased by 0.76% to 23.32 lakh hectares (57.62 lakh acres) with 209.27 lakh tonnes production (2nd advance estimates) as compared to 207.72 lakh tonnes production from 23.50 lakh hectares (58.06 lakh acres) during the last year” (https://agmarknet.gov.in/). “In Telangana during 2022-23 area covered under mango was 1.31lakh ha (3.24 lakhacres). Major Mango growing districts in Telangana are Nagarkurnool 13.86 thousand ha (34.26 thousand acres), Jagityal 13.78 thousand ha (34.05 thousand acres), Khammam 13.71 thousand ha (33.9 thousand acres), and Sangareddy 5.93 thousand ha (14.67 thousand acres)” (https://agmarknet.gov.in/).

Enhancing crop productivity is vital for meeting the growing demand and can be achieved through advanced production techniques, high-yielding varieties, and innovative crop management practices. To address this, the District Agricultural Advisory and Transfer of Technology Centre, Sangareddy, under PJTAU organized frontline demonstrations in farmers’ fields, showcasing improved practices to promote sustainable and high-yielding mango cultivation.

This study was conducted with the following objectives:

The study aimed to evaluate the yield gaps in mango production within the Sangareddy district and to assess the adoption of integrated crop management (ICM) practices in mango cultivation, both before and after the implementation of frontline demonstrations (FLDs). Additionally, it sought to examine the economic impact of mango production practices prior to and following the adoption of FLDs.The findings aim to highlight the effectiveness of FLDs in enhancing mango cultivation practices, bridging yield gaps, and improving farmers' economic returns (Anonymous 2015).

2. MATERIALS AND METHODS

Frontline demonstrations (FLDs) were carried out during 2020–21 and 2021–22 in Sangareddy district, Telangana, to assess the impact of Integrated Crop Management (ICM) practices and the economics of mango cultivation. The demonstrations focused on Banganpally (Beneshan) mango orchards, uniformly aged 12–15 years, across various villages in the district. To raise awareness and enhance the knowledge of mango growers, the DAATT Centre, Sangareddy conducted capacity-building initiatives, including on-campus and off-campus training programs and workshops, as part of the FLD activities. Farmers were provided with critical inputs and guided to apply them according to the package of practices recommended by SKLTHU, Rajendranagar, Hyderabad.

Scientists from the DAATT Centre, Sangareddy, regularly monitored the demonstration plots at all stages of cultivation, including pruning, flowering, fruiting, harvesting, and marketing. These efforts were implemented annually in 15 selected mango orchards, ensuring the effective adoption of improved practices and sustainable mango production.

Baseline data from the respondents were collected before and after the implementation of frontline demonstrations (FLDs) through personal interviews using a structured interview schedule developed for the study. A total of 30 farmers' fields, covering 6 hectares, were selected for the demonstrations. Details of the recommended package of practices and the farmers' existing practices are presented in Table 1. The collected data were analysed using appropriate statistical methods.

Yields from the demonstration plots were recorded under the close supervision of scientists from the DAATT Centre, Sangareddy, across various locations in the district. Additionally, information on actual yields achieved by farmers under their traditional management practices was gathered for comparison.

The following yield gaps were calculated:

1. **Technological gap (Yield Gap-I):** The difference between the potential yield and the yield from the demonstration plots.
2. **Extension gap (Yield Gap-II):** The difference between the demonstration plot yield and the yield achieved by farmers under their practices.
3. **Total yield gap:** The difference between the potential yield and the actual yield achieved by farmers.

These analyses provided insights into the impact of FLDs in reducing yield gaps and improving mango cultivation practices.

%’ increased yield = Demonstration yield- Farmers yield / Farmers yield

Technology gap = (Potential yield) – (Demonstration yield)

Extension gap = Demonstration yield – yield under existing practice

3. RESULTS AND DISCUSSION

3.1 Yield Gap in Mango Production

The yield gaps in mango production, as presented in Table 2, highlight significant differences between potential, demonstrated, and actual yields. The potential yield of mango was found to be 120.00 q/ha, while the demonstrated yield obtained through frontline demonstrations was slightly lower at 115.70 q/ha. However, the actual yield achieved by farmers using their own resources and management practices was significantly lower, at 82.40 q/ha. The technological gap (yield gap-I), which represents the difference between the potential yield and the demonstrated yield, was 43.0 q/ha, accounting for a 35.8% reduction from the maximum attainable yield. The extension gap (yield gap-II), or the difference between the demonstrated yield and the actual yield, was 33.3 q/ha, indicating a 27.75% reduction compared to the demonstrated plots. Overall, a substantial total yield gap of 76.3 q/ha was observed, representing a 63.5% shortfall in achieving the potential yield.

These findings align with the results reported by Amandeep Kaur *et al.* (2013) and Biplab and Tanmay (2010). The large total yield gap can be attributed to environmental differences between research stations, extension workers, and farmers’ fields, as well as the non-adoption of recommended production technologies, as noted by Mishra *et al.* (2007) and Kiran (2003). Addressing this gap requires effective coordination between researchers, extension workers, and farmers. These results are consistent with the findings of Hiremath and Hilli (2012) and Jadav and Solanki (2009).

3.2 The Adoption Level of The Package of Practices in ICM of Mango

The adoption levels of recommended practices in Integrated Crop Management (ICM) for mango, as presented in Table 3, revealed that most respondents implemented practices such as water management (93.3%), harvesting methods (90.0%), recommended doses of inorganic fertilizers (83.3%), intercropping with legumes (80.0%), and application of the recommended quantity of farmyard manure (76.6%). These high adoption rates can be attributed to the simplicity of these practices compared to more complex technologies. Similar observations were reported by Singh *et al.* (2014), Changadeya *et al.* (2012), and Jadav *et al.* (2009).

Notably, the adoption percentages increased more significantly for practices like spraying mango special (70.0%) and spraying growth regulators (40.67%). However, practices such as intercropping with legumes, water management, and the application of farmyard manure showed relatively smaller increases in adoption rates after frontline demonstrations. According to Mehta *et al*. (2012), this lower increase in adoption may contribute to a significant reduction in yield. These findings align with those 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 previous mango fruits.	Improper pruning
2	Recommended quantity of farm yard manure application	Applied 25 kg per tree per year	Applied 2-3 buckets or baskets per tree per year
3	Recommended dose of fertilizer application	730 g N + 180 g P2O5 + 680 g K2O 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	Flood/channel irrigation
5	Growing legumes as intercropping	Grown green gram as intercrop for additional income and also improved the soil fertility	Growing green manure crops 3 years intervals.
6	Spraying with Mango special (micronutrient	Sprayed IIHR Mango special at 75 g in 15 liters of water with one lemon juice and one shampoo sachet (Rs.1/) during Sept. Oct. Nov. & December month	sprayed micronutrients at improper time and dosage
7	Spaying of growth regulators to reduce flower and fruit drops	Sprayed 20 ppm NAA to reduce flower and fruit drops	Sprayed pesticides in place to growth regulators
8	Plant protection measures to control pests and diseases	1) Mango hopper management: Sprayed Imidacloprid @ 0.3 ml/L of water. 2) Fruit fly management: used pheromone traps 10 No./ha. 3) Powdery mildew management: Sprayed Hexaconazole 5 EC @ 2 ml/L of water 4) Anthracnose: Sprayed Carbendazim @ 1.5 g/L of water.	Not followed, irrespective of disease and pest, used plant protection chemical combined with growth regulator without knowing the compatibility of chemicals and not identified pest and disease for spraying.
9	Harvesting method	Used UAS Bengaluru improved mango harvester	Manual harvesting causes damage to fruits.

Table 2. Yield gap identified in mango production

Particulars	Yield q/ha	Percentage gap
Potential yield q/ha	120	--
Demonstration Yield q/ha	115.7	--
Farmer practice	82.4	--
Technology gap (yield gap I)	43	35.8
Extension Gap (Yield gap II)	33.3	27.75
Total Yield gap	76.3	63.5

3.3 Impact of ICM on Mango Yield

The impact of Integrated Crop Management (ICM) on mango yield through frontline demonstrations is summarized in Table 4. The data indicates a significant increase in mango yield, with a 25.50% improvement per hectare in the FLD plots. The yield of mangoes showed a notable difference before and after the implementation of the FLD, highlighting the wider adoption of the demonstrated technologies by farmers. These findings are consistent with the research conducted by Meena *et al*. (2015) and Patel and Patel (2014).

3.4 Economic Analysis of Mango Production

The economic impact of demonstrated production practices for mango was analysed by calculating the total cost of cultivation, gross return, net return, and benefit-cost ratio (BCR) before and after the implementation of frontline demonstrations (FLD). The data presented in Table 5 shows that mango yield increased from 82.4 q/ha before FLD to 115.7 q/ha after FLD. Farmers sold mangoes at an average rate of ₹2880 per quintal, and profitability was calculated based on this rate (Balaji *et al.,* 2013)

The results revealed net returns of ₹93,785/ha before FLD, which increased significantly to ₹1,52,681/ha after FLD. The benefit-cost ratio also improved, rising from 1.6 before FLD to 2.0 after FLD. This indicates that the BCR of mango production was higher after FLD, which can be attributed to the higher adoption of recommended practices for mango production and effective extension contact between FLD farmers, scientists, and extension workers. These findings are consistent with those reported by Patel and Patel (2014) and Shinde (2011).

Table 3. The adoption level of the package of practices in ICM of mango (n=30)

Sl. No.	Package of practices Adoption	Adoption (Before FLD)		Adoption (After FLD)		Increased in adoption Technologies	
		No	Percent	No	Percent	No	Percent
1	Pruning and canopy management	06	20	18	60	12	40
2	Recommended quantity of farm yard manure application	14	46.6	23	76.6	09	30
3	Recommended dose of inorganic fertilizer application	15	50	25	83.3	10	33.3
4	Water management	17	56.6	28	93.3	11	36.6
5	Growing legumes as intercropping	13	43.3	24	80	11	36.6
6	Spraying with Mango special (micronutrient)	8	26.6	21	70	14	46.6
7	Spaying of growth regulators	08	26.6	12	40	4	13.3
8	Plant protection measures to control pests and diseases	10	33.3	23	76.6	13	43.3
9	Harvesting method by harvester	12	40	27	90	15	50

Table 4. Yield of mango before and after frontline demonstration n=30

Average yield of mango (q/ha)		Percent increase in yield
Before FLD (Farmer Practice)	**After FLD (Demonstrated Field)**	
82.4 q/ha	115.7q/ha	33.3

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

S. No.	Particular	Before FLD	After FLD
1	Cost of cultivation (Rs/ha)	144940	180892
2	Yield of mango (q/ha)	82.4	115.7
3	Gross Return (Rs/ha)	237369.6	364416
4	Net Return (Rs/ha)	93785	152681
5	B: C ratio	1.6	2.0

The adoption of Integrated Crop Management (ICM) practices in mango cultivation through frontline demonstrations (FLD) led to significant changes in farmers' practices. Most farmers became aware of the recommended package of practices for mango production after the FLD was conducted in their fields. A noticeable increase in the adoption percentage was observed for key practices, such as spraying mango special and growth regulators, after the FLD compared to before its implementation. The yield of mango, along with net returns and the benefit-cost (B:C) ratio, showed substantial improvements in the FLD plots compared to traditional farmer practices.

The positive impact of ICM in mango production was evident from the increased adoption of demonstrated technologies even after the FLD program. This highlights the effectiveness of frontline demonstrations in promoting advanced practices. Applying this concept more broadly, including to progressive farmers, can facilitate the rapid and widespread dissemination of recommended practices across the farming community

4. CONCLUSION

The findings of this study highlight the significant potential of ICM practices in bridging yield gaps and enhancing economic returns in mango production. The yield analysis underscores substantial differences between potential, demonstrated, and actual yields. The FLDs proved instrumental in reducing these gaps by promoting the adoption of improved practices and resulting in a 25.50% increase in yield. Economic analysis further revealed that FLD implementation significantly enhanced profitability, increasing net returns and improving the benefit-cost ratio from 1.6 to 2.0. Expanding the scope of such demonstrations and targeting progressive farmers can accelerate the adoption of these practices, ultimately bridging yield gaps and benefiting the broader farming community.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Alagukannan, G., Velmurugan, P. and Ashok Kumar, M. (2015). Impact of interventions on knowledge and adoption of improved technologies in Banana cultivation. *J. Krishi Vigyan*, 3(2): 54-58.

Amandeep Kaur, Hardeep S. S., Gurpreet Singh, Jaswinder Singh and Gurpreet Kaur. (2013). Yield gap analysis in paddy based on demonstration on seed treatment technique for control of bacterial leaf blight. *J. Krishi Vigyan*, 2(1): 79-81.

Anonymous. (2015). Improved Production practices in Agricultural and Horticutlural crops, University of Agricultural Sciences, Bengaluru, Karnataka. Aski, S. G. and Hirevenkanagoudar, L. V. (2010). Extent of adoption of improved mango cultivation practices by the KVK trained farmers. *Asian Sciences*, 5(2): 98-101.

Aski, S. G. and Hirevenkanagoudar, L. V. (2010). Extent of adoption of improved mango cultivation practices by the KVK trained farmers. *Asian Sciences*, 5(2): 98-101.

Balaji, C. M., Bairwa, R. K., Verma, L. N., Roat, B. L. and Jalwania, R. (2013). Economic impact of frontline demonstrations on cereal crops in Tribal Belt of Rajasthan*, Int. J. Agric. Sci*., 3(7): 566-570.

Biplab Mitra and Tanmay Samajdar. (2010). Yield gap analysis of Rape seed – Mustard through Frontline demonstration. *Agril. Extn. Review*, 22(1): 16-17.

Changadeya, W., Ambali, J. D. A. and Kambewa, D. (2012). Farmers adoption potential of improved Banana production Techniques in Malawi. *Int. J. Phy. Social Sci*., 2(4): 32-48.

Hiremath, S. M. and Hilli, J. S. (2012). Yield gap analysis in chilli production technology. *The Asian Journal of Horticulture*, 7(2): 347-350.

Jadav, N. B. and Solanki, M. M. (2009). Technological gap in adoption of improved mango production technology. *Agric. Update*, 4 (1&2): 59-61.

Khan AU, Choudhury MAR, Tarapder SA, Maukeeb ARM, and Ema IJ. 2020. Status of Mango Fruit Infestation at Home Garden in Mymensingh, Bangladesh. *Current Research in Agriculture and Farming*. 1(4): 35-42. Doi: http://dx.doi.org/10.18782/2582-7146.119.

Khan AU. 2022. The insect pests and diseases of mango (*Mangifera indica* L.) Plants and

Fruits: Importance and Management Strategies. 28-29 July 2022. Conference: Agriculture and Horticulture and Food Science and Aquaculture. At: Avani Atrium Bangkok Hotel. P. 23.

Kiran, S. T. (2003). A study on technological gap and constraints in adoption of recommended practices of mango growers. M. Sc. (Ag.) Thesis, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, M.S. (INDIA).

Meena, K. C. and Gupta, I. N. (2015). Impact of KVK training programmes on adoption of garlic production technology. *J. Krishi Vigyan*, 4(1): 41- 43.

Mehta, B. M., Sonawane and Madhuri. (2012). Characteristic and adoption behaviour of mango growers of Valsad district of Gujarat. *Agric. Update*, 7(1&2): 37-41.

Mishra, D. K., Tailor, R. S., Pathak, G. and Deshwal, A. (2007). Yield gap analysis of blight disease management in Potato through frontline demonstration. *Ind. Res. J. Ext. Edu*., 7(2&3): 82-84.

Patel, R. N. And Patel, J. R. (2014). Impact of Front Line Demonstration on Mustard growers. Guj. *J. Extn. Edu*., 25:91-92.

Shinde, A. S. (2011). Impact of production technology of mango: An Economic analysis. M.Sc. (Ag.) Thesis, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, M.S. (INDIA).

Singh, A. P., Vaid, A. and Mahajan, V. (2014). Impact of KVK training programmes and Frontline demonstrations on adoption of Pusa Basmati 1121 in Kathua district of Jammu and Kashmir. *J. Krishi Vigyan*, 2(2): 44-48.

Nagappa Desai, Nagaraja Kusagur, Chandru Patil and Shreenivasa, K. R. 2021. Effect of Integrated Crop Management on Yield and Economics of Mango through Frontline Demonstration in Tumkuru District, Karnataka, India. *Int.J.Curr.Microbiol.App.Sci*. 10(02): 3146-3152. doi: https://doi.org/10.20546/ijcmas.2021.1002.345

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/129868