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Popularization of Improved Production Technologies in Mango through Farmer Field School Approach

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ABSTRACT

Mango repeatedly acclaimed as the king of fruits, is the most important commercially grown fruit of India due to its wide range of adoptability, high nutritive value and excellent flavour. However its productivity had shown declining trend over the years which need to be addressed. Hence, the farmer field school (FFS) was conducted for twenty five mango growing farmers. Significant increase in knowledge gain was observed among farmers after completion of FFS. Further it enhanced the adoption per cent of production practices in mango which ranged from 36 to 100 per cent. Cent per cent of farmers adopted technologies like mulching, fruit harvesting using tools and artificial ripening of fruits using ethylene gas. Small per centage (36 %) of farmers adopted the technologies related to spongy tissue management, post-harvest treatment with hot water, increasing shelf life of the fruits with plant wax, processing and values addition. A change in level of adoption was also recorded for eco-friendly management of fruit flies.

Key Words: Awareness, Farm Field School, Mango cultivation, Productivity

INTRODUCTION

Mango (*Mangifera indica* L.) is one of the most important fruit crops of tropical and subtropical regions. India is the leader in mango production (20772 thousand MT) during 2021-22, which accounts for more than 40 per cent of global mango production (Balaganesh, 2023). The area occupied by Mango in India is 22.58 lakh hectare, where the annual production and productivity is 218.22 lakh MT and 9.7 MT/ ha respectively as against a higher productivity of 30 MT/ ha in Israel. Andhra Pradesh leads in area of mango cultivation occupying 3.63 lakh hectare followed by Uttar Pradesh occupying 2.65 lakh hectare whereas Uttar Pradesh leads in production of 45.51 lakh MT followed by Andhra Pradesh producing 43.73 lakh MT and Rajasthan leads in productivity of 17.58 MT/ ha followed by Punjab of 16.9 MT/ ha (Anonymous, 2018).

The main reason for low productivity of mango in India can be attributed due to poor orchard management, dense canopies with wider spacing, poor sunlight interception and ventilation encouraging more pest and disease incidence (Kumar *et al*, 2017). The increased productivity can be achieved through hi-tech cultural practices such as nutrient management, mulching, canopy management, using of growth regulators, floral manipulation in mango by application of exogenous plant hormones, induction of off – season flowering, top working of old and senile orchards for rejuvenation by reducing long gestation period, reduced pest and diseases incidence and post-harvest management.

The affordability of small and marginal farmers towards application of recommended fertilizer doses is increasingly becoming difficult, owing to ever increasing cost of inorganic fertilizers. Therefore, alternate mode/ source of essential plant nutrients should be thought of. In this context, farm yard manure (FYM) and in-situ green manuring as low cost input sources may be considered for improving crop productivity and soil health to the majority of the farming community (Kailash kumar *et al,*2017). Weeds are

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Table 1. Knowledge gain on mango production technologies. n=25

Sr. No.	Production practice	Before FFS	After FFS	X^2Value
A	Summer ploughing in area between the basins			
1	Not aware	14	04	0.6*
2	Fully known	11	21	
B	Green manuring			
3	Not aware	20	02	0.8**
4	Fully known	05	23	
C	Intercropping			
5	Not aware	08	0	1.0**
6	Fully known	17	25	
D	Identification of nutritional deficiencies			
7	Not aware	25	16	0.2*
8	Fully known	0	09	
E	Manuring and fertilizer application based on soil test			
9	Not aware	14	01	0.9**
10	Fully known	11	24	
F	Micro nutrient management			
11	Not aware	16	04	0.6*
12	Fully known	09	21	
G	Canopy management			
13	Not aware	22	0	1.0**
14	Fully known	03	25	
H	Regulation of bearing			
15	Not aware	19	08	0.4*
16	Fully known	06	17	
I	Regulation of fruit drop			
17	Not aware	17	10	0.3*
18	Fully known	08	15	
J	Rejuvenation of old and senile trees			
19	Not aware	12	03	0.6*
20	Fully known	13	22	
K	Importance of mulching			
21	Not aware	04	0	1.0**
22	Fully known	21	25	
L	Eco friendly management of fruit flies through pheromone traps			
23	Not aware	24	06	0.6*
24	Fully known	01	19	
M	Management of spongy tissue			
25	Not aware	25	11	0.4*
26	Fully known	0	14	
N	Tools for harvesting of mango			
27	Not aware	06	0	1.0**
28	Fully known	19	25	
O	Artificial ripening of fruits by ethylene gas			
29	Not aware	20	0	1.0*
30	Fully known	05	25	

Sr. No.	Production practice	Before FFS	After FFS	X^2Value
P	Post -Harvest treatment with hot water			
31	Not aware	23	16	NS
32	Fully known	2	09	
Q	Increasing shelf life of the fruits with plant wax			
33	Not aware	24	14	NS
34	Fully known	01	11	
R	Digital marketing of fruits			
35	Not aware	18	07	0.4*
36	Fully known	07	18	
S	Different packaging Materials			
37	Not aware	08	0	1.0**
38	Fully known	17	25	
T	Processing and value addition			
39	Not aware	19	01	0.9**
40	Fully known	06	24	

X^2 Chi square

** Significant at 0.05 level of probability*

*** Significant at 0.01 level of probability*

NS Non significant

widespread in many mango orchards. If not managed properly, however, they can have a serious economic impact with crop losses and increased production costs. Canopy management is one of the most important factors to sustain the yield and quality of fruits in mango. In many fruit crops, increase in production with enhanced fruit quality is achieved by managing canopies. Capturing and conversion of sunlight into the fruit biomass (dry matter content) is an important process in fruit production.

Micronutrients deficiency in Indian soils are higher in case of Zinc (Zn) and Boron (B). It is estimated the average deficiency of Zn is to be around 50 now and by 2025 projected to increase 63 % (Singh, 2001). It reflects on health at risk across the globe (Alloway, 2008). Deficiency of Zn ranged between 5.9 to 75.0 per cent in soil and 33.3 to 100 per cent in mango leaf tissue analysis in Uttar Pradesh (Kumar *et al*, 2015). Application of 100g borax per plant with spraying of 0.5% boric acid during the month of September- October solution at peanut and marble size of fruits useful for optimum improvement in fruit quality.

Exogenous application of NAA at 50 ppm at pea and marble stage of fruit growth was beneficial in improving the fruit retention and yield of mango cv. Amrapali while, $ZnSO_4$ at 0.75 per cent resulted in production of superior fruits (Vejendla *et al,* 2008). At harvest, fruit number was higher under NAA (20ppm) treatment in Alphonso at Bangalore (Upreti *et al*. 2014). There are number of insect pests damaging mango tree but the main challenge faced by mango producers is fruit infestation caused by the invasive oriental fruit fly, *Bactrocera dorsalis* (Meyer *et al,* 2016). Mango suffers from several diseases at all stages of its life. All the parts of the plant, namely, trunk, branch, twig, leaf, petiole, flower and fruit are attacked by a number of pathogens including fungi, bacteria and algae. They cause several kinds of rot, dieback, anthracnose, malformation, scab, necrosis, blotch, spots, mildew, etc. (Haggag Wafaa, 2014).

The Farmer Field School (FFS) is a tool to build capacities of farmer groups through participatory approach for promoting sustainable agricultural development, managing crop ecosystem, to make them better decision maker in sustainable use of resources at the cropping, farming and watershed levels. It also helps in stimulating local innovation. FFS is based on the farmer's need and training is imparted outside the

classrooms and on the farms. The schools usually comprise season long practical training with a set pattern of activities like regular field monitoring and Agro- Ecosystem Analysis (AESA). FFS provides an opportunity for the farmers to master its basic skills to enable them to make informed field management decisions (Kawale, 2011). Keeping these points in view this study was conducted with FFS approach to popularize production technologies in mango and to assess the impact of FFS programme on awareness and adoption of production technologies among participant farmers.

MATERIALS AND METHOD

This FFS was conducted at Hude village of Hanagal taluk, Haveri district, Karnataka. Hanagal taluk has got highest area under mango crop (3844 ha) contributing 68.64 and 71.36 per cent to total district mango area and production respectively. Before initiation of FFS, a survey was taken up among mango growers of Hude and adjacent villages to assess the knowledge level about production technologies in mango crop. After the survey it was found that nearly 65 per cent of farmers were unaware about production technologies. Based on above fact, at monthly interval the FFS was carried out by including 25 mango growing farmers at Hude village.

Collection of Data

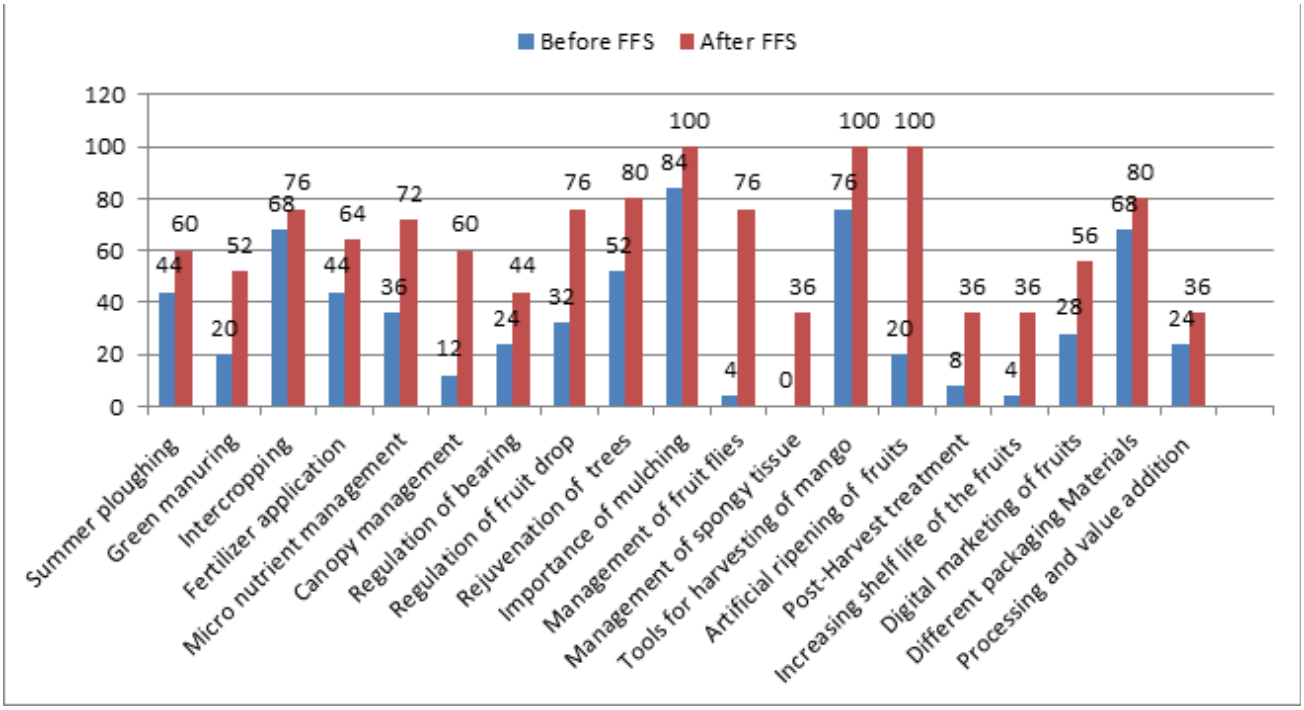
To assess the knowledge gain and adoption of production technologies in mango crop, pre-evaluation and post-evaluation was conducted before initiation of FFS and one year after completion of FFS respectively. Both the pre and post evaluation questionnaires comprised the same questions on cultural practices, soil sampling method and soil test based nutrient management, weed management, intercropping with mango, micronutrient management using mango special, use of pheromone trap, crop stage wise pest and disease management, post-harvest technologies, marketing and value addition aspects. At the time of pre-evaluation, farmers basic information like age, crops cultivated, land holding, education and their contact details etc. were also collected. Differences in knowledge of farmers in technological solutions regarding low productivity and poor fruit quality were analysed using Chi-square (x^2) test, while differences in adoption were interpreted using descriptive statistics.

RESULTS AND DISCUSSION

The Farmer Field School (FFS) is a form of adult education, which evolved from the concept that farmers learn optimally from field observation and experimentation. It provided an opportunity for the farmers to learn together, field oriented participatory and learning by doing. Knowledge gain on mango production technologies presented in Table 1. The results revealed that FFS was an efficient way to improve farmers knowledge. This method of education had significantly influenced the awareness on summer ploughing in area between the basins, green manuring, identification of nutritional deficiencies, intercropping, manuring and fertilizer application based on soil test, micro nutrient and canopy management, regulation of bearing and fruit drop, rejuvenation of old and senile trees, importance of mulching, eco-friendly management of fruit flies through pheromone traps, management of spongy tissue, tools for harvesting of mango, artificial ripening of fruits by ethylene gas, digital marketing of fruits, different packaging materials, processing and value addition. These results are in line with the findings of Rola *et al* (2002) who reported that the FFS farmers gained more knowledge in pest and nutrient management and actively exercised interpersonal networks to share knowledge among themselves, but very little with other farmers. The results showed that there was an improvement in knowledge gain for subjects like post-harvest treatment with hot water and enhancement of shelf life of the fruits with plant wax but it is found to be non-significant.

Some previous studies focused on the economic aspect of the FFS program found that the FFS participants have significantly more knowledge about IPM practices; they have the potential to improve production and productivity (Godtland *et al,* 2003 and Davis *et al,* 2012). Participation in FFS enhanced the adoption per cent of production practices in mango production which ranged from 36 to 100 per cent. FFS which

Figure 1. The findings pertinent to the item-wise adoption level of the FFS beneficiaries (in percentage)



emphasis participatory learning aiming to share knowledge and skill at farmer's field produces more tangible results (Jothilkashmi and Akila, 2022). The skill transfer activities and demonstrations in FFS may have increased the confidence level to adopt the practices in contrast to conventional extension approaches which increased knowledge and awareness and not influenced adoption behavior (Shelly, 2020 and Chander and Chand, 2020).

After conducting of FFS, a cent per cent adoption of technologies like mulching, fruit harvesting using tools and artificial ripening of fruits using ethylene gas was noticed among farmers. Mulching practice gained popularity amongst mango growers because of lack of irrigation facilities. Traditional manual harvesting methods are labour-intensive and inefficient. Harvesting tools offers a promising solution, with the potential to significantly reduce harvesting costs and contribute to overall production efficiency further use of ethylene gas is a simple and low cost method for uniform accelerated ripening as an alternative to banned calcium carbide method which encouraged the farmers for complete adoption of above technological solutions.

Karan singh *et al* (2010) found that majority of farmers did not adopt practices such as summer ploughing, application of fertilizers, inter cop, plant growth regulators, green manuring, insect pests, diseases, physiological dis orders and marketing procedures where as Kawale (2011) reported that most of the beneficiaries adopted the practices taught in FFS namely, varieties, land preparation, fertilizer application, irrigation practices and harvesting of fruits.

\From very low level of adoption (4 % before FFS) to high level of adoption (76 % after FFS) was observed for eco-friendly management of fruit flies through pheromone traps mainly because it caused significant economic losses by lowering the market value of fruits and as a result, diminishing farmer's revenues. The total estimated losses caused by these fruit flies were up to 27-42 per cent and in severe cases, it may reach upto 90 per cent in mango. FFS conducted in onion reduced the pesticide usage, expense and increased income while maintaining the same yield (Sanglestsawai *et al,* 2015).

Even after completion of FFS, merely 36 per cent of the participants were adopted the technologies related to spongy tissue

management, post-harvest treatment with hot water, increasing shelf life of the fruits with plant wax, processing and values addition. This may be due to non-availability of critical inputs and complex procedure. Divya and Arunachalam (2020) also reported that none of the respondents have adopted technologies like, dipping fruits in 52±1ºC hot water immediately after harvest for 5 minutes owing to their lack of awareness.

Farmer field school enhanced the knowledge and adoption of technological solutions by mango farmers resulting in higher productivity and better income which is in line with Kawale *et al*, (2011). The FFS is a better approach to enhance farmers technical knowhow of complex technologies/ practices (Godtland *et al*, 2003) and adoption of the same. The findings of Bhuiyan and Maharjan (2022) revealed that FFS farmers had a lower agroecological impact from pesticide use and their behaviour in farming practices was improved. FFS was demonstrated to be a key strategy in strengthening agricultural extension services, which will contribute to promoting sustainable agriculture.

CONCLUSION

This study revealed that there were varied levels of knowledge among farmers against the mango cultivation. Since farmers were willing to learn and adopt new management strategies, new strategies were introduced via appropriate extension methods such as Farmer's Field School. There was significant improvement in farmer's knowledge after attending FFS on various aspects of mango production. Further, appreciable per cent increase in adoption of production technologies were noticed. Hence, this study suggested that participatory education approach like FFS may be adopted to strengthen productivity in mango crop.

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