

Original Research Article

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Yield gap analysis in adoption of production



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technology of mango by the farmers at Tumkuru

4

district of Karnataka

ABSTRACT

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The studies were conducted on yield gap analysis in adoption of production technology of



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mango by the farmers at Tumkuru district, selected ten village of twenty farmers from each



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village, ten belong to big and small farmers category ~~during the year from 2010-11 to 2012-~~

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13. Total 200 sample size were selected multistage random sampling technique, the data were



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collected through personal interview, Frontline demonstration, Off-campus and On-campus

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training programme. Observation was found that 20 per cent of yield gap between



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demonstration plot and actual farmers plot yield in mango. The total yield gap between

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potential yield and actual yield was 50 per cent. Majority of the big farmers (63 %) and small

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farmers (50 %) were medium level of adoption. Majority of the big farmers (more than 80 %) 

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fully adopted the production practices like plant population per hectare and pit size, where as 

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more than 90 per cent of small and big farmers have not adopted technology such as spraying 

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with mango special as micronutrient, application of Paclobutrazol for regular bearing in

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alphanso mango variety and using improved mango harvester for drudgery reduction. 

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Significant percentage of big farmers partially adopted the technologies such as

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recommended farm yard manure application (55 %), recommended dose of inorganic

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fertilizer application (58 %) and powdery mildew management (46%). More than 70 per cent

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of small farmers have not adopted technologies such as selection of grafted seedlings (71 %)

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and fruit fly management (70). But significant percentage of small farmers have not adopted

practices viz., selection of improved variety (62 %), selection of grafted seedlings (71 %), recommended dose of inorganic fertilizer application (72 %) and powdery mildew management (63 %). High cost and non availability of labour, erratic supply of electricity, lack of knowledge regarding pest and disease management, unawareness about nutrient management and high cost of inputs as major production constraints perceived by the Mango growers. A great majority of big and small farmers opined that providing crop insurance, availability and supply of improved seedlings and inputs at right time, research efforts for development of cost effective simple technologies for pest and disease management and conducting demonstration cum training programmes were the major suggestions of mango grower to overcome the constraints

Key words: Adoption, frontline demonstration, production constraint, mango and yield gap.

INTRODUCTION

The Mango (*Mangifera indica* L) belongs to family Anacardiaceae. It is called “the king of fruits” on account of its nutritive value, taste, attractive fragrance and health promoting qualities (Banarjee, 2011). It is commercially cultivated in more than 80 countries like Brazil, China, Egypt, India, Indonesia, Mexico, Pakistan, Phillipines, Thailand and Vietnam among these countries India is ranking number one in mango production. 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 2500 thousand hectares with an annual production of 18002 thousand metric tones in India during 2012-13. (Hand book on Horticulture statistics 2014, 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. Efforts are made to transfer these recommendations among the mango

49 growers by the extension workers. However, it has been observed that mango growers are
50 still following their age old practices of mango cultivation. The practices followed by the
51 mango growers of Tumkur district have not been systematically documented so far. Hence,
52 the study was undertaken to yield gap analysis in adoption of production technology of
53 mango by the farmers at Tumkuru district of Karnataka state.

54 MATERIALS AND METHODS

55 Tumkur district is the important mango growing district of Karnataka comprising of 10 taluks
56 of which, Gubbi taluk was selected for the study, where it has the maximum area under
57 mango compared to other taluks. From Gubbi taluk, 10 villages having maximum area under
58 mango growers were selected randomly. From each village, 20 farmers were selected in
59 which ten belong to big farmers category and ten belong to small farmers category. Thus, a
60 total sample size of 200 was constituted by following the multistage random sampling
61 technique. An interview schedule was used to collect the data from the respondents. The data
62 were collected through personal interview, Frontline demonstration, Off-campus and On-
63 campus training programme during the year from 2010-11 to 2012-13. The information
64 collected was tabulated, analysed and interpreted as per the objectives of the study.

65 Yield data of experiment was collected by Krishi Vigyan Kendra, Konehalli, Tiptur taluk,
66 Tumkur district for considered as the absolute maximum production potential yield of the
67 crop in a given situation. Besides this, the demonstration plot yield was obtained using the
68 data from the On farm trial and Frontline demonstrations conducted in the farmers field under
69 the close supervision of scientists from KVK, Konehalli, Tiptur in different locations of the
70 district. Further, information on actual yield obtained by the farmers on their farms under
71 their own management practices was collected at the time of interaction with farmers. Using
72 these data the differences between potential yield and demonstration plot yield (Yield gap-I),

73 difference between demonstration plot yield and actual yield (Yield gap- II) and difference
74 between potential yield and actual yield (Total yield gap) were worked out.



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

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

77 Potential yield - Actual yield = Total yield gap

78 RESULTS AND DISCUSSION

79 The realized yield and estimated yield gaps are presented in Table I, the potential yield of
80 mango was found to be 200 kg/tree and the demonstration plot yield obtained through
81 frontline demonstrations was found to be 160 kg/tree (Changadeya *et al.*, 2012). The actual
82 yield realized by the farmers on their farm with their own resources and management
83 practices was 100 kg/tree. The magnitude of technological gap (yield gap-I) was 40 kg/tree,
84 which was 20 per cent less than the maximum attributable yield (Jadav and Solanki 2009).
85 Extension gap (yield gap-II) refers to the difference between demonstration plot yield and
86 actual yield and it was 60 kg/tree. There was 30 per cent reduction in yield compared to
87 demonstration plots yield. A sizable total yield gap of 100 kg/tree was observed and it
88 accounted for 50 per cent. These findings are in agreement with that of Venkata Kumar *et al.*,
89 2010.



90 **Table I: Yield gap identified in mango production**



Particulars	Yield (kg /tree)	Percentage gap
Potential yield	200	--
Demonstration plot yield	160	--
Actual yield	100	--
Technological gap (Yield gap I)	40	20
Extension gap (Yield gap II)	60	30
Total yield gap	100	50

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92 Note: age of mango (Alphanso variety) tree 15-16 year old orchards

The causes for such a large total yield gap may be attributed to environmental differences between research stations, extension worker, farmers fields and non adoption of production technologies. It could be reduced through considerable co-ordination between researchers, extension workers and farmers

Overall adoption level: The findings related to the overall adoption levels are presented in Table II. Majority of the big farmers (63 %) have medium level of overall adoption, whereas in the case of small farmers, half of the farmers (50 %) have medium level of overall adoption. As it is seen in the table, one third of the (34 %) small farmers have low level of adoption. The farm size and economic conditions were found to influence the adoption level of big farmers as compared to small farmers.

Table II: Overall adoption level of recommended practices by Mango growers (n=100)

Category	Big farmers		Small farmers	
	No	Percentage	No	Percentage
Low	18	18.00	34	34.00
Medium	63	63.00	50	50.00
high	19	19.00	16	16.00

Production practice wise adoption level: The practice wise extent of adoption of production technologies by the mango growers were analysed and results are presented in Table III. More than 90 per cent of small and big farmers have not adopted technology such as spraying with mango special as micronutrient, application of Paclobutrazol for regular bearing in alphanso mango variety and using improved mango harvester for drudgery reduction. More than 80 per cent of small and big farmers have not applied weedicide in the mango garden for weed management and canopy management in mango orchard. It is evident from the table that, majority (more than 80 %) of the big farmers fully adopted the practices like plant population per hectare and pit size. Significant percentage of big farmers partially adopted the

technologies such as recommended FYM application (55 %), recommended dose of inorganic
fertilizer application (58 %) and powdery mildew management (46%). More than half of the
big farmers have not adopted selection of grafted seedlings (54 %), mango hopper
management (60 %) and fruit fly management (65 %). These findings are in line with
research findings of Aski *et al.*, 2010 and Kiran 2003.

The practices which were adopted fully by small farmers were pit size (86 %) and plant
population per hectare (76 %). More than 70 per cent of small farmers have not adopted
technologies such as fruit fly management (70 %). Significant percentage of small farmers
have not adopted practices viz., selection of improved variety (62 %), selection of grafted
seedlings (71 %), recommended dose of inorganic fertilizer application (72 %) and powdery
mildew management (63 %). The study revealed that the simple technologies were adopted to
a relatively greater extent as compared to complex technologies. Complexity of innovations
may be one of the reasons for non adoption of practices like spraying with mango special as
micronutrient, application of Paclobutrazol for regular bearing in alphanso mango variety,
canopy management in mango orchard and using improved mango harvester (Alagukannan *et*
al., 2015; Patel *et al.*, 1998).

Table III :Production practice wise adoption by mango growers

Production Practices	Big farmers (n=100)						Small farmers (n=100)					
	Full adoption		Partial adoption		Non adoption		Full adoption		Partial adoption		Non adoption	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Improved variety	25	25	32	32	43	43	18	18	20	20	62	62
Selection of grafted seedlings	14	14	32	32	54	54	08	08	21	21	71	71
Plant population/ha	82	82	18	18	--	--	76	76	24	24	--	--
Pit size	85	85	--	--	15	15	86	86	14	14	--	--
Recommended quantity of	20	20	55	55	25	25	15	15	46	46	39	39

FYM application												
Recommended dose of inorganic fertilizer application	30	30	58	58	12	12	12	12	16	16	72	72
Drip irrigation followed	40	40	22	22	38	38	35	35	36	36	29	29
Spraying with Mango special (micronutrient)	--	--	09	09	91	91	--	--	06	06	94	94
Canopy management	08	08	08	08	84	84	07	07	05	05	88	88
Growing legumes as intercropping	28	28	26	26	46	46	21	21	24	24	55	55
Weedicide application	10	10	08	08	82	82	06	06	08	08	86	86
Application of Paclobutrazol	--	--	--	--	100	100	--	--	--	--	100	100
Mango hopper management	23	23	17	17	60	60	19	19	21	21	60	60
Fruit fly management	12	12	23	23	65	65	08	08	22	22	70	70
Stem borer management	16	16	36	36	48	48	13	13	32	32	55	55
Powdery mildew management	18	18	46	46	36	36	15	15	22	22	63	63
Using improved mango harvester	--	--	09	09	91	91	--	--	07	07	93	93

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133 ***Relationship between the adoption level and personal, socio-economic characteristics of***

134 ***mango growers:*** The study included the correlation analysis to know the relationship



135 between the adoption level and personal, socio-economic characteristics of mango growers.

136 The results with respect to the correlates level are presented in Table IV. The results indicated



137 that, out of 16 variables, ten variables had relationship with the adoption level of big farmers

138 at varied level. The variables like farming experience, extension contact, social participation,

139 risk orientation and scientific orientation were found to be highly significant at 0.01 per cent

140 level with the adoption level. Whereas, the variables like education, level of aspiration,

141 cosmopolitaness, economic motivation and innovative proneness showed lesser level of

142 significance at 0.05 per cent level. However, in case of small farmers category, occupation,

143 farming experience and level of aspiration were found to be highly significant at 0.01 per cent

level with the adoption level of small farm mango growers. This may be due to the fact that the respondents having higher education level with farming experience, extension and social participation and higher aspirations might be influenced in adopting the crop production technologies at higher rate. Further, motivation to maximize the profit, willingness to change, taking risk to try new ideas, scientific situation analysis, contact with resource persons of different institutions might be the possible reason for adopting improved technologies by mango growers (Mehta et al., 2012).

Table IV: Relationship between the adoption level and personal, socio-economic characteristics of mango growers



Characteristics	Correlation co-efficient (r)	
	Big farmers (n=100)	Small farmers (n=100)
Age	-0.17	-0.14
Education	0.825**	0.351
Occupation	0.186	0.422*
Farming experience	0.419*	0.478*
Family size	0.218	0.246
Extension contact	0.472*	0.212
Social participation	0.516*	0.305
Opinion on Agriculture	0.312	0.292
Level of aspiration	0.653**	0.464*
Cosmopoliteness	0.732**	0.233
Economic motivation	0.652**	0.318
Risk orientation	0.434*	0.294
Scientific orientation	0.497*	0.327
Innovative proneness	0.754**	0.306
Credit orientation	0.213	0.273
Annual income	0.315	0.295

* Significant at 0.01 per cent level

155 ** Significant at 0.05 per cent level

156 **Production constraints among mango growers:** The findings related to production
 157 constraints are presented in Table V. Big and small farmers opined that erratic supply of
 158 electricity (91% & 94%), Lack of knowledge about application of Paclobutrazol, canopy
 159 management and use of improved mango harvester (82 % & 91 %) and Lack of knowledge
 160 regarding pest and disease management (81% & 84%) respectively as the major production
 161 constraints (Badhe *et al* 2009; Jaitawat *et al.*, 2007). Majority of the big farmers expressed
 162 that the major production constraints in mango cultivation such as inadequate irrigation
 163 source (72 %), unawareness about micro and macro-nutrient management (61 %), low market
 164 rate for the produce (65 %) and lack of adequate market information (60%). High cost of
 165 inputs (71 %), inadequate irrigation source (81 %), unawareness about micro and macro-
 166 nutrient management (73 %), low market rate for the produce (78 %) and lack of adequate
 167 market information (73 %) were the major production constraints expressed by the small
 168 farmers. These findings are in line with research findings of Amandeep *et al.*, (2013), Biplab
 169 Mitra *et al.*, (2010), Raut 2006 and Chavda (1981).

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171 **Table V: Production constraints of mango growers**

Production constraints	Big farmers (n=100)		Small farmers (n=100)	
	No.	Percentage	No.	Percentage
Non availability of inputs	26	26	34	34
Inadequate irrigation source	72	72	81	81
High cost of inputs	52	52	71	71
Erratic supply of electricity	91	91	94	94
Unawareness about micro and macro-nutrient management	61	61	73	73
Lack of knowledge about application of Paclobutrazol, canopy management and	82	82	91	91

use of improved mango harvester				
Lack of knowledge regarding pest and disease management	81	81	84	84
Low price for the produce	65	65	78	78
Lack of adequate market information	60	60	73	73

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173 The aforesaid production constraints imply that there is an urgent need to strengthen the
 174 outreach activities of developmental departments. These constraints also serve the policy
 175 makers to formulate strategies to develop irrigation sources, continuous power supply and
 176 fixed price for the produce. Training programme, demonstrations and other extension efforts
 177 targeting the farmers needs on production technologies of mango by the developmental
 178 departments will reduce the technological and extension gap and will improve the socio-
 179 economic status of mango growers.



180 ***Suggestions of the mango growers to overcome the production constraints:*** Suggestions of
 181 the mango growers are presented in Table VI. A great majority of big and small farmers
 182 expressed that providing continuous power supply, research efforts are needed for
 183 development of cost effective simple technologies for production practices, fixed price for
 184 the produce and developing irrigation source were the solutions to overcome the production
 185 constraints. A significant percentage of big farmers opined that providing crop insurance (76
 186 %), availability and supply of grafted seedlings and inputs at right time at subsidized rates (74
 187 %), ~~research efforts are needed for~~ development of cost effective simple technologies for
 188 production practices (73 %) and conducting demonstration cum training programmes (62%)
 189 were the suggestions to overcome the constraints (Hiremath and Hilli 2012; Yadav *et al.*,
 190 2004; Sharma,1997).



191 Providing crop insurance (79 %), availability and supply of grafted seedlings and inputs at
 192 right time at subsidized rates (79 %), ~~research efforts are needed for~~ development of cost

193 effective simple technologies for production practices (86 %), conducting demonstration cum
194 training programmes (78 %) and providing good market price (62 %) were the suggestions of
195 small farmers to overcome the production constraints (Meena and Gupta 2015, Singh *et al.*,
196 2014, Malleswararai *et al.* 2008).

197 **Table VI: Suggestions of the mango growers to overcome the constraints**



Overcome the production constraints	Big farmers (n=100)		Small farmers (n=100)	
	No.	Percentage	No.	Percentage
Availability and supply grafted seedlings and inputs at right time at subsidized rates	74	74	79	79
Research efforts are needed for development of cost effective simple technologies for production practices including pest and disease management	73	73	86	86
Conducting demonstration cum training programmes	62	62	78	78
Providing crop insurance	76	76	79	79
Providing good market price	56	56	62	62
Providing continuous power supply	72	72	81	81
Developing irrigation source	81	81	93	93

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199 CONCLUSION

200 It can be concluded that adoption of scientific production practices can reduce the yield gap
201 to a considerable extent, thus, leading to increased productivity of mango in the district.
202 Hence, there is a need for reaching mango growers with different extension strategies like
203 organizing capacity building activities for stakeholders, conducting demonstrations to show
204 the worth of the technologies, organizing field visits to solve field problems, conducting
205 exposure visits to successful farms to develop confidence about technologies and
206 encouraging collaborative and group approaches may increase the production and
207 productivity of mango in the district.



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288 Demonstration on mango spacial spray

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291 Demonstration on mango fruit fly trap



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293 Demonstration on improved mango harvester

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296 Demonstration on improved mango harvesting



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Demonstration on improved mango harvesting Vs. Farmers method of harvesting



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309 Data collection in registration book with farmers

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312 Data collection in registration book with farmers signature

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315 Improved and farmers mango harvester

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318 Farmers method of harvesting